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BUSINESS SCHOOL

ECONOMICS

CYCLICALITY, DETERMINANTS AND MACROECONOMIC EFFECTS OF FISCAL POLICY IN EUROPEAN COUNTRIES, WITH PARTICULAR REFERENCE TO TRANSITION COUNTRIES

Rilind Kabashi

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Abstract

This thesis empirically investigates the stabilization properties and the effectiveness of fiscal policy, which is an issue that has been gaining attention in the academic literature and among policy-makers in the past two decades, particularly in the wake of the Great Recession. The aim of the thesis is to analyse the cyclical character and determinants of fiscal policy, as well as the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European countries, with particular reference to transition countries. Using an extensive survey of the relevant literature and particularly the results of the comprehensive empirical investigation, the thesis offers recommendations relevant for policy-makers in European countries. The thesis thus deals with issues that lie at the heart of the main academic and policy debates in the wake of the European debt crisis. Consequently, its findings and recommendations should be useful for current and prospective European Union and euro area member states.

In order to analyse the cyclical character and determinants of fiscal policy, system GMM is used as the most appropriate estimation method for the sample and the aim of the study. The main finding in this part is that discretionary fiscal policy is pro-cyclical in both groups of transition countries (from Central and Eastern Europe and from South-eastern Europe), thus aggravating economic fluctuations, while it is a-cyclical in old EU member states. These baseline results are robust to various extensions and robustness checks. The investigation of a wide range of additional factors indicates that various political and institutional factors also have important effects on fiscal policy in European countries, with numerous differences among the three country groups regarding their particular effect.

The extensive analysis of the stabilisation properties of fiscal policy is followed by an investigation of the ability of fiscal policy to influence economic movements, as well as of the transmission mechanism of fiscal policy. In this part, Panel Vector Auto Regression with recursive identification of government spending shocks is used to analyse the short- to medium-term effects of fiscal policy on output (fiscal multipliers) and other macroeconomic variables. The main results indicate that expansionary government spending shocks have a positive, but a relatively low effect on output, with the fiscal multiplier around one in the year of the shock and the following year, and lower thereinafter. Further, effects of fiscal policy are strongly dependent on structural country characteristics. In particular, fiscal multipliers are higher in new EU member states, in countries with low public debt and low trade openness.

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List of abbreviations

2SLS	Two-Stage Least Squares
3SLS	Three-Stage Least Squares
AMECO	Annual macroeconomic database of the European Commission
BP SVAR	Blanchard Perotti Structural Vector Autoregression
CAB	Cyclically-adjusted budget balance
CAPB	Cyclically-adjusted primary budget balance
CEE	Central and Eastern Europe
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
DSGE	Dynamic Stochastic General Equilibrium
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECB	European Central Bank
ECOFIN	Economic and Financial Affairs Council of the European Union
EMU	European Monetary Union (euro area)
EMU12	12 original members of the European Monetary Union
ERM	Exchange Rate Mechanism
EU	European Union
EU15	15 old EU member states (before the 2004 enlargement)
EU17	17 old EU member states: EU15 plus Cyprus and Malta
EU27	27 EU member states as of 2012
FE	Fixed Effects
FEVD	Forecast Error Variance Decomposition
FGLS	Feasible Generalised Least Squares
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
HP	Hodrick-Prescott
IFS	International Financial Statistics
IMF	International Monetary Fund
IPVAR	Interacted Panel Vector Autoregression
IRF	Impulse Response Function
IV	Instrumental Variable
LSDV	Least Square Dummy Variable

MTO	Medium term objective
NATO	North Atlantic Treaty Organisation
NMS	New EU member states
NMS10	10 new EU member states from Central and Eastern Europe from the 2004 and 2007 enlargements
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
p.c.	Per capita
p.p.	Percentage point
PCHVAR	Panel Conditional Homogenous Vector Autoregression
PVAR	Panel Vector Autoregression
PVAR FE	Panel Vector Autoregression with Fixed Effects
RBC	Real Business Cycle
SEE	South-eastern Europe
SEE6	6 South-eastern European countries: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia
SGP	Stability and Growth Pact
SGP-I/II/III	Main stages of the Stability and Growth Pact
SUR	Seemingly Unrelated Regression
SVAR	Structural Vector Autoregression
UK	United Kingdom
US	United States
VAR	Vector Autoregression
VECM	Vector Error Correction Model
W2SLS	Weighted Two-Stage Least Squares
WB DPI	World Bank Database of Political Institutions
WEO	World Economic Outlook
WLS	Weighted Least Squares

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Notes

The views expressed in this study are of my own. In no case do they represent the views of any of the persons or institutions mentioned above.

Throughout the text and tables, decimal numbers have been rounded to the displayed number of decimal figures.

Whenever the source of a table/figure is not reported, it means it has been drawn from the author's estimation results.

All chapters, sections, tables, figures and appendices are cross-referenced with links and can be accessed with 'ctrl+click' in Microsoft Word or with 'click' in Adobe Acrobat Reader. References can be similarly accessed.

A paper based on Chapter 3 of the thesis won the 2012 Oesterreichische Nationalbank Olga Radzyner Award for scientific work on European economic integration, which is bestowed on young economists from Central, Eastern and South-eastern Europe. A shorter version of the paper has been published in *The Focus on European Economic Integration* (Kabashi, 2014).

Chapter 1 – Introduction

1.1 Aims of the study

The aim of this thesis is to analyse the cyclical character and determinants of fiscal policy, as well as the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European countries, with particular reference to transition countries.

1.2 Context

One of the main issues that economic policymakers have to face is the stabilization of economic fluctuations using monetary and fiscal policy as the main tools. Accordingly, this is one of the fields that have attracted considerable attention in the academic literature since the start of macroeconomics as a discipline. The prevalent view on the role and effectiveness of fiscal and monetary policy has been almost constantly evolving. It has moved from considering fiscal policy the only stabilization tool in the 1950s to putting all the emphasis on monetary policy in the 1990s. Fiscal policy was until recently confined to automatic stabilizers, while it was recommended that discretionary fiscal policy should be reserved for "abnormal circumstances" such as the zero interest rate bound (Blinder, 2004). The primacy of monetary policy both reflected and inspired the new neo-classical synthesis (Goodfriend and King (1997), Woodford (2009)). It reflects the convergence of macroeconomic theories and methodologies (Mankiw (2006), Goodfriend (2007)) by combining Keynesian views of sticky prices and monopolistic competition with the neo-classical methodology of general equilibrium analysis of inter-temporal optimisation by rational economic agents. This is now the basic theoretical framework in the academic and policymaking world, as evidenced by the adoption of New Keynesian Dynamic Stochastic General Equilibrium (DSGE) models in central banks (Tovar, 2008). The standard formulation of these models reflects the dominant view of monetary policy as the most effective tool for inflation and output stabilization. On the other hand, most of the early contributions in this literature and their applications to policymaking have little space for the role of fiscal policy, reflecting the assumption of Ricardian equivalence, although recently considerable efforts have been made to incorporate various features of fiscal policy within New Keynesian DSGE models.

Despite the primacy of monetary policy in academic and policy-making circles, in practice policy-makers were also using fiscal policy to stabilise macroeconomic fluctuations. Moreover, fiscal policy did not disappear from the research agenda. Indeed, researchers have been revisiting some of the key issues of fiscal policy, thus resurrecting the old debates in macroeconomics. For instance, from the mid-1990s there was a proliferation of empirical studies analysing the stabilisation properties of fiscal policy, i.e. the reaction of fiscal policy to fluctuations in output (the cyclical character of fiscal policy) as well as to a wide range of other factors. In addition, the recent crisis and the zero bound for interest rates stressed the importance of fiscal policy in fighting the recession. This reignited the interest of the theoretical and empirical literature on the effects of fiscal policy on output (fiscal multipliers) and on other macroeconomic variables. Indeed, as Romer (2011) notes, between 2009 and 2011 there have been more studies on the effects of fiscal policy than in the previous quarter century.

On a more personal note, there were two key reasons that motivated the work on this particular thesis. First, coming from a transition country that is yet to join the European Union and prospectively the euro area, there was an obvious interest to learn about the experiences of other European countries regarding fiscal policy. This particularly applies to the experiences of transition countries that are already members of the European Union and of the euro area. Second, as a researcher working in a central bank in a European country, it is perhaps natural that the recent European debt crisis would fuel a personal curiosity regarding issues that are related to the sources of the crisis and possibilities of preventing its recurrence. Indeed, the issues that are treated in the thesis lie at the core of the current academic and policy debates in the European context, and it is therefore hoped that the thesis findings and policy implications would be useful for European policy-makers in the future.

1.3 Research objectives

This thesis analyses the key issues related to fiscal policy in European countries, with a particular reference to transition countries. Therefore, it is directly related to the current focus of research in the literature, as well as to a very important policy issue. It also fills an important gap in the literature, particularly on transition countries. Indeed, while monetary policy in both old EU member countries and European transition countries is an extensively researched area (both in the level of individual countries and groups of countries), there is still a lack of a comparable body of literature on fiscal policy. Therefore, this thesis provides a comprehensive study on the issues noted above for the group of European countries, with a particular focus on comparisons between old EU member states on the one hand, and new and prospective EU member states from Central, Eastern and South-eastern Europe (i.e. European transition countries) on the other hand. In particular, this thesis investigates the role of fiscal policy in stabilizing economic fluctuations, i.e. whether the character of fiscal policy in European countries is counter-, pro- or a-cyclical. In this part, it also analyses in detail a wide range of possible determinants of fiscal policy, encompassing various political, institutional and other factors. Further, the thesis also analyses the short- to medium-term effects of fiscal policy on output (but does not explore the separate topic of long-term growth) and on other important macroeconomic variables such as inflation and interest rates. It also investigates the possible influence of various country structural characteristics on the effects of fiscal policy as well as the transmission mechanism of fiscal policy. In other words, the thesis first analyses the effects of output on fiscal balances (controlling for other determinants), and interprets them as the cyclical character of fiscal policy. Then it analyses the opposite: the effects of fiscal policy on output, as well as on other macroeconomic variables. Therefore, the two empirical parts complement each other to provide a comprehensive study of fiscal policy in European countries. Indeed, if there are only limited effects of fiscal policy on macroeconomic movements (i.e. fiscal multipliers are low), then the issue of the cyclical character looses a great part of its importance. If fiscal policy can not affect output movements, it does not matter too much whether it is counter-, a- or pro-cyclical. On the other hand, large fiscal multipliers would warrant a more aggressive use of counter-cyclical fiscal policy, since in such a case fiscal policy would be effective in stabilising the business cycle.

The thesis tackles these issues by drawing extensively on the existing theoretical and particularly empirical studies, which focus mostly on developed countries. It analyses and compares advantages and disadvantages of the application of various empirical approaches to the issues being investigated. On the basis of this extensive discussion, it then selects and applies the most appropriate methodologies bearing on mind the aims of the study, the data and sample at hand, as well as recommendations in the relevant literature. Besides providing a genuine contribution to knowledge regarding fiscal policy in European countries, it is expected that findings and recommendations arising from the thesis will be useful to policymakers in European countries in general, and particularly in transition countries. Last but not least, bearing on mind that the Republic of Macedonia has yet to undergo most EU integration and reform processes that other transition countries have already completed, it is expected that findings of the thesis will also be useful to policymakers in my home country when designing and implementing fiscal policy in the future.

Consequently, the thesis has the following research objectives:

- To briefly review the main macroeconomic and fiscal policy developments in European countries;
- To review and critically assess the theoretical and empirical literature on the cyclical character and determinants of fiscal policy, as well as on the effects of fiscal policy on output and other macroeconomic variables;
- To analyse empirically the cyclical character and determinants of fiscal policy in European countries, with a particular focus on transition countries;
- To analyse empirically the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European countries, with a particular focus on transition countries;
- To draw policy recommendations relevant for transition countries and Macedonia in particular.

1.4 Stylised facts

Before proceeding to the empirical analysis in the following chapters, here we briefly describe the data and the main macroeconomic and fiscal policy developments in our sample. The empirical analysis in the thesis includes all the European countries which have data available for the variables of interest. This means that we use a sample of 33 countries between 1995 and 2012. In order to carry out comparisons between old EU member states and transition countries, in parts of the investigation we split our sample in three groups: old EU member states and two groups of transition countries. The first group consists of 15 old EU member states, plus Malta and Cyprus (labelled EU17[1]). The second group consists of the more advanced transition countries, i.e. the 10 countries from Central, Eastern and South-eastern Europe that joined the EU in 2004 and 2007 (NMS10). The third group, denoted as SEE6, includes 6 transition countries from South-eastern Europe that are in various stages of the EU accession process: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia[2]. It should also be noted that data on SEE6 countries are only available from a later date than 1995. In addition, we include SEE6 countries in our analysis of the cyclical character of fiscal policy, while we omit this group from the analysis of effects of fiscal policy due to lack of relevant data.

Fiscal policy in our sample was affected by several important factors. Most notably, this applies to the requirements of the Maastricht criteria and of the Stability and Growth Pact (SGP). The Maastricht Treaty prohibits countries from exceeding reference values for budget deficits and public debts, defined as 3% and 60% of GDP, respectively. The literature notes two possibilities for the effects of the Maastricht Treaty and the SGP on fiscal policy (e.g. Galí and Perotti (2003) and Fatás and Mihov (2009)). On the one hand, the loss of monetary sovereignty means that fiscal policy is the only remaining tool for macroeconomic stabilization, so policymakers would use it more aggressively in a counter-cyclical manner when faced with crisis or output volatility. On the other hand, the limits in the Maastricht Treaty and the SGP could prevent such an activist counter-cyclical policy, and consequently fiscal policy would become a-cyclical or even pro-cyclical.

In transition countries, fiscal policy was additionally and heavily affected by unprecedented political, economic and structural transformation since the beginning of the 1990s. Initially, fiscal policy was constrained because of changes in revenues and expenditures due to the restructuring and privatization of state-owned enterprises. Government budgets were also affected by the market and price liberalization, infrastructure building and institutional reforms. Expensive borrowing

[1] Cyprus and Malta joined the EU in 2004, but they are grouped with old EU countries because their economic structure and history makes them much closer to them than to the transition countries.
[2] Kosovo is omitted due to lack of data on public debt. Croatia became an EU member state in 2013, while our analysis ends in 2012.

sources and some of the exchange rate regimes were additional constraints. As transition advanced, the challenges in transition countries started resembling those of their Western European peers, such as issues of counter-cyclical fiscal policy, the effectiveness of fiscal policy and the sustainability of public debt. However, these countries were still facing some specific challenges. The process of EU-accession meant that they had to continue spending on institutional reforms and infrastructure modernization in order to meet entrance criteria and reach the development levels of Western European countries. Further, as EU members and potential candidates for entrance in the euro area, they were also faced with the constraints of the Stability and Growth Pact (SGP). Various authors argue that the SGP puts additional constraints on transition countries, generally considered undue because of their rapid development and their specifics (Nuti, 2006). Coricelli (2004) brings forward three arguments why SGP requirements would be more stringent for the new EU member states. First, they have a higher potential and more volatile actual GDP growth than old EU member states, so the deficit ceiling would be binding more often, even if one considers cyclically-adjusted indicators. This would impose a need for frequent fiscal adjustments, thus increasing the volatility and the pro-cyclical bias of fiscal policy. Second, in the original SGP there is lack of consideration for public investments, which are higher in transition countries due to the catching-up process. Third, the political element in the Excessive deficit procedure, which was also important in some cases of breaches by old EU member states, means that larger transition countries could have laxer treatment when breaching the SGP.

Macroeconomic developments during the period under analysis broadly confirm the specific environment for the implementation of fiscal policy in old EU member states and in the two groups of European transition countries during the past two decades[3]. According to Figure 1.1, transition countries had a considerably higher average GDP growth between 1995 and 2012 than the EU17 countries: average GDP growth in NMS10 and SEE6 was 3.6% and 3.2% respectively, compared to only 2.2% in the EU17 group[4]. In line with expectations in Coricelli (2004), GDP growth in transition countries was also more volatile, with a standard deviation of 4.4 in NMS10 and 4.1 in SEE6, considerably higher than the standard deviation of 2.8 in EU17 countries[5]. Related to this, GDP growth in most countries in the EU17 group was fairly compressed around the group average, with Ireland as a positive and Italy as a

[3] Besides the figures below, Appendix 3.2 contains additional graphs on output gap movements accross countries and groups and also according to different calculation methods.
[4] All group indicators are calculated as simple, non-weighted averages.
[5] Group standard deviations are calculated as averages of country standard deviations.

negative outlier. On the other hand, growth in transition countries was much more diverse, with very few countries close to their respective group average. For instance, in the NMS10 group, Baltic countries, Poland and Slovakia had growth rates considerably higher than the group average, whereas the other countries and particularly Hungary had significantly lower growth. A similar picture could also be noticed in South-eastern European countries, with Albania growing much more quickly than the group average, as opposed to the considerably slower average growth in Serbia, Macedonia and Croatia.

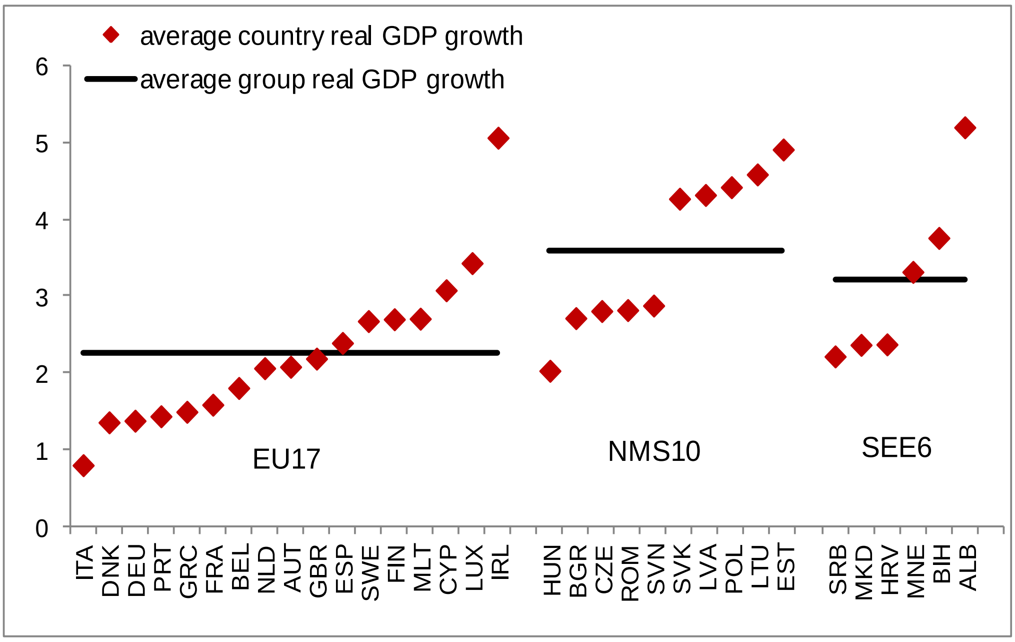

Figure 1.1. Average real GDP growth rates by countries and groups, 1995-2012 (in %)
Source: European Commission AMECO Database for EU17, NMS10 and some SEE6 countries. National statistical offices, central banks or finance ministries, EBRD, and the IMF WEO Database for some SEE6 countries.
Note: Group averages are unweighted.

Differences in GDP growth between the three groups of countries are also noticeable if averages are compared across years. According to Figure 1.2, average GDP growth in both groups of current EU member states (i.e. EU17 and NMS10) was quite similar in almost all years until 2000. On the other hand, growth in SEE6 was quite volatile, in good part reflecting the consequences of wars and the post-war reconstruction in the region during this period. However, a clear decoupling appears between 2000 and 2007, with both groups of transition countries growing more quickly than their Western European peers in all years. In this period, growth was highest in the countries in the NMS10 group, which were clearly reaping the benefits of the pre- and post-accession convergence. Finally, growth in all countries is considerably lower during and after the global crisis. Indeed, real GDP declined in all country groups in 2009, with the deepest fall registered in NMS10 countries. However, the post-crisis recovery mostly resembles the pre-crisis period, albeit at lower growth rates: GDP growth is again higher in transition countries (particularly new EU member states) than in the old EU countries.

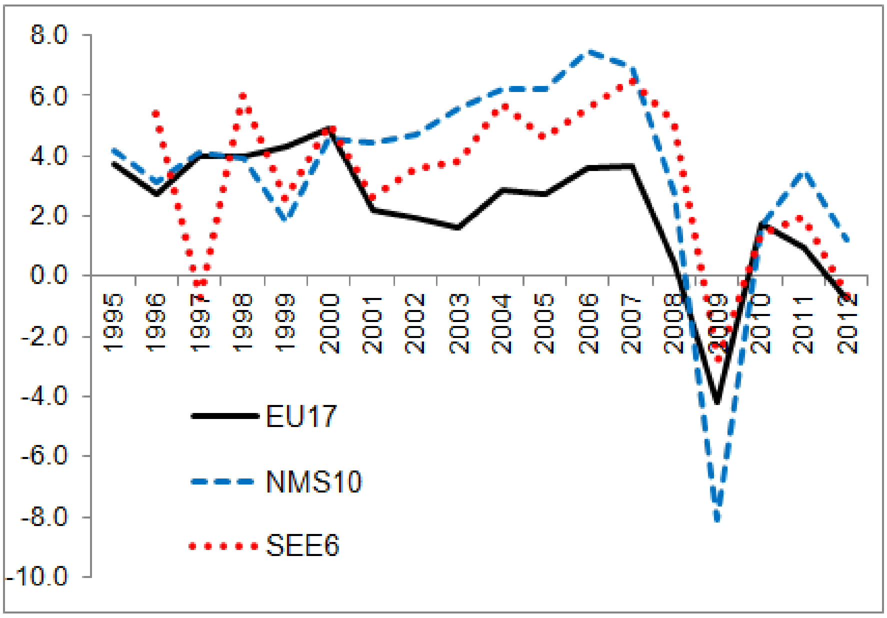

Figure 1.2. Average annual real GDP growth rates by country groups (in %)
Source: European Commission AMECO Database for EU17, NMS10 and some SEE6 countries. National statistical offices, central banks or finance ministries, EBRD, and the IMF WEO Database for some SEE6 countries.
Note: Group averages are unweighted.

There are also considerable differences in fiscal policy among European countries that persist even if one analyses cyclically-adjusted budget balances, which are expected to correct for differences in economic growth (Figure 1.3). The average cyclically-adjusted deficit in NMS10 between 1995 and 2012 was 3.5% of GDP, much larger than the deficit of 2.7% in the EU17 group, while the average deficit of 3.1% of GDP in SEE6 was somewhere in between. In addition, Figure 1.3 shows that there were also relatively large variations among countries. Indeed, most of the "core" EU17 countries had discretionary surpluses or small deficits, while a few countries from the "periphery" had relatively large deficits. On the other hand, except the marginal surplus in Estonia, the average cyclically-adjusted budget balance was in deficit in all NMS10 during the period, with the four Visegrad countries having large deficits close to or exceeding 5% of GDP. Cyclically-adjusted budget balances were also negative on average in all SEE6 countries, and quite large in Croatia and particularly Albania.

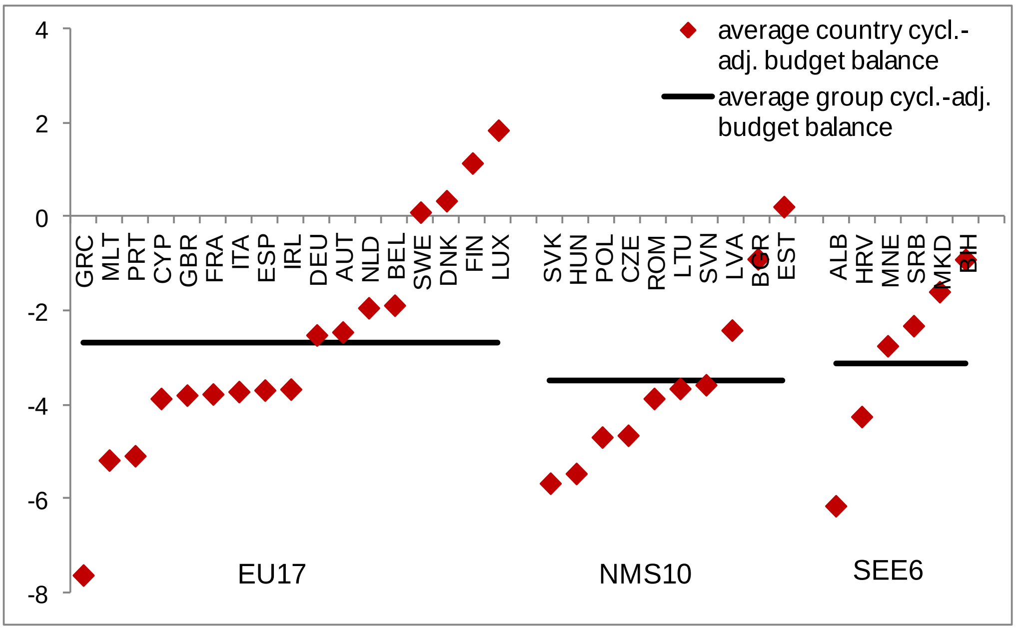

Figure 1.3. Average cyclically-adjusted budget balances by countries and groups, 1995-2012 (in %)

Source: European Commission AMECO Database for EU17 and NMS10. Author's calculations based on data from national statistical offices, central banks or finance ministries, EBRD, and the IMF WEO Database for SEE6 countries.
Note: Group averages are unweighted. The cyclical adjustment is based on the Hodrick-Prescott calculation of trend GDP.

This divergence in budget balances could be explained by two factors. First, it confirms the expectation that fiscal policy in transition countries would be affected by the comprehensive political, economic and structural transformation. Therefore, it is in line with the arguments in Nuti (2006) and Coricelli (2004) that the fiscal policy environment would be heavily affected by the specifics of the transition process. Second, transition countries were able to pursue a more expansionary fiscal policy for a relatively long period, as indicated by budget deficits analysed above. In particular, transition countries started the period with fairly low debt levels, which enabled them to accumulate budget deficits, generally without seriously bringing into question the issue of debt sustainability. As Figure 1.4 shows, average debt-to-GDP ratios during the period were 31.6% in NMS10 and 47.7% in SEE6. On the other hand, in this respect fiscal policy was more constrained in EU17 countries, as they had a considerably higher average debt/GDP ratio of 64.6% during this period, with significant variations among countries.

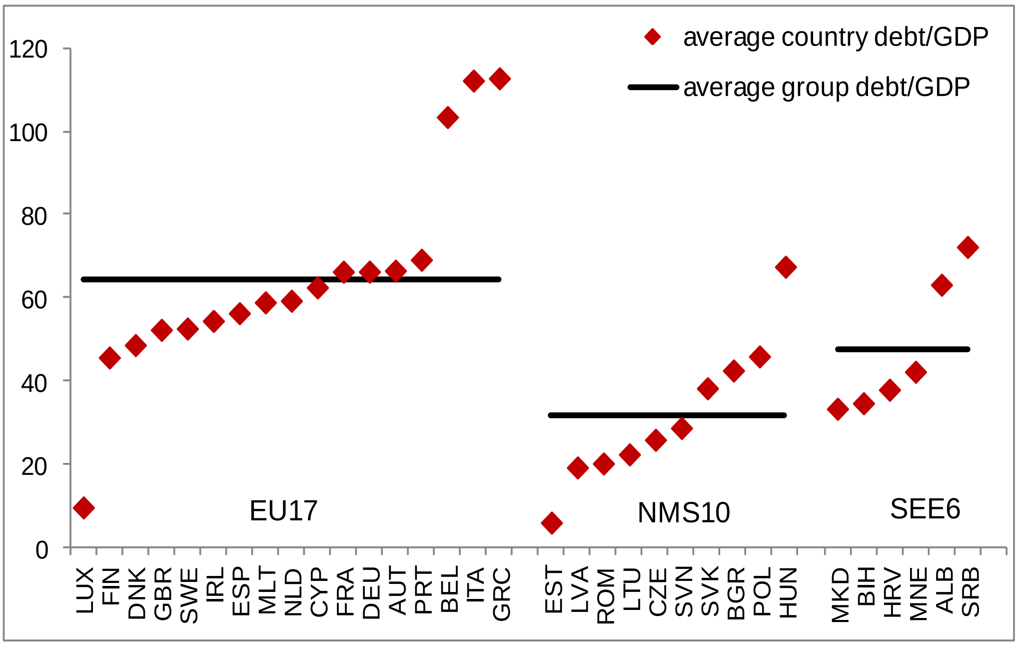

Figure 1.4. Average public debt/GDP ratios by countries and groups, 1995-2012 (in %)
Source: European Commission AMECO Database for EU17 and NMS10. Author's calculations based on data from national statistical offices, central banks or finance ministries, EBRD, and the IMF WEO Database for SEE6 countries.
Note: Group averages are unweighted.

1.5 Structure of the thesis

After providing a brief review of macroeconomic and fiscal policy developments in European countries, the thesis proceeds as follows in order to meet the other research objectives outlined in Section 1.3 above.

Chapter 2 provides a critical review of the theoretical and empirical literature on the cyclical character of fiscal policy. It starts by reviewing the traditional Keynesian and neo-classical views as well as several more recent theories on the cyclical character of fiscal policy. Then it provides an extensive discussion on the context of fiscal policy design and implementation in European countries, including the effects of the Maastricht Treaty and the Stability and Growth Pact, as well as the specifics of the transition process in ex-communist countries. Further, it describes the measurement and decomposition of fiscal policy to be used in the rest of the thesis, and also the measurement of cyclical output movements. The chapter proceeds with a critical assessment of the main empirical studies on the cyclical character of fiscal policy. The early studies, which use relatively simple methodologies, are surveyed first, before moving on to more recent studies which use more advanced estimation methods. In addition, studies on the cyclical character of fiscal policy in transition countries are surveyed separately. This extensive review not only outlines the chronological and methodological progress in this area, but also lays the foundation for the choice of the most appropriate estimation method to be used in our empirical analysis.

Chapter 3 provides an empirical investigation of the cyclical character and determinants of fiscal policy in European countries, with a particular focus on transition countries[6]. It starts with an extensive discussion of the model specification. In line with the absence of an overall theory of the cyclicality of fiscal policy, it describes our decision to use a relatively simple, baseline model specification, which is then extended with numerous factors related to various theoretical or practical considerations. After an assessment of the advantages and disadvantages of various estimation methods for our aim and sample (consisting of an unbalanced panel of 33 European countries between 1995 and 2010), system GMM is chosen as the most appropriate method to be used in the empirical analysis. The chapter proceeds by presenting results of the baseline specification. It then presents results of the extension of the baseline specification with numerous variables capturing voracity effects, institutional, political and ideological factors, constraints on fiscal policy and effects of fiscal governance. Additional extensions are carried out by analysing sources of the cyclicality of fiscal policy, sample splits and possible effects of the crisis on results. Throughout the chapter, results are presented both for the entire sample, as well as separately for the three groups of countries, thus enabling the comparison between old EU member states and the two groups of transition countries. In addition, particular attention is paid to the robustness of the indicator on the cyclical character of fiscal policy to the numerous extensions. The final robustness check is provided by jack-knifing the baseline specification, i.e. removing one country from

[6] A paper based on this chapter won the 2012 Oesterreichische Nationalbank Olga Radzyner Award for scientific work on European economic integration, which is bestowed on young economists from Central, Eastern and South-eastern Europe. A shorter version of the paper has been published as Kabashi (2014).

the sample at a time and re-estimating in order to analyse whether results are driven by any single country.

Chapter 4 surveys and critically assesses the theoretical and empirical literature on the effects of fiscal policy. It first briefly describes traditional classical and Keynesian views on the effects of fiscal policy. Then it provides a more detailed review of modern, dynamic-optimising versions of traditional theories in the form of Real Business Cycle (RBC) and New Keynesian models, as well as of the extensions of these models aimed at matching empirical findings on the effects and the transmission mechanism of fiscal policy. The chapter then turns to the critical assessment of empirical studies on the effects of fiscal policy. In order to systematise the discussion of this relatively large body of literature, it first describes the Vector Auto Regression (VAR) method as the dominant empirical approach, and then it reviews the studies that use five various types of VARs to analyse the effects of fiscal policy on output and other macroeconomic variables. This is followed by an extensive discussion of the main problems of the five types of VARs in the fiscal policy context, as well as of the possible sources of the wide range of results of empirical fiscal policy studies. The chapter concludes with a description of the panel VAR method and a review of its application in several relatively recent studies of fiscal policy.

Chapter 5 provides an empirical analysis on the effects of fiscal policy on output and other macroeconomic variables in European countries, with a particular reference to transition countries. The empirical analysis in this chapter uses fixed effects panel VAR with recursive identification of policy shocks and annual data on 27 EU countries between 1995 and 2012. Justifications for this estimation method are provided both with regard to the aim of our study and the available data, and by building onto the extensive discussion of the relevant empirical literature in the previous chapter. After a description of our fixed effects panel VAR model, additional arguments in support of our choice of estimation method are provided, particularly with regard to the possible bias arising from the imposition of slope homogeneity and from the dynamic specification with fixed effects. This is followed by the description of our baseline model, i.e. the definition of the variables used, the cyclical adjustment of fiscal data, the ordering of variables and the lag-length of the VAR. Then we present our baseline results and discuss their robustness to various modifications of the baseline specification. The chapter proceeds with results from various sample-splits, which are mostly aimed at analysing the possible influence of various country structural characteristics on the effects of fiscal policy, but also at analysing the effects of omitting the recent crisis period. Further, several extensions of the baseline specification are provided in order to analyse the transmission mechanism of fiscal policy, as well as the effects of fiscal policy when introducing public debt and open economy elements in the analysis. In this part, results are presented both for the entire sample, as well as separately for old and new EU member states. Final robustness checks are provided by jack-knifing the baseline specification in order to analyse possible effects of the omission of each country from the sample.

Chapter 6 provides conclusions based on the findings of our empirical analysis and it also draws policy recommendations. In addition, it summarises the contributions of this thesis to the existing knowledge, but also recognises limitations of our study and provides some suggestions for future research.

Chapter 2 - Theoretical and empirical review on the cyclicality of fiscal policy

2.1 Theoretical background

The stabilization of economic fluctuations around the trend growth is one of the main issues that economic policymakers have to face. Accordingly, it is also one of the fields that have attracted considerable attention in the academic literature in macroeconomics. Fiscal and monetary policies are commonly perceived to be the main tools for the stabilisation of economic fluctuations. However, over the last several decades, the dominant view in academia and in the policy-making world came to be that monetary policy is the most effective stabilization tool. It became a conventional wisdom that fiscal policy should be confined to automatic stabilizers, and that discretionary policy should preferably be used in extreme circumstances only (Blinder, 2004). The recent crisis and the exposure of many economies to extreme circumstances brought fiscal policy back into the spotlight again, including some re-consideration of automatic stabilizers and discretionary measures (Blanchard et al., 2010). Nevertheless, it must be mentioned that in reality policymakers never completely discarded fiscal policy and were continuously using it with the aim to stabilize economic fluctuations, albeit with various degrees of aggressiveness and success.

Despite the direction of the recent literature, the stabilization role of fiscal policy has been one of the central themes in macroeconomics from its beginnings as a discipline. Indeed, it has been one of the main tenets of Keynesianism that, in times of crisis, the government should counteract the falling output by propping up the effective demand, thus compensating the fall in private consumption and investment. According to this view, in recessions, the government should reduce tax rates and increase its consumption and investment, which would contribute to higher aggregate demand. Therefore, the Keynesian tradition has clear views that governments are capable to and should actively pursue counter-cyclical fiscal policies, and that, if it is implemented boldly, such an intervention would bring the economy out of recession[7].

Neo-classical economists had a more sceptical view on the stabilization role of fiscal policy, which was accordingly reflected in the absence of fiscal policy in neo-classical models. According to the tax-smoothing models initiated by Barro (1979), for an exogenously given path of government spending, governments should keep tax rates constant over the cycle, which implies that the overall budget balance would move in a counter-cyclical manner. On the other hand, prescriptions about government consumption in the neoclassical literature are less clear-cut. According to Lane (2003), the common neoclassical assumption is that government spending is exogenously determined, thus without any apparent prediction in relation to the cycle. However, if it is endogenised, the prescriptions on government consumption are still ambiguous, since they depend on the existence and the degree of substitutability in utility between government and private consumption. Government consumption should be counter-cyclical if they are substitutes and pro-cyclical if they are complements. Finally, if government and private consumption enter preferences separably, the optimal policy would be to smooth government consumption over the cycle. Overall, the two traditional theories thus yield opposing prescriptions regarding policy reactions to cyclical output movements. The Keynesian view prescribes higher tax rates and lower government spending in expansions (and the opposite in recessions), whereas the baseline neo-classical view prescribes unchanged tax rates and constant government spending in both expansions and recessions.

The focus of the academic literature on monetary policy as the main stabilization tool during the last two decades of the 20th century created a gap in the fiscal policy literature, particularly regarding the theoretical literature on the

[7] The extent to which counter- or pro-cyclical fiscal policies affect the business cycle (i.e. stabilize or amplify economic fluctuations) in reality is also related to the size of the fiscal multiplier, which will be discussed and analysed in more detail in Chapter 4 and Chapter 5.

cyclicality of fiscal policy. As Strawczynski and Zeira (2009) note, theoretical contributions on the cyclical stance of fiscal policy following the neoclassical model in Barro (1979) have been quite scarce. This lack of attention on the cyclicality of fiscal policy and on fiscal policy in general even led to lamentations that "serious discussion of fiscal policy has almost disappeared" and that "fiscal policy is either impossible or undesirable or both" (Solow, 2002, p. 1). However, this trend was interrupted in the late 1990s, largely as a result of the blossoming of empirical research on the cyclical properties of fiscal policy around that period. These empirical studies were yielding results that were sometimes difficult to link to the traditional theories regarding the cyclical stance of fiscal policy. For instance, none of the traditional theories gave any justification for a pro-cyclical fiscal policy, which was typically found to dominate in developing countries, starting from the pioneering study by Gavin and Perotti (1997). This was in contrast to the counter- or a-cyclical policy usually found in developed countries, which had sound theoretical explanations. Therefore, it was sometimes noted that the pro-cyclical fiscal policy is a puzzle in search of an explanation (Talvi and Végh, 2005). Consequently, authors soon began putting forth various explanations for the observed pro-cyclical policy in developing countries. These explanations are mostly related to two groups of problems: market failures and the common pool problem, which covers various political economy and institutional aspects.

Gavin and Perotti (1997) were among the first to offer an explanation for the observed pro-cyclicality of fiscal policy in Latin America. They argued that this was due to the borrowing constraints that these countries faced on international markets during recessions. This limits the ability of governments to borrow and, combined with the falling revenues, makes them unable to counter the recession, thus forcing the policy to be pro-cyclical. On the other hand, these constraints vanish in good times, so governments do borrow in international markets and maintain or increase spending, thus again running a pro-cyclical policy.

One of the first frameworks of the common pool problem in the context of pro-cyclical fiscal policy is the "voracity effect" described by Lane and Tornell (1998) and Tornell and Lane (1999). This effect consists of multiple power blocks competing for a higher share in a common pool of resources. This competition intensifies in good times, when revenues are higher, which gives rise to a strong "voracity effect". In such cases, none of the power groups has an incentive to argue for saving part of the increase in revenues. Instead, each group makes pressure to appropriate a higher amount for itself, being aware that otherwise some other group will increase its share. Consequently, overall spending increases, which yields a pro-cyclical fiscal policy. Therefore, within this framework, the higher dispersion of power will make fiscal policy more pro-cyclical than with unitary power. It must be noted that the description of power groups in this framework is relatively broad. It can refer to various branches of central government, various levels of government (central, regional, local), political parties or ministries within the government, labour unions, employer confederations or state enterprises.

Further, Alesina and Tabellini (2005) found the explanation of credit constraints by Gavin and Perotti (1997) incomplete, since it does not explain the possibility of governments accumulating reserves in good times, or of lenders providing funds in expectation of expansions in the future. Therefore, they argue that the observed pro-cyclicality reflects a political agency problem in democracies. In their model, voters are suspicious of corrupt government officials, and of them appropriating the surpluses or channelling them to close interest groups. Therefore, voters demand that, in good times and with higher revenues, governments should lower taxes and increase public spending. Being threatened with losing office, governments duly oblige, but also raise borrowing in the process, which is made easier by the fact that voters have imperfect information on government borrowing. Therefore, in this context, overall fiscal policy turns out to be myopic and pro-cyclical because of voters' demands.

Talvi and Végh (2005) build a similar model which explains pro-cyclicality with political economy factors. Their initial point is the observed higher volatility of output and hence of the tax base in developing countries. Under tax-smoothing circumstances, this would yield large surpluses in good times and deficits in bad times (i.e. counter-cyclical policy). However, they argue that this is not the case because of the increased pressures by various interest groups in good times for higher spending instead of saving or debt retirement. Because of these pressures, in their model it is costly for the governments to stick to tax-smoothing prescriptions and run budget surpluses in expansions. Therefore, faced with positive shocks to the tax base, the optimal policy for governments will be to lower tax rates and increase spending. This then explains the differences between developed and developing countries quite well. Indeed, the low variability of the tax base in the first group creates little space for pressure by interest groups, unlike the developing countries, where high variability of output creates plenty of opportunities for such pressures.

A related, but distinct body of literature consists of theoretical and empirical studies of political economy determinants of fiscal policy. This field, which has been flourishing since 1980s, is not focused on the cyclical character of fiscal policy *per se*, but on various political economy factors behind policy formulation and outcomes[8]. Hence, it is typically concerned with overall fiscal policy, and particularly the deficit bias, and related issues of government short-sightedness and the common pool problem (Debrun et al., 2008). Numerous authors provide various explanations for fiscal outcomes[9], ranging from political and electoral systems to political business cycles and ideology. Further, an increasing attention is paid to various institutional factors, such as fiscal rules, institutional quality and the budgetary process.

2.2 The European context

Besides these theoretical explanations for the cyclical character of fiscal policy in developing countries, there are some additional practical constraints which are specific for the European countries. The process of European economic and monetary integration created a specific environment for the conduct of fiscal policy, including some important aspects for the response of fiscal policy to economic fluctuations.

The Maastricht Treaty of 1992 provided several conditions that EU member states had to fulfil in order to qualify for the adoption of the single currency. The main economic argument for the fiscal criteria in the Maastricht Treaty (and subsequently for the Stability and Growth Pact) was that fiscal indiscipline can become a source of high inflation. Indeed, it is well grounded in theory and practice that high deficits and high debts can prevent normal government financing, which creates an incentive for governments to resort to monetisation of budget deficits. In addition, there was the free-riding risk, according to which a government can engage in unlimited borrowing up to the point of default, knowing that it would be bailed out by the other members of the monetary union. Wyplosz (2006) relates these two arguments to the aim of the EU founding fathers to reverse the previous fiscal dominance into monetary dominance. In order to achieve this, the Maastricht Treaty explicitly bans central bank financing of budget deficits and bailouts of highly indebted countries[10]. Additional justifications for the Stability and Growth Pact (SGP)

[8] Due to the main aim of our study and in line with the practice in the relevant literature, we do not survey this wider literature of political economy aspects of overall fiscal policy, but focus on theoretical studies specifically related to the political economy determinants of cyclicality. However, we refer to the relevant studies in the former literature during our empirical work in the following chapter.

[9] Alesina and Perotti (1995) and Eslava (2006) provide excellent surveys of the various theories on political economy determinants of fiscal policy.

[10] However, in the wake of the European debt crisis, the no-bailout rule was clearly breached in the cases of Greece, Ireland and Portugal. The creation of the temporary European Financial Stability Facility and

are sometimes offered, such as the desirability of policy coordination, the deficit bias of fiscal policy and the externalities to the interest rates in the monetary union. However, they are considered to be insufficient or unnecessary for the existence of SGP (von Hagen and Wyplosz, 2008). For instance, the deficit bias could be overcome by national fiscal rules or stronger institutions and budgetary processes, while the effect on interest rates is irrelevant, as they are allowed to differ between countries. In addition to these constraints, the Maastricht Treaty prohibits countries from exceeding reference values for budget deficits and public debts, defined as 3% and 60% of GDP, respectively[11]. Fiscal sustainability defined in this way was also used as one of the entry criteria for euro-adoption as the final stage of the European Monetary Union (EMU[12]). With the aim of maintaining fiscal stability, Maastricht Treaty laid out the Excessive deficit procedure, later made operational by the Stability and Growth Pact (SGP), which was adopted in 1997 and entered into force with the introduction of the euro in 1999. The aim of the SGP was to ensure that, once the countries had met the entrance criteria and adopted the euro, they would continue to abide by the requirements of fiscal discipline.

Although the Maastricht Treaty defined both the deficit and the debt ceiling, the initial design of the SGP (SGP-I[13]) approached the issue of fiscal sustainability and of the credibility of the common currency by focusing mostly on the magnitude of the budget deficit. It defined that all member states should aim to reach a medium-term objective of a budget that is 'close to balance or in surplus'. The final goal was to avoid excessive deficits above 3% of GDP, while at the same time leaving some leeway for a response of fiscal policy to cyclical fluctuations. The SGP consists of two parts: "the preventive arm", which is concerned with the surveillance of budgetary positions and developments in all EU member states; and "the corrective arm", which deals with the measures to be taken in case of breach of criteria by euro area members, including the imposition of sanctions and fines. According to the preventive arm, each year member states submit programmes in which they present plans to reach the medium

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its successor the permanent European Stability Mechanism implies that the no-bailout rule has been abolished permanently (Wyplosz, 2013).

[11] It is not entirely clear how the numerical values were determined. Buiter and Grafe (2004) put forward the explanation that the debt target was very close to the average debt ratio of EU members in 1992. As well as some other authors, they claim that the 3% ceiling for the deficit could possibly reflect the calculations that it stabilizes the debt ratio to around 60% if nominal GDP growth is 5% (which would correspond to estimates of potential real GDP growth of 3% and targeted inflation of 2%). Wyplosz (2013) links the deficit rule of 3% of GDP to the accepted estimated size of public investments.

[12] In line with most of the literature, we use EMU as an acronym for the "European Monetary Union", which refers to the euro area. Officially, EMU stands for the "Economic and Monetary Union" and includes not only members of the euro area but all EU members.

[13] Labels like SGP-I are not official, but we use them here to delineate the main stages of the SGP framework.

term objective (stability programmes for EMU members, convergence programmes for the others). The European Commission assesses country aims, programme, and actual developments and can issue early warnings if there is a risk of excessive deficits. On the other hand, the "corrective arm" is aimed at enforcing fiscal discipline policies in euro area countries. It lays out the details of the Excessive deficit procedure which is triggered if planned or actual deficits exceeded the 3% ceiling, and includes definitions of exceptional circumstances, deadlines and procedural steps such as the imposition of sanctions and fines.

The implementation of the Maastricht Treaty and later the SGP-I put considerable constraints on fiscal policy in EU member states, particularly the ones aiming to adopt the common currency. Most countries implemented considerable fiscal adjustment in the 1990s in order to qualify for accession in the euro area and afterwards to keep themselves within the SGP limits. Accordingly, budget deficits in what would later become the euro area fell from 4.5% of GDP in 1991 to 2.6% in 1997 and later to only 1% in 2000, and cyclically-adjusted balances in the same period fell by more than 3 percentage points (Morris et al., 2006). However, the accession to the euro area was followed by a period of 'fiscal fatigue' (Fatás and Mihov, 2009), when several countries relaxed their policies. In the context of higher actual revenues due to the economic expansion and in expectation of favourable future economic developments, several countries increased their expenditures and introduced tax cuts. However, in early 2000s there was an unexpected economic downturn, which resulted in considerably lower budget revenues compared to expectations. The higher budget deficits and lower output made several countries breach the deficit ceiling, which would have normally initiated corrective action. In fact, the European Commission initiated excessive deficit procedures for several countries and in 2003 recommended to the Economic and Financial Affairs Council of the European Union (ECOFIN) that, because of their failures to meet recommendations and take corrective measures, "notices" should be issued against Germany and France, which is one step before sanctions. However, under intense political pressure, in November 2003 the Council failed to accept this recommendation and decided to put these countries "in abeyance", effectively suspending the Excessive deficit procedure and the enforcement of the SGP. This was later challenged by the Commission and overturned by the European Court of Justice in 2004, although the decision was made on procedural grounds, as the Court recognised the right of the Council to delay or suspend the rules (Filipek and Schreiber, 2010). However, the entire procedure and disagreements made clear that the system was not credible enough, as the enforcement of the SGP, which is in the mandate of the European Commission, could be blocked by a political body such as the Council, an issue that had been raised since the introduction of the SGP. More generally, it was often noted that one of the main problems of SGP-I was the weak enforcement mechanism (e.g. de Haan et al. (2004)). Another important criticism was related to the fact that the focus of the entire SGP framework was on unadjusted deficits, which ignores the endogeneity of business cycles and budget movements (as discussed below). The main suggestion at that time was to start taking into account cyclical output movements, and therefore to use cyclically-adjusted deficits (e.g. Galí and Perotti (2003)). In reality, until 2003 the Commission was also looking at cyclically-adjusted balances, but only as analytical tools[14], whereas compliance with ceilings was formally assessed in terms of unadjusted budget indicators (Larch and Turrini, 2010). A related frequent criticism was that the ceilings were interpreted in a uniform manner, with little consideration for country-specific circumstances such as long-term fiscal movements or public investment needs (Morris et al., 2006). Further, even though the aim was to achieve balanced budgets over the medium term, the main indicators were defined and assessed only on an annual basis, which does not properly capture the medium term nature of fiscal discipline (Wyplosz, 2006). Another important property of the SGP was its asymmetry, in that it constrained policy reactions in bad times but offered little incentives for improvement in good times (Annett, 2006). Related to this, Larch et al. (2010) argue that the preventive arm of the SGP was quite ineffective, since it did not cure the pro-cyclicality in good-times as one of the main problems of fiscal policy. They note that during the 1990s and 2000s, the asymmetry caused episodes when member countries relaxed instead of tightening fiscal policies in good times, only to find out later on that there were risks of or actual excessive deficits in bad times. Finally, the initial design of SGP was generally considered to be quite inflexible, although it did have some escape clauses.

As a result of these criticisms and of the failure to enforce the Excessive deficit procedure in 2003, the SGP was reformed in 2005[15] (SGP-II), generally in the direction of increasing the economic rationale and introducing higher flexibility. This followed the adoption by the ECOFIN in 2003 of a decision which redefined the 'close to balance or in surplus' requirement of SGP in cyclically-adjusted terms (Larch and

[14] At that time, they were officially mentioned only in two official documents: the 1998 and 2001 Codes of Conduct on the content and format of stability and convergence programmes (Larch and Turrini, 2010).
[15] See Morris et al. (2006) for an excellent review of the initial and reformed SGP and the relevant official documents and Fischer et al. (2007) for a comprehensive review of criticisms and numerous proposals for reform of the SGP at that time.

Turrini, 2010). The 2005 reform left the deficit and debt ceilings at 3% and 60% of GDP, and the main focus was still on the deficit. The debt criterion was slightly strengthened with the call for application of the Treaty concept of a debt ratio 'sufficiently diminishing and approaching the reference value at a satisfactory pace'. However, the enforcement was left weak, since it was defined that the debt criterion would be applied in qualitative terms, reflecting the failure to reach an agreement on a quantitative definition of the satisfactory pace of debt reduction (Morris et al., 2006). Regarding the preventive arm, the SGP-II redefined the medium term objectives so that more attention would be paid to country-specific developments and circumstances, whereas the uniform 'close to balance or in surplus' requirement was abolished. Each country would present its own medium term objective, which takes into consideration issues such as public debt and potential growth (EC, 2006). The country medium term objectives could diverge from the 'close to balance or in surplus' requirement, although euro area and countries in ERM-II are expected to have a medium term objective of a budget balance no lower than -1% of GDP, in cyclically-adjusted terms and net of one-off measures. In case of failure to meet the medium term objective, the fiscal adjustment is also more gradual, and is expected to be achieved over the cycle. As a guideline, the euro area and countries in ERM-II should make annual adjustments of at least 0.5% of GDP in cyclically-adjusted terms and net of one-off measures. The adjustment can also be subject to structural or pension reforms, provided that the safety margin to the overall deficit of 3% of GDP is maintained. The corrective arm was also significantly modified, mostly by clarifying and relaxing the various escape clauses (Morris et al., 2006). The severe economic downturn was now defined to be negative GDP growth or accumulated negative output gaps. A lot of attention was dedicated to precisely defining what Maastricht Treaty refers to as "other relevant factors including the medium term economic and budgetary position" related to the Excessive deficit procedure. Now they include a wide range of country specific developments such as potential growth, cyclical conditions, expenditures related to the Lisbon agenda, public investment, quality of public finances, debt sustainability as well as other factors the concerned member state deems relevant. There was also an extension of procedural deadlines and an extension of deadlines for corrective action, and the possibility was introduced for repetition of recommendations and notices. However, these changes are generally not considered sufficient to deal effectively with the problem of weak enforcement. On the contrary, it is claimed that the numerous exceptions from the rules make them meaningless (Feldstein, 2005). Fatás and Mihov (2009) also note that this increased flexibility attracted criticisms that the constraints are so lax that the entire system is sometimes deemed irrelevant. Perhaps more notably, the European Central Bank (ECB) was also quite critical, as it declared it was "seriously concerned about the proposed changes" and warned about the risks that changes in the corrective arm could undermine the confidence in the EU fiscal framework and the sustainability of public finances (ECB, 2005).

Until the recent economic and financial crisis, it seemed that SGP is functioning well, as countries were generally meeting their medium term objectives and budgets were mostly balanced or in surplus (Filipek and Schreiber, 2010). However, this was concealing the impact of favourable macroeconomic movements, and particularly the effects of asset and housing bubbles on higher revenues (Larch et al., 2010). The crisis, particularly the financial problems in some countries and generally euro area debt problems, brought the spotlight back on the European economic and fiscal governance. The severity of the crisis and the need for immediate policy responses effectively meant that the SGP was suspended and was quietly put aside (Wyplosz, 2010). Nevertheless, the need to incorporate the lessons of the crisis and to prevent future instabilities prompted an effort to redesign the EU economic and fiscal governance. Therefore, the SGP framework was considerably modified in 2011 and 2013 to give rise to what could be labelled SGP-III. The acts that implement these reforms of the SGP are known in the EU-parlance as the "six-pack" of 2011 (five Regulations and one Directive), the "two-pack" of 2013 (two Regulations) and the Fiscal Compact within the inter-governmental Treaty on Stability, Coordination and Governance of 2013 (EC, 2014). These changes considerably strengthened both the preventive and the corrective arm of the SGP, particularly regarding fiscal and economic governance in euro area countries, but also in other EU members (in the case of the Fiscal Compact). In addition to fiscal governance, the SGP-III also deals with the surveillance and correction of macroeconomic imbalances. Besides the importance in its own right, this is also relevant for fiscal governance, as the latest crisis proved inaccurate the previous paradigm of the "Great Moderation" that fiscal discipline and low inflation will suffice in bringing about macroeconomic stability (Buti and Larch, 2010).

While it maintains the previous focus on country medium term objectives (MTO), the SGP-III quantifies "significant deviations" from the MTO or the adjustment path towards achieving it. Countries that have accepted the Fiscal Compact are now required to meet or converge to their MTO with a lower limit of the cyclically-adjusted budget balance of -0.5% of GDP, net of one-off measures (or -1% of GDP for countries with public debt significantly below 60% of GDP). Similarly to previous stages, SGP-III also allows for exceptions from the rules in case of exceptional circumstances. On the other hand, in order to ensure balanced budgets, the compliance or the adjustment towards the country-specific MTO is now also linked to the expected growth of expenditures, which should be at or below potential GDP growth (or alternatively should be matched by appropriate growth of discretionary revenues). In order to strengthen enforcement, SGP-III requires that MTOs should be incorporated within national legislation, through provisions of "binding force and permanent character, preferably constitutional" (EC, 2014), which thus makes fiscal discipline a legal obligation for each country (Wyplosz, 2013). Further, equal prominence is now given both to the deficit and debt levels. Indeed, the Excessive deficit procedure can now be launched not only in cases of excessive deficits, but also if the debt ratio exceeds the reference value of 60% of GDP and is not reduced with a sufficient pace (defined as average annual reduction over three years equal to 1/20th of the gap between the actual debt ratio and the target of 60%). Besides strengthening sustainability, the focus on debt levels is also aimed at correcting the previous flaw of asymmetry, as countries will now be forced to undertake fiscal adjustments in good years as well if their debt levels are high. For cases of breaches of SGP by member states, SGP-III clarifies and extends the possible financial sanctions, which may be imposed from early stages of the preventive arm to the latest parts of the Excessive deficit procedure and may reach up to 0.5% of GDP. Related to this, it is now more difficult for a political body such as the Council to block them. Instead, sanctions will now be more automatic and will be initiated by the European Commission, and the Council will be able to stop them only with a qualified majority. The SGP-III also requires that the compliance with the new fiscal rules aimed at meeting the MTO should be monitored by independent institutions. Besides the existing requirement for the submission of medium-term plans as parts of Stability or Convergence Programmes, the SGP-III strengthens surveillance by requiring that euro area countries should also submit draft budgets for the following year and macroeconomic assumptions to the Commission. If the Commission judges that the draft budget is not in compliance with the SGP, it can now require a submission of a revised draft-budget, thus strengthening the preventive arm of the SGP. However, while both the streamlining of sanctions and the monitoring of national budgets by the European Commission make the framework more credible, they might in reality reignite conflicts between sovereign member states and the Commission (Wyplosz, 2013). In addition, the SGP-III also lays down stronger powers for enhanced surveillance by the

Commission if a particular country is receiving precautionary financial assistance from the EU or is undergoing or is threatened with severe difficulties related to financial stability.

The constraints of the Maastricht Treaty and the SGP are directly related to the ability of governments to conduct stabilizing fiscal policies. Related to this, two possibilities are proposed and analysed in the literature (Galí and Perotti (2003), Wyplosz (2006), Fatás and Mihov (2009) and Candelon et al. (2010)). On the one hand, charging a super-national body with the achievement of the target of price stability means that national authorities are left with the pursuit of output stabilisation as the remaining macroeconomic policy target. The loss of monetary sovereignty means that fiscal policy is the only tool they have left, so policymakers would use it much more aggressively to counter economic crisis and output volatility. In other words, this would mean a more active counter-cyclical fiscal policy, which would be especially pronounced in recessions, when public pressures to act intensify. It is often argued that the need for counter-cyclical policy as a response to adverse shocks is even more pronounced in the euro area because of the combination of centralised monetary policy and decentralised fiscal policy with low labour mobility, quite opposite to the US (Feldstein, 2009). On the other hand, as discussed above, the limits of the Maastricht Treaty and the SGP would clearly prevent such an activist policy, for the very reason that it could threaten the fiscal discipline which is considered essential for the entire common currency project. If this was true, there would be a much more limited role for counter-cyclical fiscal policy. Therefore, in this scenario, it would be expected that fiscal policy would become pro- or a-cyclical in the euro area, or at least less counter-cyclical than before accepting the common currency.

The constraints of the SGP on fiscal policy are also relevant for transition countries, further affecting fiscal policy in these countries beyond the specifics of the transition process. Indeed, policymakers in transition countries had to face the challenges of unprecedented economic, political and structural transformation since the beginning of 1990s, which had a considerable effect on fiscal policy. Initially, it was constrained because of changes in revenues and expenditures due to the restructuring and privatisation of state-owned enterprises. Government budgets were also affected by the market and price liberalization, infrastructure building and institutional reforms. Expensive borrowing sources and some of the exchange rate regimes were additional constraints. As transition advanced, the challenges started resembling those of their Western European peers, such as issues of the stabilising properties of fiscal policy, financing of budget deficits and the sustainability of public debt. The process of EU-accession implied that the constraints of the SGP on fiscal policy became applicable for the new member states (NMS) from Central and Eastern Europe as well, both for the ones that are only EU members and particularly for the majority of NMS that have joined or aspire to join the single currency as soon as possible. In addition, these constraints would also apply to prospective EU member states from South-eastern Europe. More precisely, all EU member states are subject to the Maastricht criteria and the SGP, including the Excessive deficit procedure, but only euro area members can be subject to sanctions. However, as Staehr (2008) notes, there is a relatively scarce literature on the effects of the euro area enlargement on fiscal policy in the NMS. Nevertheless, most authors agree that the SGP puts some additional and specific constraints on NMS, generally considered undue because of their rapid development and specific aspects (Nuti, 2006). Besides the criticisms applicable for all countries analysed above, Coricelli (2004) brings forward three main arguments why SGP requirements would be more stringent for the NMS. First, they have a higher potential and more volatile actual GDP growth rate, which means that the 3% ceiling on the budget deficit will be binding much more often, even if one considers cyclically-adjusted indicators. Subsequently, this will impose a need for more frequent fiscal adjustments, thus strengthening the volatility and the pro-cyclical bias of fiscal policy, as it will have to be tightened during bad times. While this argument is similar for the old EU members, it is more relevant in the NMS because of the higher output volatility and the consequent need for a stabilizing role by fiscal policy. Eller (2009) indicates that, in light of the severity of the latest recession and the moderate effect of automatic stabilizers, there is a limited space for discretionary fiscal policy in the NMS. Although he does not link this directly to SGP constraints, it is exactly the discretionary policy that would be constrained by the SGP when these countries become members of the euro area. Related to this, Lewis (2009) notes that the worsening of budget balances and the Excessive deficit procedure for several transition countries have severely restricted the possibilities for stimulatory response with discretionary policy in case of recessions. The second argument concerns the lack of consideration for public investments in SGP-I, which are higher in NMS as part of the catching-up process with their Western European peers. The SGP-II has partially remedied this criticism, as a distinction is made between public deficit and public investment expenditure (Nuti, 2006), but there are additional areas where the specifics of transition countries and the convergence process require higher spending. Third, the political element in the Excessive deficit procedure means that larger NMS countries will have a more lax treatment in case of breaches. While the most recent reforms (SGP-III) somewhat ameliorate this concern by putting the responsibility for imposing sanctions primarily with the European Commission, for the time that it was valid there is some evidence of differences in fiscal behaviour between large and small NMS. For instance, Berger et al. (2004) find evidence that the larger NMS had a more relaxed fiscal policy once they became NATO members and had secured EU membership, and they link this to the higher bargaining power compared to smaller NMS. Lewis (2007) finds similar results, although he ascribes them to the higher need for an active use of fiscal policy for stabilizing purposes in NMS with fixed exchange rates, which are incidentally the smaller NMS.

2.3 Measurement and conceptual issues

Before proceeding with the further discussion of studies and with the empirical work, a brief description of measurements and conceptual issues of fiscal policy and its cyclicality is in order. This is important as the comparison of studies and sometimes even the results can be sensitive to the particular definitions used.

It is common in most of the literature (e.g. Galí and Perotti (2003) or Fatás and Mihov (2009)) and in policymaking to separate overall fiscal policy into two main components: automatic stabilizers and discretionary policy (Figure 2.1). Automatic stabilizers represent the response of fiscal policy to economic fluctuations that is built into the tax code and the overall legislation. Therefore, they act without particular actions by policymakers, who at least in the short-run have no control over them. Typical examples of automatic stabilizers are the higher tax revenues in expansions or the higher spending on unemployment benefits during recessions. Discretionary policy on the other hand captures all the deliberate actions by the governments and is often measured by the cyclically-adjusted budget balance. However, discretionary policy measures are not unique, and they depend on the motivation behind them. If they are undertaken by policymakers in response to the cyclical movements in the economy, such as lower taxes or higher spending in case of recessions, they can be considered as endogenous, or systematic discretionary fiscal policy (Galí and Perotti, 2003). On the other hand, fiscal measures undertaken without reference to cyclical movements are usually labelled exogenous discretionary policy (Figure 2.1). Typical examples of the latter would be higher government spending because of political motivations, military spending, or policy measures related to the Maastricht Treaty in the European context.

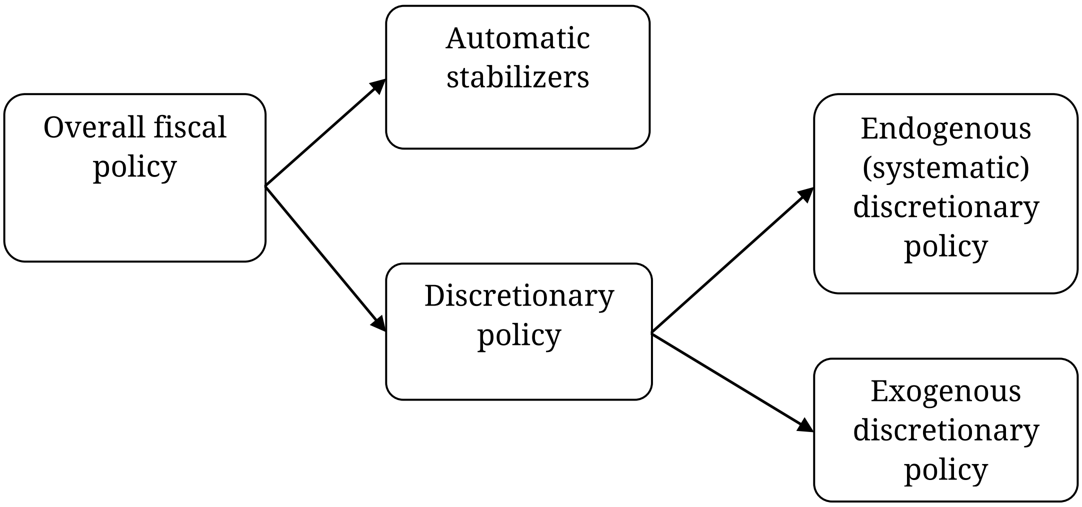


Figure 2.1. Components of fiscal policy

Fiscal policy is mostly conducted through automatic stabilizers, and they are largely found to be effective during economic fluctuations (Debrun and Kapoor, 2010). However, since they represent mostly an automatic response, at least in the short run, they are not usually the main focus of research. Instead, the majority of studies focus mostly or exclusively on the discretionary policy (both components), since this is considered to show the actual stance taken by policymakers. Because of their importance for policymakers, the measurement of the components of fiscal policy is a major concern for governments and international organisations, as well as for empirical research. There are two main approaches that are used to measure and analyse these components: the elasticities approach and the econometric approach (Baunsgaard and Symansky, 2009). However, it must be noted that the separation of the automatic stabilizers and the cyclically-adjusted balances is not an easy task and is one of the most controversial issues in the literature (Fatás and Mihov, 2009).

The elasticities approach to calculating cyclically-adjusted balances as a measure of discretionary policy is widely used by international organisations such as the OECD, the IMF and the European Commission (EC), which all use similar methods of calculation[16,17], whereas the ECB uses a different method[18]. The aim is to calculate

[16] The cyclical adjustment by OECD and its refinement through the years is described in Giorno et al. (1995), van den Noord (2000) and Girouard and André (2005). The procedure by the EC is described in EC (2005) and EC (2006). The description here draws on these documents.

the fiscal balance that is cleaned of the fiscal effect of cyclical output movements, i.e. the balance that would prevail if the output gap was zero and actual output was at the level of potential output. As an initial point, the overall budget balance[19] could be decomposed as in Eq. 1, which is equivalent to the decomposition of overall fiscal policy in Figure 2.1, with the cyclical component *CC* equivalent to automatic stabilizers and the cyclically-adjusted balance *CAB* corresponding to discretionary policy. The automatic stabilizers have a direct relationship to the business cycle as measured by the output gap. Therefore, in the EU surveillance framework (EC, 2006), the cyclically-adjusted balance is calculated by subtracting the cyclical component from the overall balance using the budgetary sensitivity parameter μ, i.e. by rearranging Eq. 1 into Eq. 2. In other words, Eq. 2 calculates the cyclically-adjusted balance as the difference between overall balance and the cyclical component, with the later linked to the output gap as a measure of cyclical movements.

$$OB_t = CC_t + CAB_t \quad \text{Eq. 1}$$

$$\frac{CAB_t}{Y_t} = \frac{OB_t}{Y_t} - \mu * GAP_t \quad \text{Eq. 2}$$

where:

OB	- overall budget balance, in absolute terms
CAB	- cyclically-adjusted balance, in absolute terms (discretionary policy)
CC	- cyclical component of balance, in absolute terms (automatic stabilizers)
μ	- budgetary sensitivity parameter (change in the budget balance to GDP ratio with respect to the output gap)
GAP	- output gap, as a percentage of potential output

[17] Mourre et al. (2013) provide an update on the cyclical adjustment methodology that is used by the EC since 2013 reflecting the use of semi-elasticities to measure cyclical components and the use of updated weighting parameters associated with individual elasticities. However, the updated methodology is not discussed here since the data used in the empirical analysis in the following chapter are calculated based on the old methodology (i.e. they were collected and used in our analysis before the data based on the updated methodology became available).

[18] The main differences are the use of various macroeconomic variables instead of GDP to describe the macroeconomic environment and the inclusion of the composition effects of aggregate demand and of national income, as well as the more precise selection of budgetary items subject to cyclical adjustment. See Bouthevillain et al. (2001) for a detailed explanation of the ECB 'disaggregated' method and Kiss and Vadas (2007) for a critique of the two methods and a proposed improvement.

[19] For simplicity, here we abstract from the interest payments, in line with the discussion in the original documents. If the adjustment is made on the primary instead of the overall budget balance, then the result is the cyclically-adjusted primary balance (CAPB).

This is the crucial part in the entire process, as it requires careful calculation of two unobserved components. First, the construction of the output gap (Eq. 3) as a measure of the cyclical position of the economy relies on the calculation of trend or potential output, which can be done using various statistical and econometric techniques (de Brouwer (1998), Guarda (2002)), and is often in itself a methodologically difficult process. The European Commission (EC) has used the Hodrick-Prescott filter in the past to calculate trend output (EC, 1995), but since 2002 it has adopted the more sophisticated production function approach to calculate potential output[20], also used by the OECD (Giorno et al., 1995). Indeed, the EC pays considerable attention to continuously advancing the process of potential output calculation for its member states (Denis et al. (2002), Denis et al. (2006) and D'Auria et al. (2010)).

$$GAP_t = \frac{Y_t - Y_t^*}{Y_t^*} * 100 \qquad \text{Eq. 3}$$

where:

GAP	-	output gap, as a percentage of potential output
Y	-	actual GDP, in absolute terms
Y^*	-	trend/potential GDP, in absolute terms

The second unobserved component that needs to be calculated is the budgetary sensitivity parameter μ, which reflects the reaction of revenues and expenditures to the output gap, and is calculated by aggregating individual revenue and expenditure elasticities. Here, the EC uses the elasticities calculated by the OECD (Girouard and André, 2005), and extends the same approach to the EU members that are not OECD members (EC, 2006). In this process, the OECD first calculates elasticities for four revenue items and for unemployment related expenditures as budget items that are assumed to be sensitive to cyclical output movements[21]. Elasticities of each of the revenue items ε_{Ri} to the output gap are composed of two components: the elasticity of the respective item with respect to the particular tax base $\varepsilon_{Ri,TBi}$ and the elasticity of the tax base to the output gap $\varepsilon_{TBi,GAP}$ (Eq. 4 below). A similar approach is used for unemployment-related expenditures. The first component is constructed by

[20] Appendix 3.2 contains a comparison of output gaps using Hodrick-Prescott trend GDP and production function potential output for the sample that will be used in the empirical analysis in Chapter 3.

[21] Due to lack of detailed data on particular budget items, the IMF only uses overall revenues and expenditures (Fedelino et al., 2009).

using information in country tax codes, social security schemes and other legislation, as well as fiscal data. The second component, i.e. the elasticity with respect to the output gap, is constructed by simple regression analysis (Girouard and André, 2005). Next, elasticities for particular revenue and expenditure items are aggregated in accordance with their respective share in overall revenues and expenditures, which yields weighted elasticities of overall levels of revenues η_R and expenditures η_G with respect to the output gap (Eq. 5 and Eq. 6). Further, the sensitivity of overall revenues μ_R and of expenditures μ_G as a share of GDP with respect to the output gap is constructed by using their respective shares in GDP (Eq. 7 and Eq. 8). Finally, the difference between them yields the budgetary sensitivity parameter μ (Eq. 9), which is then used in Eq. 2 above to remove the effect of cyclical movements (automatic stabilizers) from the overall balance in order to calculate the cyclically-adjusted balance (discretionary policy).

$$\varepsilon_{R_i} = \varepsilon_{R_i,TB_i} * \varepsilon_{TB_{i,GAP}}$$ Eq. 4

$$\eta_R = \sum_{i=1}^{4} \varepsilon_{Ri} \frac{R_i}{R}$$ Eq. 5

$$\eta_G = \varepsilon_{G,U} \frac{G_u}{G}$$ Eq. 6

$$\mu_R = \eta_R * \frac{R}{Y}$$ Eq. 7

$$\mu_G = \eta_G * \frac{G}{Y}$$ Eq. 8

$$\mu = \mu_R - \mu_G$$ Eq. 9

where:

R - overall revenues, in absolute terms

G - current primary expenditures, in absolute terms

R_i - revenue item, in absolute terms (one of four items sensitive to the cycle: income tax, corporate tax, indirect taxes, social security contributions)

G_u - unemployment related expenditures, in absolute terms

ε_{Ri} - elasticity of revenue item *i* with respect to the output gap

$\varepsilon_{G,U}$ - elasticity of unemployment expenditures with respect to the output gap

$\varepsilon_{Ri,TBi}$ - elasticity of revenue item *i* with respect to the relevant tax base

$\varepsilon_{TBi,GAP}$ - elasticity of the tax base for revenue item *i* with respect to the output gap

η_R - weighted elasticity of overall revenues (change in level of overall revenues with respect to the output gap)

η_G - overall elasticity of expenditures (change in level of overall expenditures with respect to the output gap)

μ_R - sensitivity parameter of revenues (change in the revenues to GDP ratio with respect to the output gap)

μ_G - sensitivity parameter of expenditures (change in the expenditures to GDP ratio with respect to the output gap)

μ - budgetary sensitivity parameter (change in the budget balance to GDP ratio with respect to the output gap)

The advantage of the elasticities approach to the cyclical adjustment of fiscal balances is that it takes into account country specifics regarding issues such as tax legislation and the impact and size of different taxes. The use of a unified methodology is also important, since this facilitates cross-country comparison and analysis. Moreover, the detailed calculation of trend/potential output and output gaps brings a more careful construction of cyclical output movements, which then enables a more accurate cyclical adjustment of fiscal indicators. However, these calculations also suffer from several drawbacks. One of them is that they assume invariant elasticities, as they are usually constructed for a certain year only, and this therefore ignores the possibility that they might be changing, for instance due to asset price booms (Jaeger and Schuknecht, 2004). Further, since this exercise is not performed frequently, these calculations do not reflect the most recent changes in tax codes and tax rates. Related to this, the OECD/EC approach ignores compositional effects, as it assumes that each GDP component (i.e. tax base) is at the same cyclical position as the output gap (Bouthevillain et al., 2001). Indeed, Mohr and Morris (2009) find that appropriate consideration of composition effects would have yielded different conclusions for the fiscal stance in some European countries in the 1996-2003 period. Further, the approach is quite restrictive on the expenditure side, as it relies only on unemployment transfers and does not reflect other items such as age- and health-related social spending and incapacity and sick benefits, which are sometimes found to act in a strongly stabilizing manner (Darby and Melitz, 2008). Besides, Bernoth et al. (2008) argue that the cyclical adjustment removes any short-term discretionary response to output movements. That is, short-term discretionary measures are wrongly interpreted to be a consequence of the cyclical movements, and therefore they are cleaned from the cyclically-adjusted balance in the same manner as automatic stabilizers[22].

One of the most serious weaknesses of this approach concerns the calculation of trend/potential output and output gaps, as both statistical and econometric approaches have their own strengths and weaknesses (D'Auria et al., 2010). The results of the cyclical adjustment can be sensitive to the technique chosen for calculating trend/potential output and the particular assumptions and constructions while employing it, but also to the measurement errors and data revisions for both actual and potential output (Mohr and Morris, 2009). The problem is more complicated in the context of transition countries because of continuous structural changes and limited availability of data, which are often of low quality and include methodological changes. For these reasons, the EC uses both a modified production function approach and the Hodrick-Prescott filter in the calculation of trend/potential output in new member states, unlike the use of potential output based on the production function approach for old member states (D'Auria et al., 2010). Another serious criticism is related to the fact that the cyclical adjustment procedure focuses on extracting the fiscal stance by clearing the fiscal effect only of cyclical output movements (i.e. automatic stabilizers) from the overall balance. The resulting discretionary policy measure thus ignores other aspects of the macroeconomic environment and additional factors which might affect the budget balance. In addition, 'structural balances' are sometimes used as a more accurate description of the fiscal policy stance, since they remove the effect not only of cyclical movements but also of other temporary factors. For instance, Bornhorst et al. (2011) describe a method for calculation of structural balances which removes fiscal effects not only of cyclical output movements from overall balances, but also effects of changes in asset or commodity prices and one-off revenue or expenditure measures[23]. However, structural balances are not widely used for policy purposes and in the literature, which could reflect the lack of unified definition and difficulties in classifying the items that should be treated as temporary. Last but not least, cyclical adjustments of

[22] However, no additional details are provided on this particular drawback of the cyclical adjustment procedure.

[23] This implies that the structural balance falls within the endogenous discretionary policy in Figure 2.1. However, it is a narrower concept than the cyclically-adjusted balance, since from the latter it removes the non-structural elements beyond the economic cycle (e.g. asset or commodity price changes and one-off measures like the sale of telecommunication licences or emergency relief in cases of natural disasters). As Bornhorst et al. (2011) argue, cyclically-adjusted and structural balances are complements, but the latter go beyond the standard cyclical adjustment in order to provide a fiscal indicator that is independent of all macroeconomic fluctuations (i.e. not only the fluctuations reflected in the output gap) and independent of temporary measures.

fiscal policy indicators are generally available for OECD and EU countries only, so their application to studies of other countries is rather limited.

The second, econometric approach uses various econometric techniques to identify and explain the stance of fiscal policy. One of its biggest strengths is that it enables the analysis of the effect of various factors on the properties of fiscal policy, beyond the effect of a single indicator such as the output gap. Therefore, the empirical literature primarily uses the econometric approach to analyse fiscal policy. However, when dealing with discretionary policy, it often also uses measures calculated by international organisations with the elasticities approach. Consequently, the two approaches are complements, but the econometric approach aims to bring a wider perspective on the reasons behind particular movements of fiscal indicators, i.e. to go beyond the technical application of the elasticities approach. Generally, the econometric approach in the empirical literature is used by regressing fiscal indicators (unadjusted or cyclically-adjusted budget balances, revenues or expenditures using the elasticities approach) on measures of the business cycle and possibly additional control variables, and then interpreting the estimated effect (the coefficient on the output variable) as an indicator of the cyclical stance of fiscal policy, as discussed below. This interpretation depends on the particular fiscal indicator that is used as a dependent variable, leading to some disagreement regarding this issue. Some authors use unadjusted fiscal policy indicators as dependent variables, such as revenues, expenditures or overall or primary budget balances. In such a case, the coefficient on the measure of output movements is a reflection of the cyclical stance of overall fiscal policy, and it reflects both automatic stabilizers and the endogenous discretionary policy. In addition, it is considered that the exogenous discretionary policy is reflected in the residuals (Fatás and Mihov, 2003). However, there are authors who criticise this approach (e.g. Galí and Perotti (2003)), since the focus of analysis should not be on the overall fiscal policy, but on discretionary policy, which is under the direct control of policymakers. Therefore, these studies use cyclically-adjusted measures (typically calculated by the OECD, the EC or the IMF using the elasticities approach) and regress them on output and a set of control variables. This approach is generally followed in the more recent literature (as discussed below), although there are authors who play down this distinction between components, arguing that what is important is the actual response of fiscal policy, and not whether it was automatic or discretionary (Ilzetzki and Végh, 2008). Related to this, when the cyclically-adjusted balance is used as the dependent variable, the coefficient on the output measure reflects the stance of endogenous discretionary policy, i.e. the reaction of policymakers to economic fluctuations. In addition, the residuals again reflect the exogenous discretionary policy to the extent that it is not captured by additional control variables (as well as external shocks affecting the fiscal indicators). Certainly, the use of cyclically-adjusted indicators means that the regression approach is also subject to the weaknesses of the cyclical adjustment procedure, including output gap calculation, but this problem is usually addressed by robustness checks of various calculation methods. The advantage of the econometric approach lies especially in a detailed consideration of the effects of additional important variables (e.g. public debt and lagged balances, but also political, economic and institutional variables as discussed below), as well as in the separate analysis of various components of fiscal policy.

Another point that merits explanation is the definition of the cyclicality of fiscal policy itself and the particular indicators used to express it. It is commonly considered that the cyclical stance is best reflected by some measure of budget balance, such as the overall or the primary balance, mostly relative to GDP. However, there are some criticisms of this approach, most notably by Kaminsky et al. (2004). They argue that the cyclical stance of policy should be defined in terms of policy instruments only (tax rates and government spending), and not endogenous outcomes, such as tax revenues, spending and balances, in absolute terms or as shares of GDP. This argument has a solid theoretical background, as both the Keynesian and neo-classical prescriptions are defined in terms of tax rates or government consumption only. According to this view, only tax rates[24] and government spending have an unambiguous relation to the business cycle, whereas all other indicators could reflect various actual cyclical movements. However, this objection is mostly not followed in the empirical literature, although without any particular justification. The vast majority of studies (and policymakers) continue to use the share of spending, revenues or government balance in GDP as indicators of the cyclical stance of fiscal policy (see Table 2.1 and Table 2.2). There are some studies which focus on government consumption only, but this is often done because of limited data availability in wide country samples. For these theoretical and practical reasons, this study will follow the majority of empirical studies by focusing on budget balances and using indicators relative to GDP. In doing so, the interpretation will be in line with most empirical studies: in expansions, counter-cyclical policy will be taken to consist of higher budget surpluses, lower spending or higher revenues as a

[24] Generally, the focus is on statutory tax rates, although no explicit distinction is made in the literature between statutory and effective tax rates, presumably because of difficulties in calculating the latter.

share of GDP; the opposite will be true for pro-cyclicality, while insignificant coefficients would point to an a-cyclical reaction (and opposite relations would hold in recessions). Last but not least, there is also some disagreement whether the cyclically-adjusted budget balance should be viewed in relation to the actual or to the potential output. According to Fedelino et al. (2009), who provide an extensive discussion and a sensitivity analysis of this issue, the latter is to be conceptually preferred, but due to the difficulties in the measurement and interpretation of potential output, the more convenient ratio to actual output is widely used in empirical studies.

2.4 Review of empirical studies

2.4.1 Initial studies and basic specifications

Nearly all empirical studies analyse the cyclicality of fiscal policy by using some form of general fiscal policy reaction function[25]. They can be divided in two groups according to the particular empirical approach they use to analyse cyclicality. Earlier studies and some of the studies that cover a wide sample of countries mostly follow a two-stage approach (summarised in Table 2.1 below). In the first stage, they estimate country-by-country OLS time-series regressions with the fiscal indicator on the left hand side, and the contemporaneous cyclical indicator of output on the right hand side (Eq. 10). Sometimes the lagged public debt and the first lag of the dependent variable are also added as explanatory variables (Eq. 11). Both specifications yield β-coefficients as indicators of the cyclical stance of fiscal policy. Then, in the second stage, they use cross-section regressions of these indicators – the first-stage estimates of β-coefficients – on various variables which are of particular interest as possible determinants of cyclicality (Eq. 12).

[25] Only the general specifications are presented in this part, but the particular details vary across studies, such as the particular fiscal indicator used as dependent variable, the use of ratios to actual or potential output, the explanatory variables and the estimation method (see Table 2.1 and Table 2.2).

$$FI_t = \alpha + \beta Cycle_t + \varepsilon_t \qquad \text{Eq. 10}$$

$$FI_t = \alpha + \beta Cycle_t + \gamma Debt_{t-1} + \delta FI_{t-1} + \varepsilon_t \qquad \text{Eq. 11}$$

$$\beta_i = \theta X_i + \varepsilon_i \qquad \text{Eq. 12}$$

where:

FI	- fiscal indicator, usually as a share of output (primary or overall budget balance; unadjusted or cyclically-adjusted balance; revenues or expenditures)
Cycle	- indicator for cyclical movements of the economy (output gap or GDP growth)
Debt	- public debt, usually as a share of GDP
X	- 1 x m vector of additional explanatory variables (economic, political, institutional)
Θ	- n x 1 vector of coefficients of additional explanatory variables

Lane (2003) and Alesina and Tabellini (2005) are among the most widely cited studies using this two-stage approach. Badinger (2008) uses a similar approach, although its primary focus is the analysis of determinants of output volatility and the possible role of discretionary policy. However, this approach suffers from two significant shortcomings. The first one is the simultaneity of the output and the fiscal indicator, since the main point of the research is the effect of output on fiscal outcomes, but in reality fiscal indicators also affect output movements. In an OLS context, this gives rise to the endogeneity problem and consequently biased coefficients. This point has been made by several researchers, of which Jaimovich and Panizza (2007) are among the first who clearly demonstrate its consequences, arguing that the observed pro-cyclicality of fiscal policy in some groups of countries is in fact a result of reverse causality, and that results differ once this problem is properly treated. However, some studies that use such estimations do not appear to treat this problem in an appropriate manner. For instance, Lane (2003) and Badinger (2008) argue that this can be treated as a reduced form equation, although it is clear and generally accepted that government spending also has a contemporaneous effect on output movements[26]. Further, Alesina and Tabellini (2005) do not mention the endogeneity problem at all. The second main weakness is that this approach typically uses very few additional explanatory variables, and the omission of relevant regressors might give rise to biased and inconsistent estimates. Related to this, most

[26] In the published version, Lane (2003) has only reduced form OLS. He claims the web-appendix has the instrumental variable version as well, but attempts to recover it have failed.

of these studies do not include public debt and lagged deficits as explanatory variables, even though it is generally considered that the budget dynamics does have an impact on policy actions, especially with high initial deficit or debt levels. The recent crisis and fiscal problems of European countries in particular highlight the importance of past fiscal movements for markets and policy-makers. The inclusion of a time trend in some studies ameliorates the problem of omitted variables, but it still does not allow a deeper analysis of determinants of fiscal policy. An additional criticism is that this estimation approach uses data in a relatively inefficient manner, as it requires relatively long spans of data to run meaningful country-by-country time-series regressions in the first stage (Eq. 10 or Eq. 11 above). For the second stage (Eq. 12 above), it also requires wide data samples in order for the cross-section regressions to yield meaningful and precise estimates. Last but not least, Égert (2010) notes that country-by-country estimations use fiscal indicators with different levels of integration as dependent variables. He argues that the use of dependent variables in levels in some cases and in differences in others, with cycles usually defined in levels, results in limited comparability of cyclicality coefficients across studies.

In an attempt to respond to some of these criticisms, a few studies use what can be labelled an "intermediate" approach, i.e. instrumental variable (IV) estimation in the first of a two-stage approach, or panel estimation, often without proper accounting for the endogeneity bias (Table 2.1). They still tend to use relatively simple specifications and their methods are often less appropriate than the later studies. Relatively simple applications of the "intermediate" approach with panel data are provided by Gavin and Perotti (1997) in their pioneering empirical study on the cyclical character of fiscal policy in Latin America and by Fatás and Mihov (2001a) in their study on OECD countries. The same authors use a more careful two-stage approach in their well known study of discretionary policy and output volatility, although again without any role for the debt or deficit inertia (Fatás and Mihov, 2003). However, they do include them in a later study of cyclicality of fiscal policy in the euro area, which uses country-by-country estimations (Fatás and Mihov, 2009). Finally, Lee and Sung (2007) use panel IV estimation, but they do not analyse the possible role of public debts or past deficits, or of other additional variables beyond the inclusion of a time trend and country and time dummies.

Table 2.1 summarises the main features of studies on the cyclicality of fiscal policy that use a two-stage approach and an intermediate approach. As noted previously, these consist mostly of earlier cyclicality studies and some of the studies that cover a wide sample of countries.

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Lane (2003)	22 OECD member states	1960-1998	1st stage: country-by-country time series OLS; 2nd stage: cross-section WLS	1st stage: real government spending (various sub-categories) 2nd stage: cyclicality coefficients	contemporaneous real GDP growth rate	No	No	1st stage: none; 2nd stage: output volatility, power dispersion, GDP p.c., trade openness, size of public sector	
Alesina and Tabellini (2005)	87 countries (of which 23 OECD members)	1960-1999, unbalanced	1st stage: country-by-country time series OLS; 2nd stage: cross-section OLS, WLS, probit	1st stage: change in central government overall surplus as share of actual GDP (also revenues and expenditures) 2nd stage: cyclicality coefficients	output gap (HP filter)	No	Yes, in 1st stage (in levels, not changes)	1st stage: gap in terms of trade (HP filter); 2nd stage: control of corruption, initial GDP p.c., government size, democracy, financial constraints (S&P rating, spread)	
Badinger (2008)	88 countries	1960-2004, unbalanced	1st stage: country-by-country time series OLS (to get exogenous discretionary policy); 2nd stage: cross-section WLS	1st stage: change in real government spending 2nd stage: discretionary policy (volatility of residuals in 1st stage)	contemporaneous real GDP growth rate	No	No	1st stage: none; 2nd stage: GDP per capita, openness, government size (instrumented), number of elections, political constraints, electoral system, political system	Primary focus of the study is on output volatility

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Gavin and Perotti (1997)	29 countries (13 Latin American countries and 16 OECD members)	1968-1995, unbalanced	panel OLS	change in general government surplus as share of actual GDP (also includes various sub-categories)	contempora-neous real GDP growth rate	No	Yes (in levels, not changes)	Change in terms of trade, lagged inflation tax rate, exchange rate regimes, borrowing constraints, country dummies; interaction dummies with output for good and bad times	
Fatás and Mihov (2001a)	20 OECD members	1960-1997	pooled regressions with fixed effects (in regressions of fiscal indicators)	change in real revenues and spending, but also primary balance as share of GDP	contempora-neous real GDP growth rate	No	No	None	Primary focus on output volatility, automatic stabilizers and discretionary policy
Fatás and Mihov (2003)	91 countries (of which 25 OECD members)	1960-1999, unbalanced	1st stage: country-by-country time series IV (to get exogenous discretionary policy); 2nd stage: cross-section OLS	1st stage: change in real government spending 2nd stage: discretionary policy (volatility of residuals in 1st stage)	contempora-neous real GDP growth rate	No	No	1st stage: Time trend, inflation and inflation squared; 2nd stage: political constraints, electoral system, political system, number of elections;	Primary focus of the study is on output volatility; instruments for GDP in IV: two lags, oil prices, lagged inflation, lagged government spending growth
Lee and Sung (2007)	94 countries (of which 22 OECD members)	1972-1998, unbalanced	panel OLS and IV (also country-by-country)	government expenditures and revenues, and sub-components (HP gaps and growth rates)	contempora-neous real GDP (HP gap and growth rate)	No	No	Time trend, country and year dummies;	Weighted GDP of neighbouring countries as IV for GDP; also analyses asymmetries

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Fatás and Mihov (2009)	22 OECD countries (with focus on euro area)	1970-2007	country-by-country time series OLS and IV (to get cyclicality coefficients); also analyse automatic stabilizers and exogenous policy separately	cyclically-adjusted budget balance, but also spending, revenues and primary balance (shares of potential GDP, as constructed by OECD)	contemporaneous output gap	Yes, lagged debt as share of GDP	Yes	None; interaction dummies with output pre- and post-1999 (for EMU effects)	Instruments for output gap: lag and US gap for euro area, lag and euro area gap for US;
Ballabriga and Martinez-Mongay (2002)	13 EU member states (EU15 except Greece and Luxemb.)	1979-1998, unbalanced	Country-by-country GMM	primary budget surplus and cyclically-adjusted primary budget surplus as a share of GDP	contemporaneous output gap (HP filter of industrial production index)	Yes, lagged ratio to GDP	Yes	Few dummies for particular periods in some countries	Also analyses monetary policy rules

Table 2.1. Summary of studies using the two-stage and intermediate approaches
(Note: Main or baseline specifications are presented)

2.4.2 The single stage approach and extensions

The most comprehensive answer to the drawbacks described above comes by more recent studies which follow a single stage approach of analysing the cyclical stance of fiscal policy (summarised in Table 2.2 below). They typically use panel data, which enables a more efficient use of time and cross-section variation. Here, the fiscal indicator is regressed on the output indicator, debt and the lagged dependent variable (Eq. 13), usually with IV or GMM estimation. Some studies use an extended specification that includes other control variables, which enables a richer analysis of fiscal policy determinants (Eq. 14). Therefore, the problem of omitted variables and the consequent bias is less of an issue in the latter case. Related to this, fixed effects are sometimes used to pick up country-specific circumstances. Further, recent studies also tend to analyse explicitly and in more detail the various estimation methods, and use the ones which are capable of dealing with some problems of previous studies such as biased or inconsistent estimators. Some studies deal more closely with possible asymmetries of fiscal policy, which implies different reactions in expansions and recessions. Further, several recent studies investigate the issue of policy intentions instead of policy outcomes by the use of ex ante or real-time instead of ex post data (see below).

$$FI_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta FI_{it-1} + \varepsilon_{it} \quad \text{Eq. 13}$$

$$FI_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta FI_{it-1} + \theta X_{it} + \varepsilon_{it} \quad \text{Eq. 14}$$

where:

FI - fiscal indicator, usually as a share of output (primary or overall budget balance; unadjusted or cyclically-adjusted balance; revenues or expenditures)

Cycle - indicator for cyclical movements of the economy (output gap or GDP growth)

Debt - public debt, usually as a share of GDP

X - *1 x m* vector of additional explanatory variables (economic, political, institutional)

Θ - *n x 1* vector of coefficients of additional explanatory variables

One of the first studies to use a panel estimation of fiscal policy response function was Galí and Perotti (2003) on the effects of the Economic and Monetary Union (EMU) on the cyclicality of fiscal policy. Their study remains one of the most widely cited ones, and their specification has now become standard in this field, at least as an initial point of research. They insist that, if the aim is to analyse the response of fiscal policymakers, cyclically-adjusted balances should be used as the dependent variable instead of the unadjusted balances (as in most of the previous studies). In addition, they note that fiscal policymakers probably have a strong debt stabilization motive, so lagged public debt as a share of GDP should also be included. Further, the lagged budget balance should also be included in order to account both for the inertia in the budget adjustment and for possible serial correlation in exogenous shocks. Their preferred specification consists of panel estimation with fixed country effects, which gives rise to inconsistency because of the inclusion of the lagged dependent variable. They note the existence of this problem, but argue it is not an issue of concern for their aim of comparison of pre- and post- Maastricht periods, as long as the inconsistency is similar for the two periods. However, such a similarity is only assumed, and this approach is generally not followed in later studies, which tend to approach the estimation in a more elaborate manner (see below). Besides, they favour the IV estimator arguing that the sample is relatively small and that small-sample properties of consistent estimators such as GMM were not yet well understood at the time of the research. Their main findings are that discretionary policy in EMU has been pro-cyclical before 1992, but has become a-cyclical after 1992. However, this coincides with a common movement towards counter-cyclicality for other developed countries at the time, and EMU countries still lag behind the strength of counter-cyclicality reached in other countries. In a similar sample, Wyplosz (2006) reaches similar results that discretionary policy in EMU countries has been pro-cyclical before 1992 but has become a-cyclical afterwards, interpreting this as evidence of the fulfilment of the intention of founding fathers to abandon discretionary policy in EMU. However, his specification also pays no attention to additional variables, and he simply drops the policy inertia arguing that it is a known source of inconsistency in panel estimation. In contrast to the previous two studies, Candelon et al. (2010) use not only IV but also GMM methods and extend the sample for a few years. They reach fundamentally different results that discretionary policy in EMU countries has been pro-cyclical both before and after 1992, and that the pro-cyclicality has in fact increased in recent years, thus lending some support to the criticisms of the constraints of EMU and SGP on the stabilization role of fiscal policy.

In their demonstration of the consequences of endogeneity in fiscal policy reaction functions, Jaimovich and Panizza (2007) use both OLS and two-stage least squares (2SLS) regressions with country fixed effects. The radically different results with 2SLS confirm the inaccuracy of simple OLS methods and the importance of proper accounting for the endogeneity problem. They also recognize the bias that arises from fixed effects estimation with lagged dependent variables, and claim that both difference and system GMM estimations yield similar results. Ilzetzki and Végh (2008) use both quarterly and annual data[27], and they use 2SLS and GMM panel estimation with fixed effects to regress changes in government consumption on output growth. While these studies constitute an improvement on earlier simple approaches, they still suffer from the inclusion of almost no additional explanatory variables, and even ignore the potential role of debt. This also applies to the study by Calderón et al. (2010) on the determinants of fiscal policy in a wide sample of countries. In accordance with the recent literature, they stress the role of institutional variables by including a comprehensive institutional quality indicator, but fail to control for public debt and other political and economic factors.

Annett (2006) and Afonso and Hauptmeier (2009) analyse the cyclical character of fiscal policy in European countries by adding some political and institutional variables, and they also include debt and policy inertia in their studies. Annett (2006) is particularly interested in the role of elections and the form of fiscal governance, but also in possible changes of fiscal policy in old EU members as a result of the Maastricht Treaty and the SGP. The model is estimated by both pooled least squares and fixed effects with IV, although he recognises the criticisms of fixed effects estimation of dynamic panels. Related to this, he argues that this method is to be preferred if the sample is reasonably long, since in such cases the bias is not substantial and the alternative dynamic estimators can lead to less efficient estimates. The study by Afonso and Hauptmeier (2009) is also focused on the European context, as it covers the 27 EU member states over the 1990-2005 period. Its main aim is to analyse the behaviour of fiscal policy in the light of debt sustainability and institutional factors such as fiscal rules and decentralisation, but it does not capture other economic and political factors. Unlike the vast majority of studies, they use the lagged output gap as an indicator for economic movements. While the endogeneity problem is avoided in this case, this approach might not be very accurate, as it does not capture the contemporaneous effect of economic movements on fiscal outcomes, particularly as they are using unadjusted budget balances as a dependent variable. After they recognise the so called Nickell bias of the use of LSDV in short panels with dynamic specification (Nickell, 1981), they draw the attention to the drawbacks of IV and GMM type estimators in relatively narrow macro panels, most notably their bias.

[27] This is possibly the only study that compiles and uses a quarterly dataset to analyse the cyclical properties of fiscal policy.

Therefore, they use the arguments in Judson and Owen (1997) that in such cases bias-corrected LSDV estimators are preferred, and they use such an estimator proposed by Bruno (2005a) for dynamic unbalanced panels. However, for comparison they also present some results with standard LSDV and OLS estimations. Further, Égert (2010) provides one of the most comprehensive empirical analyses of cyclicality of fiscal policy in a sample of OECD countries in terms of the variables included and the alternative estimation methods. Besides the standard inclusion of the lagged dependent variable and public debt, it also gradually adds a host of other variables, mostly economic ones. It also presents results with almost all the alternatives used in the literature, by starting with the standard LSDV estimation, and also using the difference GMM and the more efficient system GMM estimator. Because of the relatively narrow and short dataset, it also presents the results using the LSDV correction developed by Kiviet (1995), Bun and Kiviet (2003) and Bun and Carree (2006) for balanced panels, which however has the drawback of assuming strictly exogenous right hand side variables. His main conclusions are that overall fiscal policy in OECD countries has become more counter-cyclical, particularly in downturns, and that discretionary policy is counter-cyclical mostly in countries with low debts and deficits, and pro-cyclical in others.

Balassone and Francese (2004) is among the first studies to extend the research of cyclicality of fiscal policy to the possibility of asymmetric reactions of fiscal policy over the cycle (i.e. different reactions in expansions and recessions), which would be inconsistent with the aims of macroeconomic stabilization and debt sustainability. Because of the inclusion of fixed effects, they use difference GMM estimation, but the results are similar to the ones with OLS. Balassone et al. (2008) extend this to a more detailed analysis of overall and primary balances, as well as revenues and expenditures in the EU member states. Again, they discuss the results of both fixed effects and difference GMM estimation. Except for the asymmetries and possible differences pre- and post-1992, none of these two studies deals with any additional explanatory variable. Turrini (2008) has a similar goal to analyse the role of government spending and expenditures on the cyclical response of fiscal policy in euro area countries over the 1980-2005 period as well as possible asymmetries. It uses much the same explanatory variables as the previous studies, expanding them with the role of elections and the US output gap for common shocks. The method of estimation is by standard LSDV, and it argues that the endogeneity problem is accounted for simply by using lags of the output gap instead of contemporaneous values, but this is generally not considered a satisfactory solution in the literature as long as there is inertia in the gap. Although the author is aware of this problem, he claims that instrumenting the output gap with its own lags and foreign output gaps yields qualitatively unchanged results.

Another important issue taken up in the recent literature concerns the analysis of policymaker intentions. These authors argue that, in order to distinguish policymaker intentions and to be able to explain their behaviour, it is necessary to use real-time data instead of ex post data, which measure actual outcomes. Real-time (or ex ante) data in the context of fiscal policy are the information on cyclical economic movements and fiscal movements that policymakers have at the time of budget planning and implementation. They might differ quite substantially from ex post outcomes, which are finally known only with a considerable delay and which normally include the effects of events and information that were unknown at the time main decisions were taken and policies were implemented. Therefore, the use of real-time data can shed additional light on the common finding of a-cyclicality or even pro-cyclicality of fiscal policy with ex post data, including the common explanation of myopic behaviour or electoral motivations of policymakers. If policy reaction functions using real-time data confirm the findings of pro-cyclicality with ex post data, it can be said that there is mal-intention by policymakers, since such a policy was in fact pre-planned. However, if instead of pro-cyclicality with ex post data, real-time data suggest that policymakers intended to react counter-cyclically to output fluctuations, then the problem is not one of mal-intention but of misinformation about the contemporaneous cyclical position of the economy and about fiscal movements (Bernoth et al., 2008).

The importance of using real-time data when analysing the behaviour of policy-makers was first demonstrated on the case of monetary policy, most notably by Orphanides (2001) and Orphanides (2003), and the subsequent literature. However, there was a delay in the application of this analysis to fiscal policy, despite the fact that its importance was potentially greater than in the context of monetary policy. Indeed, fiscal policy-makers are not only confronted with the imprecision of understanding output gap movements in real time, but they also face uncertainties regarding the real-time movement of budget deficits (particularly as a share of GDP). This all makes judgements on the cyclically-adjusted budget deficit even more prone to measurement errors. Related to this, Hughes Hallett et al. (2007) show that there are substantial revisions of output and fiscal data in OECD countries for many years after their initial publication and that real-time estimates of cyclically-adjusted balances deviate significantly from ex post ones. Consequently, if the aim of empirical studies is to analyse policy intentions, real-time fiscal indicators should be used as dependent variables instead of ex post ones. This reflects the fact that, unlike monetary policymakers, fiscal policymakers do not have control over the budget balance as their policy instrument, and in fact it may turn out to be quite different from their plans (Cimadomo, 2008). On the other hand, the vast majority of the fiscal policy literature still uses ex post data, which probably reflects the fact that real-time data (i.e. official forecasts of fiscal indicators and of GDP) are not widely available in a consistent manner. Indeed, data availability is also the reason why we will use ex post and not real-time data in our analysis in the following chapter.

Forni and Momigliano (2004) are among the first authors to analyse the fiscal policy reaction function in 19 OECD countries with real-time data on cyclical conditions and to compare them with estimates using ex post data. The crucial point is that instead of using the ex post output gap, they use real-time values of the output gap[28] (Eq. 15), alongside the standard specification that uses ex post values for all variables (reproduced in Eq. 16)[29]. Estimations are carried out with OLS and IV fixed effects, and results are presented and compared both for the specification with real-time and the one with ex post data on the output gap. Regarding the inconsistency problems of fixed effects in dynamic panels, they also argue that this does not matter for comparison purposes since there is no reason to believe that the inconsistency would differ in the two cases (i.e. real-time and ex post output gap), but they do present GMM results as a robustness check.

$$\Delta CAPB_{i,t} = \alpha_i + \beta Cycle_{i,t|t-1} + \gamma Debt_{i,t-1} + \delta CAPB_{i,t-1} + \theta X_{it} + \varepsilon_{it} \quad \text{Eq. 15}$$

$$\Delta CAPB_{i,t} = \alpha_i + \beta Cycle_{i,t} + \gamma Debt_{i,t-1} + \delta CAPB_{i,t-1} + \theta X_{it} + \varepsilon_{it} \quad \text{Eq. 16}$$

where:

CAPB - cyclically-adjusted primary balance
Cycle - output gap
$Cycle_{i,t|t-1}$ - output gap at time *t* expected at time *t-1*
Debt - public debt
X - *1 x m* vector of additional explanatory variables (Maastricht Treaty, asymmetries)
Θ - corresponding *n x 1* vector of coefficients of additional explanatory variables

[28] They use two versions of the real-time output gap: the current year gap projected by the OECD in the end of the previous year and the OECD estimate of the previous year's gap (i.e. the lagged projection). Since the results are largely similar, only the first version is presented in the equations here.

[29] Descriptions in this part represent the general baseline specifications in these studies, although particular details may vary, such as the use of ex post data for public debt, the additional explanatory variables and the analysis of asymmetries.

An important finding of the study by Forni and Momigliano (2004) is that the fit of the equation is higher with real-time data on the output gap (Eq. 15), which indicates that they capture reality better. More importantly, the fiscal response to contractions is insignificant and hence a-cyclical with ex post data (Eq. 16), but strongly and significantly counter-cyclical with real-time data (Eq. 15). This indicates that the intentions of policy-makers were to react in a stabilizing matter in response to expected contractions (i.e. counter-cyclically), but the actual economic movements made their response turn out to be a-cyclical. On the other hand, they find that the fiscal response was insignificant in case of positive gaps with both types of data, which means that both planned and actual policy were a-cyclical in relation to expansions. In addition, they also find that some of the violations of the Stability and Growth Pact may have come from inaccurate assessments of cyclical output movements in some countries.

More recent studies extend this analysis in order to shed more light on the reasons of the difference between policy intentions and policy outcomes (e.g. Cimadomo (2008) or Golinelli and Momigliano (2009)). For instance, Golinelli and Momigliano (2009) augment the standard one-stage specification that uses ex post data for all variables with two additional specifications involving real-time data. The first one regresses ex post fiscal outcomes on real-time data that were available to policy makers at the time of budgetary decisions for all independent variables. The second specification uses real-time data not only for independent variables but for the dependent variable as well[30]. Golinelli and Momigliano (2009) note that these two specifications focus on two similar but distinct problems. The first specification maintains the focus on actual policy outcomes but aims to explain them with real-time data, thus linking actual outcomes to budget adoption and implementation stages, whereas the second specification focuses completely on policy intentions and uses real-time data for all variables, including the dependent one.

In their study of EMU countries, these authors use system GMM, with country and time fixed effects, and specifications that also allow for the effect of the Maastricht Treaty, elections and asymmetries. Their main finding from the specification with real-time data for all variables is that original policy intentions are strongly asymmetric – they are counter-cyclical in good times and pro-cyclical in bad

[30] The study presents in detail the manner in which real-time data are constructed. For ease of exposition, we refrain from presenting the equations and the calculations, which are somewhat complicated. In addition, the study provides an excellent analysis and comparison of main specification choices and modeling approaches in studies of cyclicality of fiscal policy in European countries, including their effects on results, which are generally quite significant.

times, implying restrictive policies regardless of the sign of the business cycle, which is a somewhat unusual result. However, when trying to explain actual, ex post outcomes with real-time data, the policy turns out to be symmetrical and only weakly counter-cyclical. The different results in the two equations imply a relaxation of fiscal policy in the implementation stage compared to original intentions. Golinelli and Momigliano (2009) interpret this to reflect pressures for looser policy in bad times and less restrictive policy in good times, which is an argument for the establishment of budgetary rules that limit discretionary behaviour. Further, when ex post data are used for all variables in order to explain actual policy outcomes, fiscal policy is unambiguously a-cyclical. Overall, this means that the original counter-cyclical intentions are offset by errors made by policy-makers in judging real-time cyclical movements, since actual policy turns out to be a-cyclical. They interpret this as an argument for a limited use of active fiscal policy only when the cyclical position of the economy is clear and unambiguous.

Bernoth et al. (2008) also aim to analyse effects of real-time fiscal policy, and possible differences with ex post data. However, they argue that the process of separating automatic and discretionary policy itself suffers from two crucial drawbacks, which later significantly affect the quality of the analysis: the routine but inaccurate classification of short-term discretionary measures as automatic stabilizers and the problems and uncertainties in measuring potential output and output gaps. Therefore, they develop a model that enables testing for real-time measurement errors across a wider range of reaction functions[31]. Second, and more importantly, they argue that their model avoids the need for cyclical adjustment by exploiting the idea that automatic stabilizers react to the ex post output level, whereas discretionary policy as a reflection of policymakers' intentions reacts to the ex ante or real-time perceptions about the output gap. They take their model to the data consisted of a panel of 14 EU countries over the 1995-2006 period. After a careful discussion of estimation possibilities, they decide to use system GMM estimation with country fixed effects, and they later add additional control variables such as election years and the effect of Maastricht Treaty. They confirm findings in most of the literature of a-cyclical fiscal policy with ex post data. However, they also find that measurement errors for potential output and output gaps are highly significant, which means that the standard ex post specification suffers from omitted variable bias. Further, the introduction of real-time data strongly points toward counter-

[31] In the paper, the authors explain the recovery of these errors within their model, as well as the derivation of estimated equations.

cyclical intentions of policymakers. This means that the problem is mostly of misinformation, not mal-intention, although there is some evidence of the latter as policy is looser in election years with both types of data. In addition, their results indicate a much stronger discretionary reaction and consequently weaker automatic stabilizers than most of the literature, which they interpret to be a consequence of over-smoothing of discretionary policy in the process of calculating cyclically-adjusted balances, which are used in most of the empirical literature.

Table 2.2 summarises the main features of the more recent studies, which follow a single stage approach to analysing the cyclical stance of fiscal policy.

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Galí and Perotti (2003)	11 original EMU members, but also 3 EU and 5 OECD countries	1980-2002	Panel IV estimation with fixed effects (but also country and group time-series with IV)	cyclically-adjusted primary balance as a share of potential GDP (OECD); also primary spending, revenues and government investment shares in potential GDP	contempora-neous output gap (OECD calculations with production function)	Yes, lagged debt as share of potential GDP	Yes	Country fixed effects in panel estimations; interaction dummies for 1992 for changes pre- and post-Maastricht;	Primary focus on effects of EMU; Instruments for output gap: EU15 gap for US, US gap for all other countries
Jaimovich and Panizza (2007)	118 countries	1970-2003 , unbalanced	Panel OLS and IV estimation with fixed effects	budget balance as share of actual GDP and expenditure growth	contempora-neous real GDP growth	No	Yes, deficit as share of GDP	Country fixed effects; change in terms of trade;	Instrument for GDP: weighted GDP growth of export partners;
Ilzetzki and Végh (2008)	49 countries (of which 22 industrial)	1960-2006, unbalanced (quarterly), also 1961-2003 (annual)	Panel OLS and IV with fixed effects, GMM, OLS simulta-neous equations, panel VAR	change of real general government consumption (also of real central government spending)	contempora-neous real GDP growth	No	No	Country fixed effects	Instrument for GDP: contempora-neous and lagged weighted GDP growth of export partners and weighted rate on 6-month Treasuries
Annett (2006)	14 EU members or 11 EMU members (EU15 or original EMU12 without Luxembourg)	1980-2004	Pooled OLS and Panel IV, with and without fixed effects	Cyclically-adjusted primary balance as a share of actual GDP	contempora-neous output gap	Yes	Yes	Country fixed effects; election years, form of fiscal governance, relative economic size, output volatility; interaction dummies for 1992 and 1999 (Maastricht Treaty and EMU);	Instrument for output gap: lagged own output gap

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Wyplosz (2006)	EU15 members or 10 EMU members (EMU12 without Greece and Luxembourg)	1980-2005	Panel W2SLS and 3SLS	cyclically-adjusted primary balance and cyclical balance as a share of GDP	contemporaneous output gap	Yes, ratio to GDP	No	Interaction dummies for pre-Maastricht, Maastricht years and SGP	Instruments for output gap: lagged own gap and lagged and current US gap
Afonso and Hauptmeier (2009)	27 EU members	1990-2005, unbalanced	Panel LSDV and bias corrected LSDV	Primary balance and primary spending as a share of actual output	lagged output gap	Yes, lagged ratio to GDP	Yes	Country and time fixed effects; dummies for Maastricht, SGP and enlargement; elections, fiscal and budget balance rules, decentralisation and debt thresholds	
Égert (2010)	OECD countries	1970-2008, unbalanced	Panel LSDV, bias corrected LSDV, difference GMM and system GMM	Levels and changes of general government balances (primary and overall, unadjusted and cyclically-adjusted), also analyses spending and revenues	contemporaneous real GDP growth rate or output gap (constructed by production function approach)	Yes, lagged ratio to GDP	Yes	Country fixed effects; debt servicing, openness, population growth, lagged public sector size, dummies for Maastricht Treaty and EMU, inflation, output volatility, house and stock prices, strength of government, background of head of government, timing of general elections	Also analyses country specific outcomes, asymmetries, non-linearities and fiscal projections
Candelon et al. (2010)	11 EMU members (EMU12 without Luxembourg)	1980-2004	Panel IV with fixed effects and system GMM; also country-by-country time series IV	primary balance and cyclical balance as a share of potential GDP	contemporaneous output gap (OECD calculations with production function)	Yes, lagged ratio	Yes	Country fixed effects; Election dummy; interaction dummies for pre- and post-1992 for all variables;	Instruments for output gap: lagged own gap and lagged US gap

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Calderón et al. (2010)	112 countries (21 industrial and 89 developing)	1984-2008	Pooled FGLS and Panel difference GMM	real government spending changes and gap (HP filter)	contempora-neous real GDP growth rate and output gap (HP filter)	No	Yes	Institutional quality (interacted with output gap)	Also analyses monetary policy cyclicality
Balassone and Francese (2004)	14 EU member states (EU15 except Luxemb.), US and Japan	1970-2000	Fixed effects panel OLS and Arellano Bond with first differences	General government balance as share of actual GDP	contempora-neous output gap (HP filter)	Yes, as share of GDP	Yes	Fixed effects; interaction dummies pre- and post-1992; interaction dummies with output for good and bad times	Primary focus on asymmetries and the effect of EMU
Balassone et al. (2008)	14 EU member states (EU15 except Luxembourg)	1970-2004, unbalanced	Fixed effects panel OLS and Arellano Bond with first differences, SUR	Overall and primary balance, revenues, spending and sub-components as share of actual GDP	contempora-neous output gap (HP filter)	Yes, as share of GDP	Yes	Fixed effects; interaction dummies pre- and post-1992; interaction dummies with output for good and bad times; interest spending for regressions with primary variables	Primary focus on asymmetries and the effect of EMU
Turrini (2008)	11 EMU members (EMU12 without Luxembourg)	1980-2005, unbalanced	Panel LSDV (but also probit)	Change in the share of cyclically-adjusted primary balance/ spending/ revenues as a share of potential GDP	lagged output gap (constructed by production function approach)	Yes, as share of potential GDP	Yes, in levels (not changes)	Country fixed effects; dummies for 1992 and 1999 (Maastricht Treaty and EMU); lagged US output gap; parliamentary elections; interaction dummies for good and bad times	

Study	Country coverage	Period	Method	Dependent variable	Output cyclicality variable	Control for debt	Lagged dependent variable	Additional control variables	Other comments
Forni and Momigliano (2004)	19 OECD countries, of which 10 original EMU members (separate results for both groups)	1994-2004	Panel OLS and IV with fixed effects; also Arellano-Bond	Ex post changes of the cyclically-adjusted primary balance as a share of potential GDP (levels for Arellano-Bond)	Expected future output gap, expected current gap or ex post gap (production function approach), but also real GDP growth rate	Yes, lagged ratio to GDP	Yes, in levels (not changes)	Variable for Maastricht Treaty and SGP; positive and negative gaps are treated separately	Primary focus on differences between actual policies and outcomes (real time vs. ex post); IV for GDP: estimate for own gap and weighted gap of other countries in previous year
Golinelli and Momigliano (2009)	11 EMU members (EMU12 without Luxembourg)	1994-2008	Panel system GMM	expected and ex post change in the cyclically-adjusted primary balance as share of potential GDP	expected and ex post lagged output gap (production function and HP filter)	Yes, lagged ratio to potential GDP	Yes, in levels (not changes)	Country and time fixed effects; variable for Maastricht Treaty and SGP; elections; also splits the sample for good and bad times	Primary focus on differences between intentions, actual policies and outcomes; but also on effects of specifications and modelling approach
Bernoth et al. (2008)	14 EU member states (EU15 except Luxembourg)	1995-2006	Panel system GMM	ex post primary balance as a share of potential GDP	ex post contemporaneous output gap (with production function approach)	Yes, lagged ratio to potential GDP	Yes	Country fixed effects; Variable for Maastricht Treaty and SGP; elections; error in estimating the potential output, error in estimating the output gap	Primary focus on differences between intentions and outcomes and on a new approach to estimating policy responses

Table 2.2. Summary of studies using the single stage approach and extensions
(Note: Main or baseline specifications are presented)

2.4.3 Studies of fiscal policy in transition countries

Early empirical studies on fiscal policy in transition countries are relatively simple compared to other studies, mostly reflecting very limited data availability and simple empirical methods used. Although they often deal with determinants of overall fiscal policy, the cyclical character of fiscal policy and its determinants are not always their main focus. Coricelli and Ercolani (2002) are among the first authors to attempt the construction of cyclically-adjusted balances for four transition countries alongside the methodology used by the European Commission for EU member states. Although their approach to the calculation of elasticities and the cyclical adjustment is relatively simple, they conclude that discretionary fiscal policy in the early years of transition has been pro-cyclical. In addition, they find that budget deficits do not reflect cyclical movements, but are mostly due to discretionary policy, and this is particularly linked to public investment in these countries. This, combined with the higher output volatility in transition countries, may induce considerable constraints on fiscal policy once these countries become EU members and are subject to the SGP. However, they do not provide a deeper analysis of the determinants of fiscal policy. Such an attempt is made by Berger et al. (2004), who analyse the differences in fiscal policy in the eight transition countries that became EU members in 2004 by using pooled estimation. They are among the first to include some political variables in estimation, and they also build a game theory model which supports the empirical results of a more relaxed fiscal policy in the large transition countries as a result of higher bargaining power. However, the estimation has several weaknesses, most notably the small sample size and short time period, omitted variables (particularly debt and lagged deficit) and the endogeneity bias. The empirical analysis of fiscal policy reaction functions by Kattai and Lewis (2005) is even simpler, as they estimate 2SLS time series country-by-country equations with low degrees of freedom and no additional explanatory variables. According to their results, fiscal policy in most transition countries suffers from deficit bias, and in very few of them has it been used for output stabilization purposes. In a study of fiscal policy determinants with a more advanced approach of panel random effects with more explanatory variables, Schneider and Zápal (2006) confirm the lack of stabilization role for fiscal policy. In addition, they find a strong role for finance ministers and external constraints in fixed exchange rate regimes, but no role for elections. However, their study also suffers from very low sample size, endogeneity and omission of debt and lagged balances. Although it is infrequently used in empirical studies, they also use the growth accounting approach proposed by von Hagen et al. (2001) to analyse the cyclical character of fiscal policy in transition countries, which is found to be rather ambiguous across countries over the 2001-2004 period. Finally, they also deal with issues of fiscal consolidation and its sources across various fiscal categories.

The issue of fiscal adjustment in transition countries is also treated by other empirical studies, which however do not deal with cyclicality. For instance, Pirttila (2001) analyses the role of various structural reforms, output growth and unemployment on fiscal adjustments, but also on budget balances in CEE and CIS countries. He finds that price liberalisation has a positive and enterprise restructuring has a negative impact on fiscal adjustment. While he uses more appropriate empirical methods such as pooled OLS and IV and panel estimation with fixed effects, the regressions still suffer from problems of endogeneity and omitted variables. Further, Purfield (2003) also analyses fiscal adjustments in transition countries, and uses logit regression to estimate the probability of a successful fiscal adjustment depending on the size and composition of the adjustment and initial macroeconomic conditions. He finds that the size of the adjustment and the reduction of spending are among the most important factors for a successful and durable reduction of the primary budget balance.

The improved estimation methods and wider specifications used in studies for other countries have begun to be applied to transition countries as well, although the number of these studies is still surprisingly small. A few studies include all or some transition countries as part of their wider samples, e.g. Ilzetzki and Végh (2008), Afonso and Hauptmeier (2009) and Égert (2010). In addition, recently there have been a few studies on the determinants of fiscal policy which focus almost completely on transition countries. They tend to consider wider arrays of possible determinants and/or include more sophisticated econometric techniques, capable of dealing with estimation problems involved. Understandably, because of data availability and particular interests, their specification and techniques vary considerably, although they all share a focus on overall policy, rather than on automatic stabilizers and discretionary policy.

Fabrizio and Mody (2006) analyse the effect of a variety of political, economic and institutional variables on fiscal outcomes. They use panel fixed effects as main specification, but also present some results with other techniques. Given their interest in institutional determinants, they construct a rather detailed indicator capturing budgetary institutions and processes in new member states over the 1997-2003 period. Their main conclusions are that the quality of institutions is an important determinant of fiscal outcomes, and that the importance of political factors is stronger than that of economic factors. However, one of the main drawbacks of this study is that it does not involve any indicator for the cyclical economic movements, which means that it does not offer any indication on the cyclical character of fiscal policy. Since it is expected that output movements would have an impact on fiscal outcomes, their omission probably causes bias in other coefficients and might also invalidate the conclusion about the stronger effect of political determinants, as the main economic determinant is omitted. Other weaknesses include the small sample size of a maximum of 63 observations, as well as the omission of inertia in most specifications due to its insignificance in some of them, which is at odds with the evidence of fiscal policy inertia in most other studies and might in itself be a source of bias (Lewis, 2009). Further, Lewis (2007) analyses determinants of overall budget balances in eight new EU member states over the 1996-2004 period, including the possible effect of EU-accession, and uses pooled IV estimation with both fixed and random effects. The main findings are that fiscal policy is used for stabilization purposes only in the Baltic countries, where it is the only tool left because of fixed exchange rates. In addition, it finds no disciplining effect of EU-accession on fiscal policy. However, the study divides the countries in three groups, thus hugely decreasing the sample size and consequently the precision of the results. Besides, it ignores essential variables such as policy inertia and public debt, but also does present results on additional political or economic determinants, although it claims to have tested some of them and found them insignificant.

Staehr (2008) is one of the first studies to analyse cyclicality in transition countries in a manner routinely used in most other studies. It estimates overall fiscal policy reaction functions with output growth, debt and inertia as explanatory variables in the context of all EU member states over the 1995-2005 period, which enables a comparison between old and new member states. Due to the inertia and the fixed effects, difference GMM is a preferred technique, although some OLS results are also presented. Its main findings are that overall fiscal policy in new member states is less inertial and more counter-cyclical than in old EU member states, but that debt ratios or interest payments are insignificant in both country groups. The main weakness of the study is that it does not include any other explanatory variable, which has the previously discussed possible consequences of biased results and the lack of possibility for a deeper analysis of the reasons behind its findings. In addition, it only uses simple deviations from average GDP as cyclical indicators, assuming that potential output is equal to average over the period. This prevents the interpretation of results in terms of counter- or pro-cyclicality of fiscal policy, as the business cycle (output gap) in these countries generally differs from GDP growth rates due to the volatile trend/potential GDP growth.

Further, Lewis (2009) is interested not only in fiscal policy determinants in new member states, but also in differences in policy intentions and outcomes, so he is the first to use real-time data in the context of transition countries. Related to this, he also uses GDP growth rates, both due to availability and to the argument that they are more important for policymakers than output gaps. He analyses determinants of overall budget balances in the new member states over the 1995-2008 period, including fiscal policy inertia and GDP growth (but not public debt), some political variables and various definitions of EU accession effects. Compared to other studies, he provides a somewhat more detailed discussion of estimation choices, and uses 2-step IV GMM for various specifications, although he gives evidence that the results for the main variables are not too sensitive when other IV and GMM techniques are used for the baseline specification. His main results are similar to Staehr (2008): fiscal policy is more counter-cyclical and less inertial in new than in old EU member states. In addition, he finds that most political variables are insignificant, but that the EU-accession had a loosening effect on fiscal policy, thus confirming conclusions by Berger et al. (2004) for a wider country sample. However, this study also has some of the potential spaces for improvement common with other studies on transition countries. Most notably, it would be important to use output gaps as measures of cyclical output movements, whereas GDP growth rates could be used as robustness checks, as is common in the literature. While the use of gaps in the context of transition countries does have its drawbacks, it should still reflect cyclical economic movements better than simple growth rates. Indeed, positive growth rates might reflect both above and below potential growth, and this could be more pronounced in transition countries where potential growth rates are higher. In addition, both studies focus on overall fiscal policy and do not deal with differences between automatic stabilizers and discretionary policy, and this distinction might involve possibly important issues and recommendations for policymakers. There is also some space for a more careful discussion of estimation methods, since this issue might also have an impact on results. Last but not least, while some studies make an important progress on the issue of model specification, there is still a need to consider in more detail the effect of additional factors on the cyclicality of fiscal policy in transition countries.

Chapter 3 – Empirical investigation of cyclicality and determinants of fiscal policy in European countries, with particular reference to transition countries

3.1 Introduction

This chapter[32] aims to empirically address one of the main questions of the thesis – what is the cyclical character and determinants of fiscal policy in European countries, with a particular focus on transition countries.

The two main schools of macroeconomics have different views on the appropriate response of fiscal policy to output movements. Keynesianism prescribes

[32] A paper based on this chapter won the 2012 Oesterreichische Nationalbank Olga Radzyner Award for scientific work on European economic integration, which is bestowed on young economists from Central, Eastern and South-eastern Europe. A shorter version of the paper has been published as Kabashi (2014).

that, in crises, the government should lower taxes and increase public consumption and investment, which amounts to counter-cyclical fiscal policy. On the other hand, the neo-classical theory has a more sceptical view on the stabilization properties of fiscal policy. According to the tax-smoothing models initiated by Barro (1979), for a given path of government spending, governments should keep tax rates constant over the cycle, which implies that the overall budget balance would move in a counter-cyclical manner. However, as argued in the previous chapter, none of the main theories prescribes pro-cyclical policies, which are sometimes observed in reality, particularly in developing countries. Therefore, additional explanations have been proposed for this failure of the two main theoretical prescriptions, mostly related to market failures or the common pool problem (as discussed in Chapter 2).

The empirical investigation will start by looking at the cyclical character of fiscal policy in Europe between 1995 and 2010, with a particular focus on transition countries. *A priori* expectations, which are based both on theoretical prescriptions and on results in some of the empirical studies, are that fiscal policy has been counter-cyclical in old EU member states, but probably pro-cyclical in the European transition countries. Therefore, the study will also include the investigation of the various explanations that have been proposed for the observed failure of the main theoretical prescriptions in practice, i.e. the observed pro-cyclical fiscal policy, most notably in developing countries. As surveyed in Section 2.1 of the previous chapter, there is a relatively large body of literature that links these failures of theoretical prescriptions to variations of the common pool problem. In particular, the common pool problem in the context of the cyclicality of fiscal policy is analysed by several authors, who provide similar but distinct explanations for its effects, and which will also be investigated in our study. Lane and Tornell (1998) and Tornell and Lane (1999) put forward the voracity effect. According to them, and to the empirical investigation in Lane (2003), pro-cyclicality increases with higher dispersion of power, or the number of power groups, defined in a very broad way. In addition, Talvi and Végh (2005) build a model with pressures by various interest groups for higher spending and lower savings in good times. Further, Alesina and Tabellini (2005) argue that pro-cyclicality is a reflection of a political agency problem in democracies, as corruption in democratic countries contributes towards myopic and pro-cyclical fiscal policy.

The study will also examine the effects of what can be broadly called 'political and institutional' factors on fiscal policy. In order to do so, it will draw on the relatively wide area of theoretical and empirical studies of political determinants of fiscal policy. This field, which has been flourishing since the early 1980s, is not focused on the cyclical character of fiscal policy *per se*, but on various factors behind fiscal policy formulation and outcomes. Hence, it is typically concerned with the overall fiscal policy, and particularly the deficit bias, and the related issues of government short-sightedness and the common pool problem (Debrun et al., 2008). Indeed, numerous authors have provided various theories and explanations for the fiscal policy outcomes, ranging from the political and electoral systems to political business cycles, effects of ideology or effects of decentralisation[33]. Further, an increasing attention in the literature on fiscal policy is being paid to the effects of institutions, such as fiscal rules or institutional quality. While institutional factors often lack a clear theoretical background, empirical results and practical considerations strongly argue in favour of their inclusion in any study of fiscal policy determinants. In addition, we will also include some political economy factors which are specific for European countries. Among them, already established in the literature is the effect of European economic integration on fiscal policy. We will also analyse some factors which are mostly neglected in the literature, but which are expected to have played an important role on fiscal policy in this group of countries, such as IMF arrangements and the exchange rate regime. Overall, the inclusion of a wide array of political and institutional factors in our study of fiscal policy is clearly recommended by the theoretical and empirical literature. Besides, the inclusion of these factors also has important methodological benefits, as it will enable us to minimise the problem of omitted variables. Related to this, it will enable a comprehensive analysis of fiscal policy determinants, as well a clear distinction between the effects of macroeconomic fluctuations from the effects of other potentially important factors.

This study will build upon the existing relatively extensive body of knowledge on the cyclical character and determinants of fiscal policy in European countries. However, its main aim is to expand this body of knowledge in several important aspects. First, it will include all the European transition countries, both current and prospective EU members. It will provide a comprehensive analysis of discretionary and overall fiscal policy in these countries and of possible differences with old EU member states, which are also included. Related to this, it will expand the sample by several years when most transition countries were EU members and started to enter the euro area. Both of these aspects are important extensions of existing empirical studies, most of which tend to pay little attention to transition countries or to capture mostly years prior to EU accession. To the best of our knowledge, our study will be the

[33] Alesina and Perotti (1995) and Eslava (2006) provide excellent surveys of the various theories on political determinants of fiscal policy.

first to shed some light on the cyclical character of fiscal policy in South-eastern European countries. Second, it will aim to analyse the effect of a wide array of political, institutional and other factors on fiscal policy. The main aim of the inclusion of additional factors in the analysis is to check the robustness of the results on cyclicality, which are of primary interest. In addition, treating this group of factors in a comprehensive manner will address an important gap in the existing literature, which mostly ignores these issues or treats only some of the factors, regardless of the sample of countries considered. The inclusion of these factors will also enable a richer analysis of determinants of fiscal policy outcomes, as well as a clear distinction between the effects of economic fluctuations and those of other factors. Third, the study will aim to search for and provide an appropriate model specification and empirical approach to analysing the cyclicality of fiscal policy. By doing so, it will avoid some of the drawbacks which are related to variable definitions, model specifications and estimation methods used by some of the existing studies. Overall, these improvements are also expected to considerably expand the few pioneering studies which focus on the cyclical character of fiscal policy in transition countries (e.g. Staehr (2008) and Lewis (2009)). Last but not least, the study will aim to provide several robustness checks on the results, both to test their stability and to explore additional aspects of fiscal policy in European countries. The final goal of the study will be to provide recommendations for policy-makers both in the new EU member states, and particularly in the South-eastern European countries, which are currently in the early stages of the EU accession process. Hence, it is expected that lessons drawn from more advanced transition countries from Central and Eastern Europe regarding the stabilisation properties and determinants of fiscal policy will be valuable for policymakers in South-eastern Europe.

This chapter proceeds as follows. The next section discusses the model specification, data and the estimation method. Section 3.3 provides baseline results on the cyclicality of fiscal policy. Section 3.4 deals with the effects of political, institutional and other factors on fiscal policy. The following section provides several additional extensions and robustness checks. Section 3.6 concludes.

3.2 Model specification, data and estimation methodology

3.2.1 Model specification

As discussed in Chapter 2 and in accordance with the existing literature (e.g. Galí and Perotti (2003) or Fatás and Mihov (2009)), we decompose overall fiscal policy into two main components: automatic stabilizers and discretionary policy (Figure 3.1). Automatic stabilizers represent the response of fiscal policy to economic fluctuations that is built into the tax code and the overall legislation. Therefore, they act without particular actions by policymakers, who at least in the short-run have no control over them. Discretionary policy on the other hand captures all the deliberate actions by the governments and is often measured by the cyclically-adjusted budget balance. However, discretionary policy measures are not unique, and they depend on the motivation behind them. If they are undertaken by policymakers in response to the cyclical movements in the economy, such as lower taxes or higher spending in case of recessions, they can be considered as endogenous, or systematic discretionary fiscal policy (Galí and Perotti, 2003). On the other hand, fiscal measures undertaken without reference to cyclical movements are usually labelled exogenous discretionary policy (Figure 3.1). Typical examples of the latter would be higher government spending because of political motivations, military spending, or policy measures related to the Maastricht Treaty in the European context[34].

[34] In their seminal study of monetary policy in the US, Bernanke and Mihov (1998) note that exogenous policy shocks reflect many random factors that affect policy decisions, such as personalities of policymakers, political factors, data revisions and various technical issues. They also note that, if there are no exogenous shocks, the effects of policy on the economy can not be identified by any economic method.

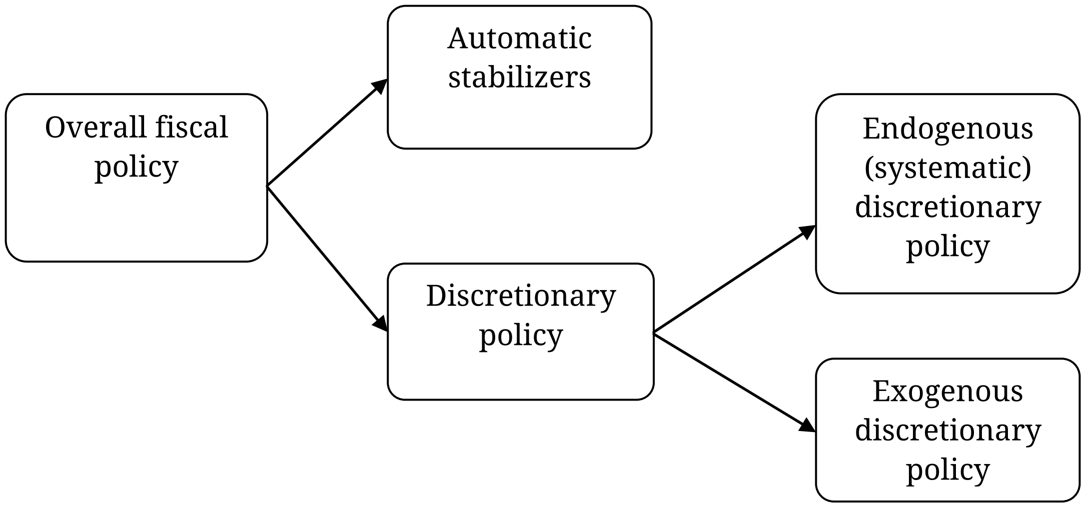


Figure 3.1. Components of fiscal policy

The decomposition of fiscal policy in Figure 3.1 can be transformed into a general empirical specification of the fiscal policy function (Eq. 17 and Eq. 18), as discussed in detail below. The specification in Eq. 17 has become standard in the more recent cyclicality studies, which almost invariably use panel estimation, as surveyed in the previous chapter. At the least, the standard model specification in Eq. 17 reflects the dependence of the fiscal policy outcome on current cyclical output movements and current debt. Bohn (1998) relates a similar empirical model to the seminal tax smoothing model proposed by Barro (1979) where debt and the cyclicality of output play a key role in optimal tax setting. In addition, Bohn (1998) emphasises an important advantage of this empirical specification in the fact that it represents a test of budget sustainability. He shows that a response of the primary balance to the debt/GDP ratio that is strictly positive and at least linear is a sufficient condition for sustainability.

$$Bal_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it} + \varepsilon_{it} \qquad \text{Eq. 17}$$

where:

Bal - budget balance (total or primary, unadjusted or cyclically-adjusted) as a share of nominal GDP
Cycle - indicator for cyclical movements of the economy (output gap)
Debt - public debt as a share of GDP

However, the empirical investigation of fiscal policy hardly ever takes the form of Eq. 17 above, but augments it with other variables of theoretical and practical interest. Therefore, following theoretical recommendations and practical considerations, we will use a model specification that is represented in Eq. 18 below. First, in line with the vast majority of empirical studies (surveyed in Chapter 2), we will not include a contemporaneous debt term, but instead split it into past debt and past budget balance. The incorporation of the lagged budget balance is to be preferred on strong practical reasons. According to Ballabriga and Martinez-Mongay (2002), it is realistic to expect high fiscal policy inertia since drastic changes in tax rates or reversal of past spending commitments are usually unfeasible. Galí and Perotti (2003) also recommend the inclusion of a lagged policy term arguing that any adjustment to a target budget balance is only gradual. In addition, this specification enables proper consideration of initial conditions, i.e. whether the previous debt level and the previous deficit affect current policy-maker decisions. Indeed, besides a positive coefficient on the debt variable (in line with recommendations by Bohn (1998)), budget sustainability also requires an auto-regressive coefficient between zero and one, as the budget balance would otherwise follow an explosive process. Further, in line with the recent literature (as discussed in Chapter 2), we will also include additional variables in the fiscal policy reaction function. Doing so will enable us not only to minimise the omitted variable bias, but also to analyse in more details the exogenous fiscal policy[35] by testing the various determinants proposed by theoretical or practical considerations, which is also one of the main aims of the thesis. One additional variable that is separated from the others and will be explicitly included in all our specifications is the annual inflation rate. Besides the avoidance of the omitted variable bias, we think it is good practice to include inflation in a model such as this one where a nominal variable (fiscal outcomes) depends on real variables (e.g the output gap). The omission of inflation, which is surprisingly common in most cyclicality studies, ignores the fact that budget balances in reality may sometimes not reflect real economic movements, but purely the rise of indexed expenditures or higher tax revenues because of higher inflation. Therefore, we decided to follow Torsten Persson's comment on Gavin and Perotti (1997) that the omission of inflation may significantly bias the coefficient on the economic cycle, which is in fact the main variable of interest.

Our specification in Eq. 18 below is in fact another representation of the decomposition of fiscal policy in Figure 3.1 above, depending on the particular

[35] In Eq. 17 above, all exogenous fiscal policy from Figure 3.1 (except debt) appears in the error term, alongside external shocks possibly affecting fiscal balances. However, in our work we use the more detailed specification in Eq. 18 below, which enables the analysis of exogenous fiscal policy from Figure 3.1 via the explicit introduction of additional economic, political and institutional variables in X_{it}.

definition of the dependent variable used. If the dependent variable is defined as the overall budget balance, then the coefficient on the output gap β shows the combined cyclicality of the automatic stabilizers and of the endogenous discretionary policy. On the other hand, if the dependent variable is defined as the cyclically-adjusted budget balance, then β shows only the cyclical stance of the endogenous discretionary policy. In this case, the effect of automatic stabilizers on the fiscal outcome is already removed by the calculation and use of the cyclically-adjusted balance. In both cases, the exogenous discretionary policy from Figure 3.1 is captured by the additional explanatory variables[36] and the error term (X_{it} + ε_{it} in Eq. 18). Usually, these variables represent political or institutional factors, but economic variables can be added as well. As noted before, debt and inflation are added separately in all specifications, and we will try to add as many other factors as justified by theoretical or practical considerations. In other words, when we introduce additional variables in the specification, we remove their effects from the error term ε_{it} and bring them into X_{it} in Eq. 18, thus effectively capturing various aspects of exogenous discretionary policy in the sense of Figure 3.1.

$$Bal_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta Bal_{it-1} + \omega Infl_{it} + \theta X_{it} + \varepsilon_{it} \qquad \text{Eq. 18}$$

where:

- *Bal* - budget balance (total or primary, unadjusted or cyclically-adjusted) as a share of nominal GDP
- *Cycle* - indicator for cyclical movements of the economy (output gap)
- *Debt* - public debt as a share of GDP
- *Infl* - inflation rate
- *X* - *1 x m* vector of additional explanatory variables (economic, political, institutional)
- *Θ* - corresponding *n x 1* vector of coefficients of additional explanatory variables

The interpretation of coefficients in Eq. 18 in terms of cyclicality is relatively straightforward. If the coefficient on the cycle β is positive, then fiscal policy is counter-cyclical, i.e. it is reacting in a stabilizing manner[37] by accumulating budget

[36] This is in line with the general practice in the literature that uses the same decomposition of fiscal policy from Figure 3.1 (e.g. Galí and Perotti (2003) or Fatás and Mihov (2009)), which interprets exogenous discretionary policy as consisting of fiscal measures undertaken not in response to cyclical movements, but for other motivations (political, military, etc).

[37] The extent to which counter- or pro-cyclical fiscal policies affect the business cycle (i.e. stabilize or amplify economic fluctuations) in reality is also related to the size of the fiscal multiplier, which will be discussed and analysed in more detail in chapters 4 and 5.

surpluses in expansions (through higher revenues and/or lower spending) and stimulating demand in recessions. On the other hand, negative β indicates pro-cyclical policies, i.e. the fiscal policy is acting in a de-stabilizing manner by running budget deficits in expansions (through lower revenues and/or higher spending) and surpluses in recessions. Finally, insignificance of β points to a-cyclicality, meaning policy-makers are not reacting to cyclical economic movements.

Bearing in mind all of this, we start our estimations with a model specification that is based on Eq. 18, but without additional controls X_{it}, which will be added later on. In the next two subsections we will first briefly present the definition of variables and then discuss the estimation methodology. After analysing baseline results on the cyclicality of fiscal policy in Section 3.3, we will move in Section 3.4 to explore political, institutional and other determinants of fiscal policy by including various additional variables (X_{it} in Eq. 18). This will enable us to check the robustness of our baseline cyclicality results, but also to explain fiscal policy as much as possible as well as to properly distinguish between the effects of economic fluctuations and the effect of other factors in fiscal policy outcomes.

3.2.2 Variable and sample description

We are interested in the cyclical character and determinants of fiscal policy in old, new and prospective EU member states. Due to our focus on European countries and data availability, our sample consists of a total of 33 countries: the 27 EU member states as of 2012 and 6 South-eastern European countries (labelled as EU27 and SEE6[38], respectively). In addition, in the analysis of differences between groups, the EU member states will be split in two: the 10 new member states (NMS10) from the Central and Eastern Europe enlargement cohorts of 2004 and 2007, and the 15 old EU member states plus Cyprus and Malta (labelled EU17 or old member states[39]). Data availability limits our sample to start in 1995 and end in 2010 for the EU member states, while data series on most SEE countries are shorter[40] (which yields unbalanced panels). We will be using this sample in all estimations, unless otherwise noted for cases where we miss data for particular variables. Here we present only the

[38] SEE6 consists of Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia. Croatia joined the EU in 2013, i.e. it was not an EU member state in the period analysed here.

[39] Cyprus and Malta joined EU in 2004 as well, but they are grouped with old EU member states because their economic structure and history makes them much closer to them than to the transition countries of Central and Eastern Europe which joined the EU at the same time or in 2007.

[40] Besides for data availability reasons, starting the analysis in 1995 also avoids the high volatility, which was typical for the early transition years in most Central, Eastern and South-eastern European countries.

definition of the key variables, whereas additional explanations will be provided as we introduce new variables in the analysis. In addition, a detailed description of sources and calculation for the entire dataset is provided in Appendix 3.1. Due to data availability, in all cases we use ex post data (i.e. actual outcomes collected from a single vintage of the most recently available data) and not real-time data.

In line with the dominant practice in the literature, we will mostly focus on budget balances, although in some specifications we will also analyse revenues and expenditures separately. Since policy-makers have little impact on interest payments, which are a result of past borrowing decisions, we will abstract from interest payments and we will focus on primary instead of total (headline) budget balances, which is also in line with the practice in the literature. Further, we will mostly use the cyclically-adjusted primary balance as a fiscal indicator, since we are primarily interested in systematic, discretionary responses by policymakers (as described in Subsection 3.2.1). However, we will also pay some attention to overall fiscal policy by using the overall, unadjusted primary budget balance. The difference between overall and cyclically-adjusted balances consists of automatic stabilizers. Therefore the comparison of results between the two options (i.e. with the cyclically-adjusted and with the overall primary balance as a dependent variable) allows inference on the role of automatic stabilizers, which is *a priori* expected to be counter-cyclical by design. In line with other studies and with the Eurostat data reporting used for the needs of the SGP, the dependent variable is defined as a share of nominal GDP. Public debt is also defined in ratio to nominal GDP. Finally, we also include the annual CPI-based inflation rate in all our specifications. This means that we will use the fiscal policy function from Eq. 18 in the previous subsection. As noted previously, we will first omit additional variables X_{it}, which will be added later on.

A key issue in cyclicality studies is the definition of the cyclical movements, which is in fact at the core of the question being investigated. The consensus in the empirical literature is that cyclical movements should be measured by the output gap, which is usually calculated as the deviation of actual from potential GDP (typically based on production function calculation) or from trend GDP (typically calculated with a Hodrick-Prescott filter of real GDP data). These measures of the business cycle can pose significant challenges for transition countries because of the numerous structural changes during transition years, which may make it difficult to calculate a meaningful output gap based on either approach. Therefore, studies focusing on fiscal policy in transition countries take different approaches (as discussed in Chapter 2). However, we consider that alternatives used in these studies are even more problematic, as they do not allow a clear interpretation of cyclicality movements, which is one of our main questions of interest. For instance, in order to capture cyclical movements, Staehr (2008) uses simple deviations from average GDP, which is constant throughout the period. In this case, the cycle moves identically as actual GDP, which is unrealistic with volatile trend/potential GDP typical for the transition period. On the other hand, Lewis (2009) uses simple GDP growth, which is generally a poor indicator of the economic cycle, since there are cases when GDP growth is positive, yet below trend/potential GDP (i.e. the output gap is negative). This might be particularly relevant for transition countries, as they generally have a higher trend/potential GDP growth (as discussed in Chapter 2).

In line with the consensus in the literature, we decided to use output gaps as a measure of cyclical movements. This is also justified by the fact that considerable attention has been paid in recent years by the European Commission and the Eurostat to calculate these indicators for all EU member states. In addition, cyclically-adjusted fiscal indicators based on these calculations of the output gap are used for decision-making related to the SGP. While Eurostat provides data on output gap for EU member states both using the production function potential GDP and the Hodrick-Prescott (HP) trend GDP, only the latter can be calculated for SEE6 states. Therefore, we decided to use the output gap defined as a percentage deviation of actual real GDP from trend GDP calculated from HP-filtering[41]. This means that we will also use cyclically-adjusted fiscal indicators which are based on this method (as discussed in Chapter 2 and described in detail for our sample in Appendix 3.1). However, as noted below, comparisons of baseline estimates for EU27 indicate that results are robust to the method of calculation of the gap. The comparison in Appendix 3.2 in most cases indicates similar movements of the output gap, regardless of the method used to calculate it.

3.2.3 Estimation methodology

The estimation method is strongly affected by our model specification and sample, which restricts estimation to panel techniques. As discussed above, due to strong theoretical and practical reasons, the model includes policy inertia and the contemporaneous output gap (Eq. 18). This means that we have two important

[41] A brief discussion of advantages and disadvantages of the two methods of calculating output gaps was provided in Chapter 2 and references therein. The calculation of HP trend GDP for SEE6 countries and the appropriate cyclical adjustment of fiscal indicators are briefly described in Appendix 3.1.

sources of endogeneity in our model that must be properly treated: the dynamic specification and the simultaneity between the left-hand side and one of the right-hand side variables (fiscal outcomes and output gap, respectively). Therefore, the use of pooled OLS would be inappropriate, since it is expected that endogeneity would yield upward biased estimates of the autoregressive parameter (Roodman, 2009a). Random Effects estimation by Generalised Least Squares would also be inappropriate, since the dynamic specification would also yield biased results because of the correlation of the lagged dependent variable with the random disturbance which includes individual effects. In addition, Judson and Owen (1997) note that Random Effects models are not appropriate for macroeconomic panels because of the correlation between individual effects representing omitted variables and the other regressors, as well as the fact that studies typically capture a particular group of countries, which do not represent a random sample from a wider population. Consequently, we consider in more details the following possible options, which are commonly used in the empirical literature in this area and analysed in relevant Monte Carlo studies: fixed effects or Least Square Dummy Variables (LSDV); bias-corrected LSDV; the Anderson-Hsiao estimator; difference GMM; and system GMM.

As surveyed in the previous chapter, numerous studies in this area use LSDV estimation, which has become common in other areas of economic research as well. However, it has long been recognised that standard LSDV in dynamic models with a finite time dimension such as ours yields biased coefficients (Nickell, 1981). Indeed, Nickell (1981) shows that, in absence of exogenous regressors, the bias declines with the time dimension and increases with the size of the true auto-regressive parameter. Unlike pooled OLS however, in dynamic LSDV estimation there is typically downward bias, which leads to suggestions that the true auto-regressive parameter should lie between OLS and LSDV estimates (Roodman, 2009a).

The empirical studies on cyclicality have dealt with this "Nickell bias" in various manners. A few studies appear to ignore it altogether, despite its serious and well known consequences (e.g. Turrini (2008)). Alternatively, there are studies that recognise the problem, but nevertheless proceed arguing that they are not interested in coefficients *per* se, but in possible changes across sub-periods while assuming that the bias is similar between the sub-periods (e.g. Galí and Perotti (2003)). Other studies use LSDV estimation in relatively long macroeconomic datasets (e.g. Annett (2006) with 25 years), arguing that the associated bias declines with time and is not severe enough to justify alternative estimators. Related to this, in a widely cited pioneering Monte Carlo study on panel estimators for macroeconomic data, Judson and Owen

(1997) conclude that LSDV yields considerable bias of the auto-regressive parameter of up to 28% when the sample consists of 20 periods and up to 20% even when the time dimension is increased to 30, while there is also a bias in the parameter on the exogenous regressor (although it is relatively small). Therefore, they warn that the Nickell bias should not be treated as insignificant by researchers. Overall, this approach is not appropriate for our case, since we are dealing with a sample of a maximum 16 years, which would be expected to result in considerable bias.

Several recent studies tend to treat the Nickell bias more seriously by employing a bias-corrected LSDV estimator, which was first proposed by Kiviet (1995), and extended by Bun and Kiviet (2003) and Bun and Carree (2006). Further, Bruno (2005a) and Bruno (2005b) extend it to unbalanced panels as well. According to the so-called 'Kiviet correction', the bias is calculated in a two-step procedure which also involves the use of a consistent estimator, such as the one proposed by Anderson and Hsiao (1981). The calculated bias is then used to correct the original LSDV estimates. While certainly a major contribution to dealing with the Nickell bias, there are two drawbacks of this procedure. First, Beck and Katz (2009) note that there is no direct way to calculate standard errors, which most likely requires some kind of block bootstrap while taking care to maintain the proper dynamic structure of the data. Second, and most important for our case, the 'Kiviet correction' rests on the crucial assumption of strict exogeneity of regressors. Therefore, it is also inapplicable in our model with a contemporaneous output gap, which is endogenous to the fiscal outcomes. The contemporaneous output gap is an essential feature of the model, so the solution by a few authors (e.g. Afonso and Hauptmeier (2009) or Debrun et al. (2008)) to side-step this weakness of the 'Kiviet correction' by using bias-corrected LSDV with lagged output gap is inappropriate. Indeed, it is reasonable to expect that a considerable part of the reaction of fiscal outcomes to cyclical economic movements would appear within the same year, while a lower part of the reaction would be delayed. The contemporaneous reaction of fiscal outcomes reflects both the response to immediate discretionary measures undertaken by policymakers and it particularly reflects the response of automatic stabilizers (if overall, unadjusted fiscal outcomes are used as the dependent variable), which is mostly contemporaneous by definition.

In order to address these problems, most researchers turn to some type of instrumental variable estimation. A few, mostly earlier studies in this area use a variant of the two-stage least squares (2SLS): a fixed effects estimation with external instruments for the output gap, (e.g. Galí and Perotti (2003) and Candelon et al. (2010)). However, one of the main problems of this approach is that it is often difficult to find or calculate valid exogenous instruments for the endogenous variables, as also recognised by Roodman (2009a). In addition, this approach generally does not address the bias arising from the dynamic specification.

This brings us to the General Method of Moments (GMM), which is being increasingly used in the empirical economic literature, including cyclicality studies. The estimator proposed by Anderson and Hsiao (1981) can be considered an early and a restricted type of the GMM estimator. It consists of first differencing the equation in order to eliminate unobserved heterogeneity, and then using the second lag of the dependent variable (either in levels, or in differences) as an instrument for the lagged differenced dependent variable[42]. However, Monte Carlo studies tend to find that, while having a generally low bias, the Anderson-Hsiao estimator is relatively inefficient compared to alternatives (Judson and Owen (1997), Beck and Katz (2009)). This probably explains its relatively infrequent use in empirical studies, as well as the motivation for further developments of GMM.

Arellano and Bond (1991) propose a GMM estimator which they demonstrate to have the lowest bias and highest efficiency among alternative estimators. It consists of first differencing the equation, and then using not only the first but also deeper lagged levels of the dependent variable as instruments for its lagged difference. In addition, this 'difference GMM' estimator exploits additional moment restrictions by using as instruments the current and/or lagged values of other regressors (depending on whether they are exogenous or not). Therefore, this estimator incorporates the Anderson-Hsiao estimator as a special case, but is more efficient due to the use of more information available in the dataset, i.e. deeper lags as instruments.

Arellano and Bover (1995) and Blundell and Bond (1998) augment the method by an additional level equation to be estimated in the system, in which endogenous and predetermined variables in levels are instrumented with their differences. Effectively, this 'system GMM' utilises a larger subset of instruments, thus increasing the information used in estimation, while maintaining other advantages over alternative estimators. The initial point for the development of the new estimator is the poor performance of difference GMM in cases of near unit root in the dependent variable, which is typical particularly in macroeconomic data. In other words, when the dependent variable is highly persistent, lagged levels are poor predictors and hence weak instruments for first differences, but lagged differences are much better

[42] Subsequent research shows that the version using level instruments yields more efficient results than the one using differences (Arellano (1989), Arellano and Bond (1991), Kiviet (1995)).

predictors of future levels. Therefore, the proposed system GMM greatly improves in efficiency over difference GMM, particularly with higher persistence in the dependent variable and lower time dimension (Blundell and Bond, 1998). The improvement in efficiency is enhanced by the ability of system GMM to use more information by generating more instruments not only for the lagged dependent variable, but also for other regressors, which might themselves exhibit high inertia. Further, an advantage of system GMM over difference GMM is that time- invariant regressors can be included, since differencing only eliminates them from the equation in differences, but they remain in the equation in levels (Roodman, 2009b).

The increasing use of difference and system GMM reflects the advances in both econometric practice and theory and computing in recent years, as well as the recognised advantages over the alternative methods. This pertains particularly to the two sources of endogeneity in our model discussed above. Indeed, difference and system GMM estimators are designed for panel data which may include dynamics and other endogenous regressors in the presence of fixed effects (Roodman, 2009b), which applies to our model specification as well. Finally, "the great advantage of GMM is that … it does not require distributional assumptions, like normality [and] it can allow for heteroskedasticity of unknown form" (Verbeek, 2004, p. 152). Related to this, (Roodman, 2009a, p. 99) also notes that difference and system GMM can address cases when the "idiosyncratic disturbances…may have individual-specific patterns of heteroskedasticity and serial correlation".

However, GMM estimators are not without their problems and necessary assumptions that need to be fulfilled. While additional moment conditions are useful in incorporating additional information, they do at the same time have the serious drawback of a rapid growth of the instrument count with the time dimension, sometimes even larger than the sample size itself. This problem of too many instruments may over-fit endogenous variables, thus failing to remove their endogenous components, which can yield biased coefficient estimates (Roodman, 2009b). The large number of instruments also increases the number of elements in the estimated variance matrix, and in finite samples this can result in dramatic decreases in efficiency (Roodman, 2009a). In addition, in both difference and system GMM, a high number of instruments can severely weaken the Sargan/Hansen[43] test of over-identifying restrictions (Bowsher, 2002), i.e. yield under-rejection of the null

[43] Hereinafter we will refer as 'the Hansen test" to the test of over-identifying restrictions commonly associated with Sargan (1958) and Hansen (1982). In testing instrument validity, the Hansen test is to be preferred, since the Sargan test, while robust to instrument count, requires homoskedastic errors, which is seldom the case in dynamic panels (Roodman, 2009b).

hypothesis that instruments are exogenous and thus valid. Consequently, difference-in-Hansen tests of the validity of sub-sets of instruments may also be weakened, which affects the choice between difference and system GMM. Instrument validity may also be checked with the Arellano-Bond test for the presence of autocorrelation in the idiosyncratic error term. If errors are serially correlated, some lags are invalid instruments since in such a case they are also correlated with the error term by definition, thus yielding inconsistent estimates (Arellano and Bond, 1991). However, this test assumes no cross-sectional error dependence. Indeed, if this assumption is violated, Sarafidis et al. (2009) warn that the null of no autocorrelation is likely to be rejected under the alternative of cross-sectional error dependence. In addition, Sarafidis and Robertson (2009) suggest that the absence of cross-sectional error dependence is a crucial assumption for all dynamic panel estimators, and ignoring its presence may lead to large rises in bias and inefficiency. Finally, the validity of the additional instruments in system GMM depends on the "steady state" assumption, which relies on a restriction of the initial condition process (Blundell and Bond, 1998). This assumption requires that deviations of the dependent variable from its steady state, controlling for covariates, must not be correlated with fixed effects (Roodman, 2009a). Indeed, Roodman (2009b) warns that this assumption is not trivial and it is underappreciated in empirical work. However, when proposing system GMM, Blundell and Bond (1998) suggest that this assumption can be maintained if the size of the autoregressive coefficient is lower than one, and if the difference-in-Hansen test, which appears to have the power to detect the invalidity of this assumption, does not reject the validity of the additional instruments for system GMM.

Another potential problem of GMM estimators is the fact that they were originally designed and are mostly used for typical microeconomic panels with a large cross-section and a short time dimension, while their small sample properties may be problematic. Indeed, the problems of too many instruments discussed above are particularly serious in small samples and/or those with a large time dimension, since it is exactly in such cases when the rapid growth of the instrument count is to be expected most. Between the two estimators discussed above, this problem is expected to be more serious for the system GMM, since it uses more instruments than difference GMM (Hayakawa, 2007). Roodman (2009a) notes that in small samples there is usually some correlation between the instruments and the endogenous components of instrumented variables, which yields biased estimates. Bruno (2005b) also notes that the properties of GMM estimators hold in panels with a high number of cross-section units, but they can be severely biased and inefficient in macroeconomic panels, which are typically small. This poses a particular problem for our sample, which consists of a maximum of 33 countries and 16 years, and hence does not fit the original and typical samples where GMM is used. However, several recent studies tend to prefer GMM to alternative estimators even in small samples. For instance, Bun and Kiviet (2006) apply higher-order asymptotic methods and Monte Carlo simulations in analysing the properties of a range of alternative least squares and GMM estimators in small samples. They conclude that there are no straightforward advices for the estimator to be used in small samples, but system GMM is a relatively safe choice with inertia in the dependent variable and effect stationarity, which was also recommended by Blundell and Bond (1998) when setting out system GMM. Celasun and Kang (2006) also use Monte Carlo simulations to investigate the properties of OLS, LSDV and GMM estimators for fiscal policy studies, and calibrate the parameters of their simulations to data and sample sizes typically available for emerging market countries. They strongly recommend GMM estimators for studies whose primary interest is in the cyclical character of fiscal policy, albeit preferably with exogenous instruments for the output gap. Further, after a theoretical calculation and numerical simulations of the bias in small samples, Hayakawa (2007) concludes that system GMM is less biased than both difference and level GMM, even though it uses more instruments. He attributes the lower bias of system GMM to the fact that it is a weighted sum of the biases of the two other estimators (i.e. of difference and level GMM), which have opposite directions. Finally, Soto (2009) concludes that, in small samples with high inertia in the dependent variable, system GMM outperforms a wide range of alternative estimators in terms of bias and efficiency, and that it is highly reliable in terms of the power of statistical significance tests.

Bearing all this on mind, we decided to proceed with system GMM as our preferred estimation method, using the *xtabond2* syntax for Stata written by Roodman (2009a). In doing so, we will be careful to avoid the problems of system GMM and follow best practice from the literature, particularly as summarised by Roodman (2009a) and Roodman (2009b). We pay particular attention to implementing and reporting the comprehensive diagnostic checks related to instrument validity and the use of system GMM as the estimation method. Regarding the 'steady state' assumption, we follow Blundell and Bond (1998) and check that the size of the autoregressive coefficient is lower than one, and that the difference-in-Hansen test does not reject the validity of additional instruments for system GMM. In line with the dominant practice in the literature using GMM estimation, we use internal instruments for the two endogenous variables (the lagged dependent variable and the output gap) in order to utilise one of the main strengths of the method and avoid the difficulty of finding valid external instruments. In order to deal with instrument proliferation, we follow the advice by Roodman (2009b) for lag limiting and collapsing the instruments. Further, we use two-step system GMM, which provides standard errors that are robust to heteroskedasticity and autocorrelation within cross-sections (Roodman, 2009a). Related to this, we address the downward bias of standard errors in two-step GMM by using the correction proposed by Windmeijer (2005), which is implemented by the *xtabond2* syntax. Finally, since differences between country groups are also of interest, we extensively use interaction dummy variables for particular country groups. In order to facilitate analysis of results, there is no base group and the constant is removed, so the reported coefficient sizes and significances for interaction terms have a direct, straightforward interpretation (i.e. they are not interpreted relative to an omitted base group).

Before proceeding to estimations, a word is in order regarding the process of investigation. The analysis of baseline results is followed by the investigation of numerous additional determinants, which are added one-at-a-time, for two main reasons. First, the sample and method we are using imply that we would soon run into practical problems with degrees of freedom if we start from a general unrestricted model. Second, the bottom-up approach we will be using is dominant in cyclicality studies since, apart from the baseline specification on cyclicality, there is no overall theory of the determinants of fiscal policy. Instead, there are various theories and hypotheses about possible effects of particular factors on fiscal outcomes. In addition, there are also factors which may have little theoretical underpinning but are expected to have strong effects in practice, and hence need to be analysed as well. Although the general-to-specific approach is dominant in the empirical literature on other issues, particularly in time series studies, there are strong recommendations for the bottom-up approach as well. For instance, Kennedy (2002) notes that while the general-to-specific approach has the advantage of unbiased results if the general model incorporates the true model generating the data, "no such true model can ever be found" (Kennedy, 2002, p. 576). Magnus (1999) also notes that the problem with general-to-specific approach is that

> "...it does not work. If you try to estimate such a large model, which has everything in it you can think of, you get nonsensical results.... In the bottom up approach one starts from a simple model and builds up from there. This is in fact how scientists in other disciplines work" (Magnus, 1999, pp. 61-62).

3.3 Baseline results on cyclicality

As noted previously, we start our investigation with the specification from Eq. 18 (reproduced below), without the part of additional controls X_{it}, which are added in other sections. By doing so, in this section we analyse in details the cyclical character of fiscal policy and the effects of key factors proposed by the common theoretical and empirical specification. After concluding on the baseline specification, in other sections we introduce additional factors that might affect fiscal policy, i.e. X_{it}. This will enable us to answer two questions: whether the baseline results on cyclicality from this section are robust, and what, if any, are the effect of numerous political, institutional and other factors on fiscal policy. We use system GMM as our estimation method. In line with the previous discussion, we have two endogenous variables in our model: the lagged dependent variable and the output gap (which are instrumented by their own lags). Further, we always use the lag limiting and the 'collapse' option in *xtabond2*, as suggested by Roodman (2009b).

$$Bal_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta Bal_{it-1} + \omega Infl_{it} + \theta X_{it} + \varepsilon_{it} \qquad \text{Eq. 18}$$

where:

Bal - budget balance (total or primary, unadjusted or cyclically-adjusted) as a share of nominal GDP

Cycle - indicator for cyclical movements of the economy (output gap)

Debt - public debt as a share of GDP

Infl - inflation rate

X - *1 x m* vector of additional explanatory variables (economic, political, institutional)

Θ - corresponding *n x 1* vector of coefficients of additional explanatory variables

We mostly use the cyclically-adjusted primary budget balance as the dependent variable and the output gap based on the HP trend GDP, although we also pay attention to overall, unadjusted budget balances (as discussed in the previous section). Consequently, the sign and the significance of the coefficient on the output gap β will be used to infer the cyclical character of fiscal policy. If the output gap is significant and positive, then fiscal policy is counter-cyclical, i.e. it is reacting in a stabilizing manner by accumulating budget surpluses in expansions (through higher revenues and/or lower spending) and stimulating demand in recessions. On the other hand, a significant and negative output gap indicates pro-cyclical policies: fiscal policy is acting in a de-stabilizing manner by running budget deficits in expansions (through lower revenues and/or higher spending) and surpluses in recessions. Finally, the insignificance of the output gap points to a-cyclicality, meaning policy-makers are not reacting to cyclical economic movements.

Table 3.1 below shows our initial results and the main diagnostics, while detailed results with diagnostics for this and all other estimations are shown in Appendix 3.3. What is common to all results in this and other tables in this section is that diagnostic tests indicate no serious problem with specification or estimation method. Indeed, the Arellano-Bond tests always indicate that there is first-order but not second-order autocorrelation. Further, p-values of the Hansen test of over-identifying restrictions lie within the range suggested by Roodman (2009b) and do not approach unity, which would be a warning for instrument proliferation to the point where the test becomes too weak to reject the null of exogeneity. In addition, in all cases the difference-in-Hansen tests of exogeneity of instrument subsets do not reject the validity of GMM instruments for levels, i.e. there is no preference for difference GMM over system GMM. The difference-in-Hansen test also indicates that in all cases the "steady state" assumption required for system GMM is fulfilled, and that there is no problem with error cross-section dependence (Sarafidis et al., 2009).

In order to account for common shocks affecting fiscal policy in our sample and to control for cross-sectional dependence, in column 1 of Table 3.1 we include a full set of year dummies, with the first year omitted as the reference category[44]. According to these results, which mostly hold in other specifications, there is a relatively high degree of persistence of discretionary policy in our sample, which also supports the use of system GMM. Further, the significantly negative coefficient on the output gap shows that discretionary policy in the entire sample has been pro-cyclical. In other words, when economies were expanding (positive output gap), policy-makers were reacting with looser policies, i.e. lower budget surpluses or deeper deficits. In particular, an increase in the output gap by 1% results in a cyclically-adjusted primary balance-to-GDP ratio that is lower by around 0.2 percentage points. Further, there is little indication that policymakers were concerned with public debt movements. The coefficient on debt in this option is significant at the 10% level, and it moves around that significance level in most future specifications, but in all cases its

[44] For convenience, coefficients on year dummies are omitted from this and all other tables in the text. However, they are shown in the corresponding tables in Appendix 3.3.

size is very small. Here, it indicates that a sizable increase of the debt-to-GDP ratio of 10 percentage points causes an increase of the cyclically-adjusted primary balance-to-GDP ratio of only 0.1 percentage point. This lack of consideration for debt movements when designing and implementing fiscal policy relates well to the recent events, when the consequences of the global economic and financial crisis in Europe were exacerbated by the high debt levels in several countries and the ensuing uncertainty over debt sustainability. Finally, inflation is also significant and has an expected positive sign showing that budget balances rise with inflation, but its effect is fairly small, and this result holds in all the specifications. Here, it indicates that a sizable acceleration of the inflation rate of 10 percentage points causes an increase of the cyclically-adjusted primary balance-to-GDP ratio of only 0.2 percentage points. Nevertheless, because of strong theoretical recommendations discussed previously, we keep both public debt and inflation in all future specifications.

Column 1 with the inclusion of full year dummies yields 25 instruments in a sample of 33 countries, and there is a reasonable risk we will later quickly run into a degrees of freedom problem as we extend this initial specification. Therefore, we considered dropping some of the year dummy variables. Indeed, most of them are individually insignificant, except for some of the latter years when they probably reflect the effects of the crisis on fiscal policy. After performing sequential tests by dropping one or several year dummies, results indicated that year dummies for 1995-2001 were both individually and jointly insignificant. Therefore, we decided to drop them from further estimations and proceed with year dummies for 2002-2010 (column 2 of Table 3.1). It should be noted that the significance and size of coefficients from column 1 (with full year dummies) are very robust to this modification, and this also holds for diagnostics, including the absence of indications for cross-section dependence (Sarafidis et al., 2009). Bearing this in mind, column 2 represents our preferred initial specification with cyclically-adjusted primary balances based on HP-trend GDP, output gap based on HP-trend GDP and year dummies for 2002-2010, and this option will be analysed and extended further in other tables.

Another important issue is the cyclical character of overall fiscal policy and the effectiveness of automatic stabilizers. Therefore, we perform the same process with the overall, unadjusted primary budget balance as the dependent variable. Column 3 of Table 3.1 shows results with full year dummies, while Column 4 shows results when dropping year dummies for 1995-2001. Again, the omission of year dummies for 1995-2001 is justified by their individual and joint insignificance, by the virtually unchanging results between columns 3 and 4, and by the absence of indications of cross-sectional dependence. Results in column 4 show that overall fiscal policy has also been quite persistent, similar to comparable results on discretionary policy in column 2 (both with year dummies for 2002-2010 only). However, the most important result in column 4 is the insignificant coefficient on the output gap, which shows that overall fiscal policy has been a-cyclical. This result resonates very well with the previous results: in the entire sample, automatic stabilizers have been exercising their expected counter-cyclical effect, thus offsetting pro-cyclical discretionary policy from column 2 and resulting in an overall a-cyclical fiscal policy. At the same time, while this means that overall fiscal policy was not amplifying cyclical movements, it was not acting in a stabilizing manner either, since it was not counter-cyclical.

Finally, we also check whether the method of calculation of the output gap and the corresponding cyclical adjustment of fiscal indicators affect the results. In order to do so, we first omit the South-eastern European countries (SEE6) from the sample, since potential GDP based on a production function is not available for them. Then, in the last two columns of Table 3.1 we show the results on the EU member states only (EU27) when using output gaps and cyclical adjustment based on the two alternative calculation methods: potential GDP based on a production function; and trend GDP based on Hodrick-Prescott (HP) filtering. Despite some minor differences in coefficient sizes, the main results do not differ, as discretionary policy is still quite persistent and pro-cyclical (significant negative coefficients on the output gap)[45]. Bearing this in mind, and also our intention to analyse South-eastern European countries for which data on output gaps based on potential GDP are not available, these results justify our decision to use the output gap and cyclically-adjusted balances based on HP trend GDP in all future estimations. Before moving to additional analyses, it is worth noting that, as we move across specifications in Table 3.1, results on the main variables are robust and the diagnostics are satisfactory.

[45] This is also in line with the comparison in Appendix 3.2, which in most cases indicates similar movements of the output gap, regardless of the method used to calculate it.

Column:	1	2	3	4	5	6
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP	Overall, unadjusted primary balance, % of nominal GDP	Overall, unadjusted primary balance, % of nominal GDP	Cyclically-adjusted primary balance (production function potential GDP), % of nominal GDP	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP
lagged dependent variable	0.71***	0.71***	0.77***	0.73***	0.83***	0.70***
	(0.07)	(0.07)	(0.08)	(0.07)	(0.14)	(0.09)
output gap, % of HP trend GDP	-0.16**	-0.16**	0.01	-0.01		-0.16***
	(0.06)	(0.06)	(0.07)	(0.06)		(0.05)
output gap, % of potential GDP					-0.12**	
					(0.06)	
lagged public debt, % of nom. GDP	0.01*	0.01**	0.01	0.01*	0.01*	0.01**
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
inflation rate	0.02*	0.02***	0.01	0.01	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
constant	-0.42	-0.26	-0.19	-0.14	-0.38	-0.33
	(0.66)	(0.32)	(0.79)	(0.39)	(0.24)	(0.34)
Observations	464	464	467	467	405	414
Number of instruments	25	18	25	18	18	18
Number of countries	33	33	33	33	27	27
Countries included (all=EU27+SEE6)	all	all	all	all	EU27	EU27
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	1995-2010	2002-2010	1995-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.58	0.51	0.44	0.50	0.14	0.31
Hansen test of overid. restrictions p-value	0.85	0.78	0.24	0.50	0.41	0.52
GMM instruments for levels: Hansen test excluding group p-value	0.66	0.54	0.59	0.55	0.23	0.29
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.77	0.76	0.11	0.33	0.62	0.70

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.1. Initial estimations of cyclicality of discretionary and overall fiscal policy

In Table 3.2 below we move to the analysis of possible differences of results on cyclicality across the three country groups: 15 old EU member states plus Cyprus and Malta (EU17), 10 new EU member states from Central and Eastern Europe (NMS10) and 6 South-eastern European countries (SEE6). In order to do this, we use dummy variables for the three country groups and interact them with the particular variable of interest. As noted above, there is no base group and the constant is removed, so the reported coefficient sizes and significances for interaction terms have a direct, straightforward interpretation. Before commenting on the results, it should be noted that the diagnostic tests again indicate no serious problem with specification or the estimation method. Hansen tests of over-identifying restrictions do not reject instrument validity and also do not approach unity. In addition, in all cases the difference-in-Hansen tests of exogeneity of instrument subsets do not reject the validity of GMM instruments for levels, i.e. there is no preference for difference GMM over system GMM. The difference-in-Hansen test also indicates that in all cases the "steady state" assumption required for system GMM is fulfilled, and that there is no problem with error cross-section dependence (Sarafidis et al., 2009).

The results from the preferred initial specification for the entire sample in column 2 of Table 3.1 are repeated in the first column of Table 3.2 for easier comparison. Then we proceed with the analysis by country groups. Column 2 shows differences in the persistence of discretionary policy across country groups. According to these results, the autoregressive coefficient is significant in all three country groups. However, there are considerable differences in terms of policy inertia. Indeed, discretionary policy is quite persistent in the EU17 group, while the relatively lower size of this coefficient in both groups of transition countries (i.e. NMS10 and SEE6) lends some support to the argument that discretionary policy in these countries has been more volatile.

Column 3 shows differences in the cyclicality of discretionary policy across country groups, which is one of our main issues of interest. We find that discretionary policy has been a-cyclical in old EU member states (insignificant output gap), which lends some support to the thesis in Wyplosz (2006) that the aim of the Economic and Monetary Union and of the Stability and Growth Pact was to constrain the use of discretionary fiscal policy. On the other hand, discretionary policy was pro-cyclical in NMS10 and even more so in SEE6, as indicated by the significant negative coefficients on the output gap. This means that in these countries fiscal policy was exacerbating cyclical economic movements, since expansions were accompanied by falling budget surpluses or deeper deficits (while the opposite holds for recessions). Indeed, it could be argued that this pro-cyclicality in the two groups of transition countries is driving the pro-cyclicality in the entire sample (column 1). In addition, these findings are broadly in line with expectations and empirical findings of more pro-cyclical policies in less developed countries.

Next, we move to analyse possible differences in reactions to public debt levels (column 4). Somewhat surprisingly, policy-makers in both old and new EU member states were not reacting to debt movements, since the coefficient on debt for these country groups is insignificant. This finding relates well to the recent developments, particularly in the euro area, where the debt levels are relatively high (Chapter 1) and where concerns about fiscal sustainability worsened the effects of the global economic and financial crisis. On the other hand, debt was having a small, but a statistically significant negative effect on fiscal balances in South-eastern European countries. Although this result is counter-intuitive, it can be explained by the relatively low debt levels and low cyclically-adjusted budget balances in most of these countries (Chapter 1), which probably comforted policymakers that they can implement policies without affecting debt sustainability.

We are also interested in the cyclical character of overall fiscal policy across country groups, which could enable us to draw conclusions on the effectiveness of automatic stabilizers. Therefore, Column 5 of Table 3.2 reproduces previous results on overall policy from Table 3.1, while the last column of Table 3.2 shows differences across country groups. Results for the cyclical stance of overall policy in NMS10 and SEE6 are in line with expectations and with results on discretionary policy in column 3. Indeed, overall policy in the two groups of transition countries was a-cyclical (insignificant output gap in column 6), which indicates that the counter-cyclical effects of automatic stabilizers were offsetting pro-cyclical discretionary policies in these countries (from column 3). However, we find no such effect in old EU member states, where both overall and discretionary policy were a-cyclical (insignificant output gaps in columns 3 and 6). This result indicates that automatic stabilizers in old EU member states were ineffective, as they were unable to shift discretionary a-cyclicality in overall counter-cyclicality. This ineffectiveness of automatic stabilizers is counterintuitive, so we return to this puzzle when doing extensions and robustness checks in Section 3.5.

These results mostly differ from findings of previous studies on transition countries, which were surveyed in the previous chapter. In particular, Staehr (2008) finds that overall fiscal policy has been more counter-cyclical in new EU member states, while we reach the opposite conclusion, with overall policy being a-cyclical in all three country groups (insignificant output gaps in column 6 of Table 3.2). Lewis (2009) also finds that overall policy in new EU member states has been counter-cyclical, which is not confirmed by our results that indicate a-cyclical overall policy. In addition, although he focuses on overall balances, Lewis (2009) indirectly calculates that discretionary policy has been a-cyclical in new EU member states, while our detailed investigation of this issue suggests that discretionary policy in this group has in fact been pro-cyclical (negative output gap for NMS10 in column 3). While a more detailed investigation of these divergences in results is out of the scope of this study, they probably reflect several differences in our approach compared to

Staehr (2008) and Lewis (2009), which were described in detail in the Chapter 2. More precisely, unlike these studies, we are using a longer sample, output gap as a cyclical indicator and system GMM as an estimation method.

Column:	1	2	3	4	5	6
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP				Overall, unadjusted primary balance, % of nominal GDP	
lagged dependent variable	0.71***		0.71***	0.70***	0.73***	0.74***
	(0.07)		(0.07)	(0.07)	(0.07)	(0.08)
lagged dependant variable*EU17 interaction		0.90***				
		(0.08)				
lagged dependant variable*NMS10 interaction		0.46***				
		(0.10)				
lagged dependant variable*SEE6 interaction		0.43**				
		(0.17)				
output gap, % of HP trend GDP	-0.16**	-0.16***		-0.16**	-0.01	
	(0.06)	(0.05)		(0.07)	(0.06)	
output gap*EU17 interaction			-0.04			0.10
			(0.10)			(0.11)
output gap*NMS10 interaction			-0.18***			-0.03
			(0.04)			(0.04)
output gap*SEE6 interaction			-0.28***			-0.02
			(0.06)			(0.06)
lagged public debt, % of nom. GDP	0.01**	0.01	0.00		0.01*	0.00
	(0.00)	(0.00)	(0.01)		(0.01)	(0.01)
lagged public debt*EU17 interaction				0.00		
				(0.01)		
lagged public debt*NMS10 interaction				0.01		
				(0.01)		
lagged public debt*SEE7 interaction				-0.03**		
				(0.02)		
inflation rate	0.02***	0.02***	0.02***	0.02***	0.01	0.01***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
dummy for EU17		-0.15	0.32	0.21		0.58
		(0.27)	(0.45)	(0.44)		(0.52)
dummy for NMS10		-0.81**	-0.24	-0.67		0.08
		(0.30)	(0.27)	(0.47)		(0.33)
dummy for SEE6		-0.33	0.38	1.54**		0.52
		(0.59)	(0.30)	(0.61)		(0.35)
constant	-0.26				-0.14	
	(0.32)				(0.39)	
Observations	464	464	464	464	467	467
Number of instruments	18	26	26	22	18	26
Number of countries	33	33	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.51	0.56	0.61	0.50	0.50	0.57
Hansen test of overid. restrictions p-value	0.78	0.59	0.89	0.78	0.50	0.68
GMM instruments for levels: Hansen test excluding group p-value	0.54	0.90	0.68	0.53	0.55	0.37
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.76	0.24	0.86	0.77	0.33	0.84

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.2. Differences in cyclicality among country groups

Before moving to a more detailed analysis of political, institutional and other determinants of discretionary fiscal policy in Section 3.4, in Table 3.3 below we analyse several additional variables which are almost routinely included in empirical studies on European countries: parliamentary elections and the effects of the common currency. We do this by successively adding them to column 1, which reproduces the previous baseline results on discretionary policy in the entire sample. According to column 2, a dummy variable for parliamentary elections has a significant negative effect, meaning that in election years the ratio of cyclically-adjusted primary balances to GDP is considerably lower by around 0.6 percentage points, thus pointing towards a political business cycle effect. Introducing country-group dummies for elections in column 3 indicates that this effect is entirely driven by old EU member states, while somewhat surprisingly elections do not affect discretionary policy in transition countries.

We define the effects of the common currency by two indicators: the convergence process to the single currency in the original 11 euro area founding countries and the Stability and Growth Pact (SGP) requirements, which effectively apply after countries enter the euro area. In order to analyse effects of the run-up to the euro introduction, in column 4 of Table 3.3 we add Maastricht convergence criteria, defined as a dummy that equals one for the original 11 euro area founding members between 1995 and 1998 and zero otherwise. In accordance with *a priori* expectations and with findings in most studies surveyed in the previous chapter, our result of a positive coefficient on the Maastricht dummy shows that these countries implemented considerable fiscal tightening trying to meet the entry criteria, while other results are unchanged. We are also interested whether the convergence process had any impact on cyclicality, besides its direct effect on better fiscal balances. According to column 5, the positive interaction term between output gap and Maastricht criteria shows that countries implemented counter-cyclical policies as they were preparing to establish the euro area. On the other hand, outside of the Maastricht convergence process, discretionary policy maintains its pro-cyclical character, as indicated by the significantly negative output gap.

We also use a dummy variable to analyse the effects of SGP, which was discussed in detail in the previous chapter. Since we also want to capture later entrants in the single currency area, the dummy for SGP is one for euro area members from 1999 or from the year of euro adoption and zero otherwise. When adding the SGP dummy in column 6, we find that SGP requirements have no effect on fiscal policy, while other results are unchanged, including the positive effect of

Maastricht convergence criteria for original euro area members. In addition, in column 7 we fail to find any support for the declared aim of the SGP to limit the scope for discretionary policy, since the interaction term of SGP and the output gap is insignificant, while other results are unchanged, including the negative output gap that indicates pro-cyclical policies. Altogether, these results show that it was much more important for the original founding members to meet Maastricht criteria and enter the euro area, so they significantly adjusted their fiscal policy during the 1990s. On the other hand, once countries enter the euro area, SGP requirements for disciplined fiscal policies have no discernible effect on actual outcomes of fiscal policy, which is also supported by the several violations of the SGP prior to the crisis and the inability of SGP requirements to prevent the European debt crisis (Chapter 2). Bearing in mind these results, we decided to remove SGP from further estimations, but maintain the dummy for Maastricht criteria.

Before proceeding further, in the last column of Table 3.3 we confirm that previous results on the cyclicality of discretionary policy by country groups hold after the introduction of dummies for parliamentary elections and for Maastricht convergence, i.e. discretionary policy is a-cyclical in old EU member states and pro-cyclical in new EU member states and even more so in South-eastern European countries. Besides, the main results in all the options are quite robust, and the diagnostic tests again indicate no serious problem with specification or estimation method. Hansen tests of over-identifying restrictions do not reject the validity of instruments and the difference-in-Hansen tests do not reject the validity of GMM instruments for levels, implying there is no preference for difference- over system GMM. In all cases the "steady state" assumption required for system GMM is fulfilled, and also there is no problem with error cross-section dependence. Therefore, we treat columns 4 and 8 as our baseline results for cyclicality in the entire sample and in country groups, respectively. In the next sections, we extend these specifications in order to analyse political, institutional and other determinants of fiscal policy, as well as to further check the robustness of our baseline results.

Column:	1	2	3	4	5	6	7	8
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP							
lagged dependent variable	0.71***	0.71***	0.72***	0.69***	0.67***	0.69***	0.70***	0.70***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)	(0.06)	(0.07)
output gap, % of HP trend GDP	-0.16**	-0.16**	-0.17**	-0.15**	-0.17**	-0.15**	-0.15**	
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)	
output gap*EU17 interaction								0.02
								(0.12)
output gap*NMS10 interaction								-0.18***
								(0.04)
output gap*SEE6 interaction								-0.27***
								(0.06)
lagged public debt, % of nom. GDP	0.01**	0.01**	0.00	0.01*	0.01**	0.01	0.01*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
inflation rate	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
dummy for parliamentary elections (1 if elections held in that year)		-0.57***		-0.56***	-0.50**	-0.56***	-0.54**	-0.49**
		(0.20)		(0.20)	(0.21)	(0.20)	(0.21)	(0.19)
dummy for Maastricht criteria (95-98)				0.66***	1.10***	0.69***		0.83**
				(0.20)	(0.39)	(0.22)		(0.35)
dummy for SGP (1 from entering euro area)						0.05	-0.20	
						(0.23)	(0.27)	
output gap*Maastricht interaction					0.45*			
					(0.24)			
output gap*SGP interaction							0.14	
							(0.20)	
elections*EU17 interaction			-0.59**					
			(0.23)					
elections*NMS10 interaction			-0.57					
			(0.49)					
elections*SEE6 interaction			-0.36					
			(0.32)					
dummy for EU17			0.29					0.21
			(0.38)					(0.48)
dummy for NMS10			-0.26					-0.17
			(0.24)					(0.25)
dummy for SEE6			0.04					0.37
			(0.27)					(0.29)
constant	-0.26	-0.11		-0.23	-0.33	-0.23	-0.18	
	(0.32)	(0.29)		(0.29)	(0.27)	(0.29)	(0.42)	
Observations	464	464	464	464	464	464	464	464
Number of instruments	18	19	23	20	23	21	23	28
Number of countries	33	33	33	33	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.51	0.36	0.37	0.45	0.67	0.45	0.49	0.63
Hansen test of overid. restrictions p-value	0.78	0.73	0.74	0.69	0.46	0.69	0.67	0.85
GMM instruments for levels: Hansen test excluding group p-value	0.54	0.43	0.42	0.42	0.24	0.41	0.51	0.58
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.76	0.84	0.88	0.78	0.70	0.79	0.62	0.88

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.3. Baseline specification, including elections and Maastricht run-up

3.4 Analysis of political, institutional and other determinants of fiscal policy

In this section[46], we add numerous political, institutional and other additional controls to the baseline specification from the previous section. In other words, we add the control variables X_{it} in the model in Eq. 18 (reproduced below). By doing so, we try to explain as much of the "exogenous" discretionary policy as possible based on the various theories of fiscal policy and on practical considerations. This will enable us to answer two questions: whether the baseline results on cyclicality from the previous section are robust, and what, if any, are the effect of numerous political, institutional and other factors on discretionary fiscal policy.

$$Bal_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta Bal_{it-1} + \omega Infl_{it} + \theta X_{it} + \varepsilon_{it} \qquad \text{Eq. 18}$$

where:

Bal	- budget balance (total or primary, unadjusted or cyclically-adjusted) as a share of nominal GDP
Cycle	- indicator for cyclical movements of the economy (output gap)
Debt	- public debt as a share of GDP
Infl	- inflation rate
X	- *1 x m* vector of additional explanatory variables (economic, political, institutional)
Θ	- corresponding *n x 1* vector of coefficients of additional explanatory variables

It should be emphasised that, regardless of the various additions, the key variables from the baseline specifications have very robust coefficients and statistical significance: there is considerable inertia in discretionary fiscal policy, it is pro-cyclical in the entire sample (the output gap coefficient is significant and negative), elections worsen fiscal discipline and the run-up to euro introduction improves it. The only unstable coefficient is the one on debt, which moves around the significance level of 10%, but is in any case very small. In addition, in all the specifications in this section, diagnostic tests indicate no serious problem with specification or estimation method. Arellano-Bond tests consistently indicate that there is first-order but not

[46] Similarly to the previous section, in the tables here we do not present year dummies. Detailed results (including year dummies) and diagnostics are relegated to Appendix 3.3.

second-order autocorrelation. Further, p-values of the Hansen test of over-identifying restrictions lie within the range suggested by Roodman (2009b) and do not approach unity. In addition, in all cases the difference-in-Hansen tests of exogeneity of instrument subsets do not reject the validity of GMM instruments for levels, i.e. there is no preference for difference GMM over system GMM. The difference-in-Hansen test also indicates that in all cases the "steady state" assumption required for system GMM is fulfilled, and that there is no problem with error cross-section error dependence (Sarafidis et al., 2009).

3.4.1 Voracity effects

We start this part of the investigation by analysing the voracity effect proposed by Lane and Tornell (1998) and Tornell and Lane (1999). According to this theory, pro-cyclicality of fiscal policy increases with higher dispersion of power, or the number of power groups, defined in a broad way. The empirical investigation in Lane (2003) was among the first to lend support to this theory. Talvi and Végh (2005) also propose a model where pressures by various interest groups for higher spending and lower savings in expansions result in pro-cyclical policy. Since there is no clear definition of power groups, in Table 3.4 below we analyse various measurements of the number of power groups and the dispersion of power using relevant indicators from the World Bank Database on Political Institutions 2010 (WB DPI, Beck et al. (2001) and Keefer and Stasavage (2003)). In column 1 of Table 3.4 we reproduce baseline results from the previous section, while in column 2 we omit Montenegro and Serbia because of lack of relevant data in WB DPI, although their omission does not change the results. In column 3 we add the number of checks and balances in the political system, which is expected to reflect well the idea of multiple power groups. This indicator measures the number of checks in the system defined in a very broad way, capturing the effects of divided control of executive power, strong presidential systems, second legislative chambers, opposition control of parliament or number of parties in cabinet needed to maintain the majority. Results from column 2 are unchanged, but we fail to find support that the number of checks and balances has any effect on fiscal policy in the entire sample. However, column 4 shows that voracity effects are present in the two groups of transition countries, where the number of checks in the system tends to worsen the cyclically-adjusted primary budget balance.

Next we analyse the fragmentation of government seats in parliament as another indicator of power dispersion. Government fragmentation is measured by a Herfindahl index of government-controlled seats in parliament from the WB DPI, which rises if there are a few strong parties making up the government (with the maximum being 100 in the case of single party governments as the highest concentration). Results are presented in column 5 of Table 3.4, which shows that baseline results (from column 2) are unaffected, while government fragmentation has no effect on fiscal policy in the entire sample. However, according to column 6, there are some indications that government fragmentation is affecting fiscal policy in old EU member states, but this coefficient has an unexpected negative sign and a relatively small size. It shows that a considerable move towards more concentrated governments results in a relatively small worsening of the budget deficit[47] in old EU member states. While this is not strictly in line with the predictions of the voracity theory, a possible explanation would be that these cases also capture moves from multiple weak parties towards fewer but stronger parties. Therefore, it can be argued that a few strong parties in government are in fact using their position to exert stronger pressures for lower fiscal discipline and higher spending.

Finally, in the last two columns of Table 3.4 we analyse the effects of the government majority itself, measured as the share of members of parliament supporting the government, regardless of whether they come from a single or multiple parties. This indicator ignores the composition of governments and hence is not linked directly to voracity effects, but it does offer some interesting insights. Column 7 indicates that stronger government majorities implement more disciplined policies, while the last column shows that this effect is present both in old and particularly in new EU member states, but not in South-eastern European countries. The coefficient on NMS10 shows that an increase of government majority by 10 percentage points results in an improvement of the ratio of cyclically-adjusted primary balance to GDP by 0.9 percentage points, indicating that strong governments in more advanced transition countries can be an important factor in carrying out successful programmes of considerable fiscal adjustment.

[47] For instance, a move from a coalition government consisted of parties controlling 50%, 30% and 20% of government seats in parliament respectively to a single-party government worsens the ratio of cyclically-adjusted primary balance to GDP by 1.1 percentage points.

Column:	1	2	3	4	5	6	7	8
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP							
lagged dependent variable	0.69***	0.70***	0.69***	0.69***	0.70***	0.69***	0.69***	0.69***
	(0.07)	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)
output gap, % of HP trend GDP	-0.15**	-0.14*	-0.14*	-0.15**	-0.14*	-0.16**	-0.13*	-0.13*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
lagged public debt, % of nom. GDP	0.01*	0.01*	0.01	0.00	0.01**	0.00	0.01*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
inflation rate	0.02***	0.02***	0.02***	0.03***	0.02***	0.02***	0.02***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
dummy for Maastricht criteria (1995-98)	0.66***	0.67***	0.77***	0.53**	0.67***	0.56**	0.69***	0.56**
	(0.20)	(0.20)	(0.25)	(0.24)	(0.20)	(0.23)	(0.25)	(0.23)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.59***	-0.59***	-0.59***	-0.58**	-0.60***	-0.59**	-0.55**
	(0.20)	(0.21)	(0.21)	(0.20)	(0.21)	(0.21)	(0.21)	(0.22)
number of checks in the system			-0.15					
			(0.12)					
number of checks*EU17 interaction				0.12				
				(0.11)				
number of checks*NMS10 interaction				-0.46*				
				(0.26)				
number of checks*SEE6 interaction				-0.68***				
				(0.12)				
fragmentation of government seats in parliament (1 party=100)					-0.00			
					(0.01)			
fragmentation of government seats*EU17						-0.02***		
						(0.00)		
fragmentation of government seats*NMS10						0.02		
						(0.02)		
fragmentation of government seats*SEE6						0.01		
						(0.01)		
government majority in parliament, % of seats							0.05**	
							(0.02)	
government majority*EU17 interaction								0.03*
								(0.02)
government majority*NMS10 interaction								0.09*
								(0.05)
government majority*SEE6 interaction								-0.02
								(0.03)
dummy for EU17				-0.23		1.28**		-1.51
				(0.45)		(0.54)		(1.13)
dummy for NMS10				1.54		-1.38		-5.27*
				(1.04)		(0.94)		(2.63)
dummy for SEE6				2.16***		-0.58		1.26
				(0.46)		(0.60)		(2.18)
constant	-0.23	-0.25	0.41		-0.07		-3.12**	
	(0.29)	(0.28)	(0.51)		(0.43)		(1.44)	
Observations	464	451	450	450	450	450	449	449
Number of instruments	20	20	21	25	21	25	21	25
Number of countries	33	31	31	31	31	31	31	31
Countries included (all=EU27+SEE6)	all	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro	all w/o Serbia, Montenegro
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.62	0.64	0.55	0.61	0.52	0.79	0.95
Hansen test of overid. restrictions p-value	0.69	0.71	0.71	0.75	0.73	0.73	0.75	0.76
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.45	0.45	0.47	0.46	0.44	0.52	0.51
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.78	0.76	0.82	0.79	0.83	0.75	0.78

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.4. Voracity effects

3.4.2 Institutional, political and ideological factors

We start this subsection by the analysis of "deeper" systemic factors which reflect the design of the political or electoral system and are expected to have an impact on fiscal policy. These determinants are based on the relatively broad literature on the political economy of fiscal policy, which provides various theories and predictions regarding the effects of these factors on fiscal outcomes (e.g. Alesina and Perotti (1995) and Eslava (2006)).

As usual, in Table 3.5 below we start by repeating the baseline results in column 1. In the second column we add a dummy variable which equals one if most or all members of the legislature are elected by the plurality (majoritarian) electoral system and zero otherwise. We find that baseline results from before are robust, and the coefficient on the plurality dummy is highly significant, but negative, showing that plurality systems yield less disciplined fiscal policies, and column 3 shows that this effect is present in both old EU member states and particularly in South-eastern European countries. This result contradicts the literature on the political economy of budget deficits, which generally predicts that it is proportional electoral systems that usually result in less disciplined fiscal policy (Eslava, 2006). Such a prediction is explained by the fact that proportional systems usually yield coalition governments, where various parties are able to condition their entry or stay in the coalition with demands for higher spending. However, we already rejected that hypothesis for the entire sample when we controlled directly for the government concentration in the previous subsection. In particular, previously we found that higher government concentration leads to worse balances in old EU member states, so these results on the electoral system lend additional support to those findings of absence of voracity effects in EU countries. While we are unable to pinpoint the exact source of these results on the electoral system, we suspect they might be due to pork-barrel projects, when members of parliament elected by relatively narrow constituencies make pressure for higher government spending or lower taxes in their regions, aiming to boost their chances for re-election. Pork-barrel projects feature regularly in American politics, but these results indicate that the old EU member states and the South-eastern European countries employing this electoral system might not be entirely immune to this phenomenon.

Next we analyse the possible effects of the political system on fiscal policy by using a dummy variable that equals one for countries with presidential systems and zero otherwise (also based on WB DPI). In column 4 of Table 3.5 we find that previous baseline results (column 1) are unchanged and that countries with presidential systems have lower fiscal discipline. This is somewhat surprising, since it would be expected that executive power concentrated in a single person would yield more disciplined policies than the typical outcome of governments and parliaments consisted of several parties. However, this finding should be taken with caution for two reasons. First, in reality power is often not entirely concentrated in the president, but divided between the president and the legislature or the government. In those cases, the president can be viewed as one more power group, in which case these results lend some indirect support to the voracity theory. Second, our sample contains very few cases of presidential systems, mostly in new EU member states. This explains the result in column 5 that presidential systems are borderline significant only in NMS10 at just above 10%. More importantly, the low number of presidential systems in the sample cautions against generalisation of this result.

Finally, in the last two columns of Table 3.5 we analyse the effects of fiscal decentralisation in the 27 EU member states[48]. We present the results using expenditure decentralisation, defined as the share of local, regional and sub-state expenditures in total expenditures, whereas revenue decentralisation has no effect on fiscal outcomes both in the entire EU27 and in country groups (Appendix 3.4). According to results in column 6, expenditure decentralisation has a significantly positive effect on fiscal balances, while column 7 shows that this result is wholly driven by the old EU member states. However, the effect is relatively small, showing that a relatively large increase in the share of local, regional and sub-state government expenditures in total expenditures by 10 percentage points results in an improvement of the cyclically-adjusted primary budget balance-to-GDP ratio of only 0.2 percentage points. While there is no clear-cut *a priori* expectation on the expected sign of fiscal decentralisation, since in reality it can take various forms, there are two possible explanations for this finding. First, the central government could be imposing discipline on local and regional governments by limiting the amounts they could spend and borrow, at least in the part that is not defined by law or fixed by some other predetermined measure. Second, being held directly accountable by a smaller electorate, which can easily observe and pressure their behaviour, it is possible that local governments are themselves choosing to behave in a more fiscally responsible manner.

[48] Data on fiscal decentralization in EU27 are taken from Eurostat. There are no comparable data for South-eastern European countries.

Column:	1	2	3	4	5	6	7
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP						
lagged dependent variable	0.69***	0.68***	0.69***	0.69***	0.71***	0.70***	0.70***
	(0.07)	(0.08)	(0.08)	(0.07)	(0.08)	(0.09)	(0.09)
output gap, % of HP trend GDP	-0.15**	-0.15**	-0.16**	-0.15**	-0.17**	-0.17***	-0.18***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)
lagged public debt, % of nom. GDP	0.01*	0.01**	0.01	0.01*	0.00	0.01**	0.01
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)
inflation rate	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
dummy for Maastricht criteria (95-98)	0.66***	0.66***	0.53**	0.63***	-0.09	0.39**	0.33*
	(0.20)	(0.20)	(0.20)	(0.20)	(1.85)	(0.18)	(0.18)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.56***	-0.55**	-0.56***	-0.59**	-0.60**	-0.59**
	(0.20)	(0.20)	(0.20)	(0.20)	(0.22)	(0.25)	(0.24)
dummy for electoral system (1 if plurality)		-0.51***					
		(0.18)					
dummy for electoral system*EU17 interaction			-0.47***				
			(0.15)				
dummy for electoral system*NMS10 interaction			-0.21				
			(0.28)				
dummy for electoral system*SEE6 interaction			-1.04*				
			(0.52)				
dummy for political system (1 if presidential)				-0.35*			
				(0.19)			
dummy for political system*EU17 interaction					-10.37		
					(22.40)		
dummy for political system*NMS10 interaction					-0.38		
					(0.23)		
dummy for political system*SEE6 interaction					-0.03		
					(0.29)		
decentralisation of expenditures (local+regional +sub-national as % of total expenditures)						0.03**	
						(0.01)	
decentralisation of expenditures*EU17 interaction							0.02*
							(0.01)
decentralisation of expenditures*NMS10 interaction							0.05
							(0.04)
dummy for EU17			0.20		0.89		-0.57
			(0.42)		(2.21)		(0.54)
dummy for NMS10			-0.33		-0.18		-1.73
			(0.30)		(0.38)		(1.16)
dummy for SEE6			0.27		0.09		
			(0.30)		(0.36)		
constant	-0.23	-0.15		-0.15		-0.91*	
	(0.29)	(0.30)		(0.30)		(0.46)	
Observations	464	464	464	464	464	414	414
Number of instruments	20	21	25	21	25	21	23
Number of countries	33	33	33	33	33	27	27
Countries included (all=EU27+SEE6)	all	all	all	all	all	EU27	EU27
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.41	0.38	0.44	0.35	0.25	0.25
Hansen test of overid. restrictions p-value	0.69	0.68	0.68	0.70	0.74	0.52	0.53
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.39	0.37	0.42	0.42	0.23	0.23
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.81	0.85	0.80	0.89	0.84	0.88

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.5. Effects of the political and electoral system

In Table 3.6 below we analyse the effects of the level of democratisation and of control of corruption on fiscal outcomes. Although the investigation of their separate effects does not have a clear theoretical underpinning, our main goal is to check the idea put forward by Alesina and Tabellini (2005) for the existence of less disciplined and more pro-cyclical policies in "corrupt democracies" because of more severe political agency problems. After reproducing the previous baseline results in column 1, in the second column we introduce an indicator for the level of democratisation taken from the Polity IV database, which ranges from 0 to 10, rising with higher democratisation. We find that previous baseline results still hold, and that countries with a higher level of democratisation have more disciplined fiscal policy, while column 3 suggests that this result is entirely driven by old EU member states. This finding that more democratic countries have lower budget deficits indirectly supports the lack of strong voracity effects discussed before. Indeed, if there were voracity effects, we would expect them to be even stronger in more democratic countries, where power groups can exert more pressure on policies. Instead, we find an opposite, positive effect of democratisation. In the absence of any clear theory, we believe this is reflecting the impact of what can broadly be labelled "institutional quality", particularly the well established and transparent procedures of budget planning, adoption and implementation in more democratic countries. Further, we also check for the effects of control of corruption, as measured by the World Bank Governance Indicators 2010 (Kaufmann et al., 2010), where a higher score means lower corruption. Column 4 shows that countries with better control of corruption have lower budget deficits, while column 5 shows this effect is present in old EU member states and in South-eastern European countries. This finding is in line with *a priori* expectations, since control of corruption generally prevents the abuse of power for channelling public expenditures into private uses or for tax avoidance.

In the final two columns of Table 3.6 we check whether corrupt democracies have more pro-cyclical and less disciplined policies. In column 6 we add both measures for the level of democratisation and for control of corruption. However, it turns out that only control of corruption matters, while democratisation loses its significance when added alongside control of corruption. This change in results compared to specifications when they enter separately (columns 2 and 4) is probably related to the high positive correlation between them of 61%, reflecting the tendency of lower corruption levels in stronger democracies. In the last column we add an interaction term between democratisation and corruption, but results indicate lack of support for the idea that fiscal policy is less disciplined in "corrupt democracies", since the interaction term and the individual corruption and democratisation variables are all insignificant. Moreover, the size and significance of the output gap is virtually unchanged and the other coefficients are also quite robust. Altogether, these results indicate that both democratisation and the control of corruption improve fiscal discipline (when introduced separately), but there is no evidence that "corrupt democracies" are affecting the fiscal policy either directly or by changing its cyclical character, as originally predicted by Alesina and Tabellini (2005).

Column:	1	2	3	4	5	6	7
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP						
lagged dependent variable	0.69***	0.70***	0.70***	0.69***	0.66***	0.69***	0.69***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
output gap, % of HP trend GDP	-0.15**	-0.15**	-0.15**	-0.17***	-0.18***	-0.18***	-0.18***
	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
lagged public debt, % of nom. GDP	0.01*	0.01	0.00	0.01**	0.02***	0.01*	0.01*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
inflation rate	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
dummy for Maastricht criteria (95-98)	0.66***	0.57***	0.50**	0.57**	0.50**	0.55**	0.55**
	(0.20)	(0.18)	(0.18)	(0.26)	(0.24)	(0.26)	(0.26)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.59***	-0.60***	-0.61***	-0.59***	-0.63***	-0.63***
	(0.20)	(0.20)	(0.21)	(0.21)	(0.20)	(0.21)	(0.22)
democratisation (rise=higher democratisation)		0.29**				0.09	0.08
		(0.12)				(0.16)	(0.16)
democratisation * EU17 interaction			0.32*				
			(0.17)				
democratisation * NMS10 interaction			0.17				
			(0.14)				
democratisation * SEE6 interaction			0.59				
			(0.36)				
control of corruption (higher=less corruption)				0.38***		0.34*	0.41
				(0.14)		(0.18)	(1.27)
control of corruption * EU17 interaction					0.94***		
					(0.28)		
control of corruption * NMS10 interaction					0.54		
					(0.39)		
control of corruption * SEE6 interaction					1.86*		
					(0.92)		
democratisation * control of corruption interaction							-0.01
							(0.14)
dummy for EU17			-2.99*		-1.95***		
			(1.58)		(0.63)		
dummy for NMS10			-1.89		-0.88***		
			(1.31)		(0.28)		
dummy for SEE6			-4.81		0.18		
			(2.99)		(0.51)		
constant	-0.23	-2.86**		-0.61**		-1.38	-1.33
	(0.29)	(1.09)		(0.23)		(1.32)	(1.28)
Observations	464	458	458	448	448	442	442
Number of instruments	20	21	25	21	25	22	23
Number of countries	33	32	32	33	33	32	32
Countries included (all=EU27+SEE6)	all	all w/o Bosnia and Herz.	all w/o Bosnia and Herz.	all	all	all w/o Bosnia and Herz.	all w/o Bosnia and Herz.
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1996-2010	1996-2010	1996-2010	1996-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.31	0.29	0.63	0.66	0.51	0.52
Hansen test of overid. restrictions p-value	0.69	0.69	0.70	0.58	0.70	0.59	0.59
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.40	0.43	0.52	0.53	0.48	0.48
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.81	0.77	0.46	0.62	0.52	0.51

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.6. Effects of democratisation and control of corruption

In the last part of this subsection we analyse possible ideological effects on fiscal outcomes. In the absence of clear theoretical predictions, we do not have particular *a priori* expectations in this part. This also reflects the blurring of ideological divisions in recent years, as well as the constraints that economic developments and the crisis impose on policymaker actions, regardless of their ideological beliefs. Data for the ideological composition of the government cabinet and changes are taken from the Comparative Political Data Set III (Armingeon et al., 2011), and are available only for the EU27 member states until 2009. Nevertheless, baseline results for the entire sample in column 1 of Table 3.7 do not change when we restrict the sample to EU27 countries between 1995 and 2009 in column 2. We proceed by adding a variable on the ideological composition of the cabinet, ranging from 1 for hegemony of right and centre parties to 5 for hegemony of left parties. While this factor is insignificant in the entire EU27 in column 3, the next column shows that it is important in old EU member states, as higher dominance of left-wing parties results in more negative budget balances. In columns 5 and 6 we use a dummy variable to check whether changes in the ideological composition of government affect fiscal policy, regardless of the direction of change, but we fail to find any effect, either for all EU27, or for the two separate groups of member states. However, the final two columns show that what is important is precisely the direction of change. In column 7 we add the "ideological gap", defined as the difference between the old and the new ideological composition of government (positive if moving to the left), and find that it is insignificant in the entire sample of EU27 member states. However, the interaction of this variable with dummies for country groups in column 8 of Table 3.7 shows that the direction of ideological change was important in old EU member states, as changes to the left yield lower budget balances. This result corresponds to the previous findings – in old member states, both the ideological composition of the cabinet itself and the direction of change have a significant impact on policy, with left-dominated governments and changes to the left resulting in looser fiscal policy. On the other hand, the consistent absence of ideological effects in new member states can be explained by the fact that ideological definitions are less clear-cut in these countries, thus confirming similar findings by Lewis (2009). Certainly, political parties in NMS10 do define themselves along ideological lines, but the actual impact this has on fiscal policy is more blurred compared to the established democracies with longer traditions of ideological definitions of right-, centre- or left-oriented parties. This result on NMS10 should also be viewed in the light of economic policies being constrained by other factors related to the transition process, which are also discussed in the next subsection. In these circumstances, actual government policies often reflected the broad consensus across the political spectrum on key economic issues and thus trumped the self-described party ideological divisions.

Column:	1	2	3	4	5	6	7	8
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP							
lagged dependent variable	0.69***	0.68***	0.68***	0.68***	0.68***	0.68***	0.68***	0.69***
	(0.07)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)
output gap, % of HP trend GDP	-0.15**	-0.17**	-0.17**	-0.17***	-0.16**	-0.17***	-0.17**	-0.17***
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
lagged public debt, % of nom. GDP	0.01*	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
inflation rate	0.02***	0.02**	0.02**	0.02***	0.01**	0.02***	0.02**	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
dummy for Maastricht criteria (95-98)	0.66***	0.48**	0.48**	0.41**	0.48**	0.40**	0.45**	0.49**
	(0.20)	(0.19)	(0.19)	(0.20)	(0.19)	(0.18)	(0.18)	(0.21)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.63**	-0.62**	-0.63**	-0.65**	-0.65**	-0.62**	-0.66***
	(0.20)	(0.23)	(0.23)	(0.23)	(0.24)	(0.25)	(0.23)	(0.21)
ideological composition of cabinet (higher=left)			-0.03					
			(0.07)					
ideological composition * EU17 interaction				-0.12**				
				(0.05)				
ideological composition * NMS10 interaction				0.26				
				(0.17)				
dummy for change in ideological composition of cabinet					0.16			
					(0.26)			
dummy for ideological change * EU17 interaction						0.17		
						(0.21)		
dummy for ideological change * NMS10 interaction						0.12		
						(0.50)		
ideological gap between new and old cabinet (rise=moving left)							0.05	
							(0.21)	
ideological gap * EU17 interaction								-0.27**
								(0.11)
ideological gap * NMS10 interaction								0.63
								(0.41)
dummy for EU17				0.48		0.10		0.11
				(0.58)		(0.61)		(0.56)
dummy for NMS10				-0.99		-0.32		-0.35
				(0.59)		(0.39)		(0.38)
dummy for SEE6								
constant	-0.23	-0.20	-0.13		-0.25		-0.20	
	(0.29)	(0.44)	(0.50)		(0.44)		(0.45)	
Observations	464	387	386	386	387	387	385	385
Number of instruments	20	19	20	22	20	22	20	22
Number of countries	33	27	27	27	27	27	27	27
Countries included (all=EU27+SEE6)	all	EU27	EU27	EU27	EU27	EU27	EU27	EU27
Period (maximum per country)	1995-2010	1995-2009	1995-2009	1995-2009	1995-2009	1995-2009	1995-2009	1995-2009
Year dummies included (not shown)	2002-2010	2002-2009	2002-2009	2002-2009	2002-2009	2002-2009	2002-2009	2002-2009
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.23	0.24	0.26	0.25	0.25	0.25	0.34
Hansen test of overid. restrictions p-value	0.69	0.47	0.50	0.50	0.47	0.51	0.51	0.47
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.24	0.24	0.23	0.25	0.23	0.24	0.24
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.71	0.78	0.81	0.67	0.84	0.80	0.70

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.7. Effects of ideological composition of the government cabinet

3.4.3 Constraints on fiscal policy and effects of fiscal governance

In this subsection we investigate additional factors which might act as constraints on fiscal policy. We start by analysing the effects of IMF arrangements and of exchange rate regimes, and then we move to the effects of fiscal rules and fiscal governance on fiscal outcomes.

Several countries were using IMF arrangements in various years in the period analysed in our sample, whether for balance of payment support (IMF programmes) or for poverty reduction and other social goals (IMF loans). IMF arrangements featured particularly in the early transition years, when they not only supported external sustainability but were also used to enhance structural reforms. In addition, the recent crisis forced some countries to turn to IMF supported programmes again. The IMF imposes several conditions on macroeconomic and structural policies that must be met during the course of the arrangement in order for a country to be able to withdraw resources that were previously agreed (make a 'purchase' or have a 'loan disbursement' in IMF parlance). This is usually done not all at once but in tranches, which ensures that the country makes continuous progress in achieving the goals agreed.

We expected to find a relatively strong effect of relations with the IMF on fiscal policy, since most of the arrangements were IMF programmes designed to cope with balance of payment problems or external sustainability. This means that they regularly imposed relatively strong constraints on fiscal policy as one of the main tools of demand management, which was primarily aimed at limiting country's imports and foreign borrowing. Therefore, after reproducing previous baseline results in column 1 of Table 3.8 below, in the second column we introduce a dummy variable that equals 1 if a country had in place an IMF arrangement, and zero otherwise (taken from IMF Annual Reports). We fail to find any effect of this factor on fiscal policy, and this result obtains across all country groups (column 3).

This insignificance of IMF arrangements on fiscal outcomes is rather surprising bearing on mind the attention paid and constraints imposed on fiscal policy during their implementation. We suspected that the insignificance is due to the way of measurement of relations with the IMF. Indeed, there have been numerous cases when a country did have a programme or a loan arrangement with the IMF, but did not use it in reality, mostly because it did not have a need for doing so but chose to have an arrangement as a precautionary measure. In addition, there have also been cases when a country decided it was no longer willing to fulfil strict IMF requirements, and hence chose to proceed with implementing its own policies and foregoing IMF resources. Therefore, in column 4 we check for effects of *de facto* IMF arrangements measured by the actual use of IMF funds by member states by using data on purchases and loan disbursements (from the IMF International Financial Statistics) as a share of nominal GDP. This measure thus omits cases when countries did not need or decided they did not want IMF funds any more, and focuses on cases when they actually used IMF funds. In this case, IMF arrangements have the expected and statistically significant positive sign, showing that a 'purchase' or a 'loan' from the IMF in the amount of 1% of GDP results in an improvement of the cyclically-adjusted primary balance to GDP ratio by 0.5 percentage points (column 4). According to column 5, where we analyse the effects of actual use of IMF arrangements by country groups, this significant effect of actual IMF arrangements is present in all country groups and is particularly strong in old EU member states. We suspected that this surprising result on the part of old EU member states was driven by the huge use of IMF resources by Greece in 2010, which is the only case in our sample when IMF funds were actually used by any old EU member state[49]. Therefore, in column 6 we drop Greece in 2010 from our sample. This yields unchanged results from the previous column, except for the omission of the interaction term between IMF arrangements and the dummy for EU17 because of collinearity[50]. According to these results, the actual use of IMF resources had an important effect on disciplining fiscal policy in NMS10, and even more so in SEE6 countries.

Further, we were also interested whether the actual use of IMF funds has an impact on the cyclicality of fiscal policy. Therefore, a dummy was created to equal 1 if a country actually used IMF funds in a particular year (regardless of the amount), and zero otherwise. In column 7 of Table 3.8, we interact this dummy with the output gap, and again omit Greece in 2010 from the sample. The results show that the actual use of IMF resources significantly changed the cyclical character of fiscal policy. Indeed, fiscal policy becomes counter-cyclical in years when IMF resources are actually used (the interaction term is positive), but remains significantly pro-cyclical otherwise. The insignificance of the dummy on IMF resources in itself suggests that the disciplining effect of IMF arrangements on fiscal policy was taking place through the imposition of counter-cyclical discretionary policies. This is to be expected, since IMF programmes were often used in cases of balance of payment problems reflecting excessive

[49] Ireland also had an IMF programme, but it did not use it in reality, i.e. did not make any 'purchase' in the period analysed.

[50] This is to be expected as the interaction variable now equals zero all the time and is thus perfectly collinear with the group dummy for EU17.

domestic demand. In such circumstances, the fulfilment of IMF arrangements in reality required more restrictive fiscal policy in order to dampen cyclical movements and consequently the balance of payment pressures.

In analysing constraints on fiscal policy, we were also interested on the possible effect of the exchange rate regime. Therefore, in column 8 of Table 3.8 we introduce the IMF regime classification from IMF Annual Reports and von Hagen and Zhou (2005), while column 9 shows results of across country groups. However, we fail to find any effect of the exchange rate regime on fiscal policy outcomes, since the regime is insignificant both when analysing the entire sample and when analysing particular country groups.

Column:	1	2	3	4	5	6	7	8	9
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP								
lagged dependent variable	0.69***	0.70***	0.71***	0.69***	0.70***	0.70***	0.72***	0.71***	0.72***
	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)	(0.08)	(0.07)	(0.07)
output gap, % of HP trend GDP	-0.15**	-0.16**	-0.15**	-0.14*	-0.15*	-0.14*	-0.32**	-0.16**	-0.16**
	(0.07)	(0.06)	(0.06)	(0.08)	(0.08)	(0.08)	(0.12)	(0.07)	(0.07)
output gap * dummy for actual purchases & loans from IMF							0.62**		
							(0.23)		
lagged public debt, % of nom. GDP	0.01*	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
inflation rate	0.02***	0.02***	0.02***	0.01***	0.02***	0.02***	0.02	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
dummy for Maastricht criteria (95-98)	0.66***	0.63***	0.57***	0.66***	0.52**	0.51**	0.36	0.68***	0.44
	(0.20)	(0.19)	(0.20)	(0.22)	(0.23)	(0.24)	(0.31)	(0.19)	(0.27)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.56***	-0.58***	-0.51**	-0.48**	-0.48**	-0.48*	-0.57**	-0.57**
	(0.20)	(0.20)	(0.20)	(0.22)	(0.23)	(0.23)	(0.25)	(0.21)	(0.21)
dummy for program or loan with IMF		-0.21							
		(0.47)							
dummy for IMF program/loan * EU17 interaction			-7.46						
			(14.33)						
dummy for IMF program/loan * NMS10 interaction			-0.09						
			(0.66)						
dummy for IMF program/loan * SEE6 interaction			-0.49						
			(0.48)						
actual purchases & loans from IMF, share of nominal GDP				0.48**					
				(0.18)					
actual purchases & loans from IMF * EU17 interaction					1.13***				
					(0.30)				
actual purchases & loans from IMF * NMS10 interaction					0.30*	0.29*			
					(0.16)	(0.17)			
actual purchases & loans from IMF * SEE7 interaction					0.66***	0.64***			
					(0.18)	(0.19)			
dummy for actual purchase/loan taken from IMF							0.12		
							(0.87)		
exchange rate regime (higher=more flexibility)								-0.02	
								(0.05)	
exchange rate regime * EU17 interaction									0.05
									(0.08)
exchange rate regime * NMS10 interaction									-0.05
									(0.07)
exchange rate regime * SEE6 interaction									-0.05
									(0.04)
dummy for EU17			-0.03		0.27	0.18			-0.09
			(0.50)		(0.48)	(0.47)			(0.46)
dummy for NMS10			-0.42		-0.37	-0.44			-0.15
			(0.40)		(0.35)	(0.35)			(0.44)
dummy for SEE6			0.09		-0.02	-0.14			0.15
			(0.46)		(0.40)	(0.41)			(0.27)
constant	-0.23	-0.15		-0.23			0.00	-0.14	
	(0.29)	(0.31)		(0.33)			(0.37)	(0.36)	
Observations	464	464	464	464	464	463	463	464	464
Number of instruments	20	21	25	21	25	24	24	21	25
Number of countries	33	33	33	33	33	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all	all	all w/o Greece 2010		all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.45	0.54	0.50	0.47	0.45	0.19	0.53	0.53
Hansen test of overid. restrictions p-value	0.69	0.71	0.76	0.43	0.35	0.30	0.31	0.70	0.70
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.45	0.49	0.32	0.31	0.31	0.16	0.39	0.40
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.76	0.80	0.46	0.35	0.27	0.56	0.84	0.85

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.8. Effects of IMF arrangements and the exchange rate regime

Finally, in Table 3.9 we analyse the effects of fiscal rules and governance on fiscal policy outcomes. In this part, we use several synthetic indicators created by other authors and institutions as part of their research or work (which usually contains a more detailed measurement and analysis of various aspects of fiscal governance). To the best of our knowledge, there are no fiscal governance indicators for South-eastern European countries, which limits our investigation to the 27 EU member states. Therefore, after reproducing the baseline results for the entire sample in column 1 of Table 3.9, in column 2 we reproduce the baseline results on EU27, while in column 3 we add the standardised fiscal rule index of the European Commission. This indicator measures and aggregates the strength of fiscal rules according to their scope and impact on fiscal policy in various levels of government. Therefore, it shows the effect of fiscal rules imposed on the national level, which constrain fiscal policy beyond the wider Stability and Growth Pact. As expected, countries with stronger fiscal rules implement more disciplined fiscal policies (column 3). Column 4 indicates that fiscal rules have an equal effect in both strong and new member states. In addition, results in column 5 show that fiscal rules are having an independent effect, and are not affecting policy by changing its cyclical character, since the interaction term between the output gap and fiscal rules is insignificant, the coefficients on output gap and on fiscal rules are almost unchanged.

In the last two columns we investigate the effects of the type of fiscal governance. These indicators draw on the work by von Hagen (1992), Hallerberg and von Hagen (1999), Gleich (2003) and Fabrizio and Mody (2006). Broadly speaking, these authors measure various aspects of the institutional setup and the budgeting process to create two main fiscal governance types: delegation and contracts. In countries where delegation dominates, most of the authority on budget drafting and implementation is concentrated in a single person or institution (typically the finance minister or the prime minister), who tends to have a relatively strong discretionary power over other ministers. On the other hand, in countries with the 'contract' type, the budgetary process is usually much more subject to contracts and commitments by the government parties.

In practice, the two types of fiscal governance are not completely exclusive, so we add both indicators in column 6 of Table 3.9. We use indicators from Hallerberg et al. (2009) for old EU member states and Hallerberg and Yläoutinen (2010) for NMS10, and their availability shortens our sample to 1995-2007 for old and 1998-2007 for new EU member states[51]. Our findings suggest that the 'contract' type results in more disciplined policies, while the 'delegation' type has no impact on fiscal outcomes. However, results in column 7 indicate that there are significant differences across country groups regarding the effects of the type of fiscal governance. Indeed, the disciplining effect of the 'contract' type of fiscal governance is present only in NMS10, which could be explained by the fact that they tend to have coalition governments and are hence expected to adopt the 'contract' type of governance more often than old member states. On the other hand, the 'delegation' type of governance has a significantly negative effect on fiscal outcomes in old EU member states[52], which argues against the prevalent practice of vesting powers of budget drafting and implementation in one person in these countries.

[51] We are grateful to Mark Hallerberg for providing additional information on the data on fiscal governance.
[52] As in all other cases, discretionary policy remains pro-cyclical in this specification, but now at a significance level just above 10%.

Column:	1	2	3	4	5	6	7
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP						
lagged dependent variable	0.69***	0.70***	0.70***	0.71***	0.79***	0.53***	0.48***
	(0.07)	(0.09)	(0.09)	(0.09)	(0.08)	(0.10)	(0.11)
output gap, % of HP trend GDP	-0.15**	-0.16**	-0.17***	-0.17***	-0.14***	-0.12**	-0.11
	(0.07)	(0.06)	(0.06)	(0.06)	(0.04)	(0.05)	(0.07)
output gap * fiscal rules index interaction					-0.02		
					(0.09)		
lagged public debt, % of nom. GDP	0.01*	0.01**	0.02***	0.02***	0.01***	0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
inflation rate	0.02***	0.02***	0.02***	0.03***	0.03***	0.00	0.03
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.02)	(0.02)
dummy for Maastricht criteria (95-98)	0.66***	0.47**	0.48**	0.44*	0.49**	0.47**	0.01
	(0.20)	(0.18)	(0.20)	(0.22)	(0.18)	(0.20)	(0.23)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.60**	-0.66**	-0.65**	-0.75***	-0.45**	-0.36**
	(0.20)	(0.25)	(0.26)	(0.25)	(0.26)	(0.17)	(0.17)
fiscal rules index (higher=stronger rules)			0.55***		0.47***		
			(0.13)		(0.12)		
fiscal rules index * EU17 interaction				0.52***			
				(0.13)			
fiscal rules index * NMS10 interaction				0.61***			
				(0.22)			
delegation in fiscal governance						-0.99	
						(0.77)	
delegation * EU17 interaction							-2.49**
							(1.04)
delegation * NMS10 interaction							0.95
							(1.14)
contracts in fiscal governance						1.58***	
						(0.50)	
contracts * EU17 interaction							0.57
							(0.37)
contracts * NMS10 interaction							1.83**
							(0.84)
dummy for EU17				-0.48			2.24*
				(0.40)			(1.13)
dummy for NMS10				-0.63**			-1.17
				(0.28)			(0.78)
constant	-0.23	-0.27	-0.60**		-0.55*	0.08	
	(0.29)	(0.30)	(0.27)		(0.27)	(0.66)	
Observations	464	414	414	414	414	291	291
Number of instruments	20	20	21	23	24	19	22
Number of countries	33	27	27	27	27	25	25
Countries included (all=EU27+SEE6)	all	EU27	EU27	EU27	EU27	EU27 w/o Cyprus and Malta	EU27 w/o Cyprus and Malta
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2007	1995-2007
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2007	2002-2007
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.19	0.25	0.25	0.31	0.35	0.41
Hansen test of overid. restrictions p-value	0.69	0.47	0.51	0.51	0.54	0.63	0.35
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.22	0.24	0.24	0.29	0.77	0.70
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.76	0.79	0.81	0.72	0.36	0.16

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.9. Effects of fiscal rules and types of governance

3.5 Extensions and robustness checks

In this section we carry out several extensions and robustness checks. In order to keep our focus on the main issues and to streamline the discussion, we focus only on key issues of interest and limit our attention to the baseline specification on cyclicality from Eq. 18 (reproduced below), without the part of additional political, institutional and other variables in X_{it}. Similar to previous sections, diagnostic tests in this section indicate no serious problem with specification or the estimation method. The Arellano-Bond tests consistently indicate that there is first-order but not second-order autocorrelation. Further, p-values of the Hansen test of over-identifying restrictions do not approach unity, but in a few cases drop below 0.25, which is the lower bound of the range suggested by Roodman (2009b). In addition, in all cases the difference-in-Hansen tests of exogeneity of instrument subsets do not reject the validity of GMM instruments for levels, i.e. there is no preference for difference GMM over system GMM. The difference-in-Hansen test also indicates that in all cases the "steady state" assumption required for system GMM is fulfilled, and that there is no problem with error cross-section dependence (Sarafidis et al., 2009).

$$Bal_{it} = \alpha + \beta Cycle_{it} + \gamma Debt_{it-1} + \delta Bal_{it-1} + \omega Infl_{it} + \theta X_{it} + \varepsilon_{it} \qquad \text{Eq. 18}$$

where:

- *Bal* - budget balance (total or primary, unadjusted or cyclically-adjusted) as a share of nominal GDP
- *Cycle* - indicator for cyclical movements of the economy (output gap)
- *Debt* - public debt as a share of GDP
- *Infl* - inflation rate
- *X* - *1 x m* vector of additional explanatory variables (economic, political, institutional)
- *Θ* - corresponding *n x 1* vector of coefficients of additional explanatory variables

3.5.1 Sources and asymmetries in the cyclicality of discretionary fiscal policy

First, in Table 3.10 below we analyse the sources of cyclicality, i.e. whether the particular cyclical character of fiscal policy is a result of cyclically-adjusted revenues or of primary expenditures. Therefore, in the first column we reproduce baseline results, with the cyclically-adjusted primary balance as the dependent variable, while in the next two columns we use the same specification to check for the cyclical character of cyclically-adjusted revenues and primary expenditures in the entire sample. Some of the findings are expected and in line with baseline results: there is considerable inertia in revenues and particularly expenditures, and election years result in lower revenues and higher expenditures, indicating heavy use of fiscal policy to affect election outcomes in the entire sample. However, in the light of the significantly negative output gap indicating pro-cyclical policy in column 1 (i.e. lower balance in expansions and higher balance in recessions), it is surprising that the output gap is insignificant in both the revenue and expenditure equations in columns 2 and 3. This result means that both discretionary revenues and expenditures were a-cyclical, although it should be noted that in column 3 revenues are borderline pro-cyclical at a significance level of 12% (lower revenues in expansions).

Therefore, we delve into this issue further. In column 4 of Table 3.10 we reproduce the analysis of the cyclically-adjusted primary balance by country groups, while in columns 5 and 6 we do the same for cyclically-adjusted revenues and primary expenditures. The findings confirm our suspicion that there are significant differences in the cyclical character of revenues and expenditures between country groups, which explains the somewhat confusing result from the first 3 columns. Indeed, the significant negative output gap on both revenues and expenditures for old EU member states in columns 5 and 6 shows that revenues were pro-cyclical (falling in expansions and rising in recessions), while expenditures were counter-cyclical (falling in expansions and rising in recessions). These effects offset each other, thus yielding an a-cyclical discretionary fiscal policy, as indicated by the insignificant effect of the output gap on cyclically-adjusted balances for these countries in column 4. On the other hand, the pro-cyclical policy in NMS10 from column 4 is completely explained by pro-cyclical revenues in column 5 (falling in expansions and rising in recessions), while the insignificant output gap for these countries in the expenditure equation in column 6 shows they were a-cyclical. Further, results for SEE6 are not clear cut. On the one hand, the significant negative output gap indicates strongly pro-cyclical discretionary policy in these countries in column 4 (lower surplus in expansions and higher surplus in recessions). On the other hand, both revenues and expenditures are a-cyclical, as the output gap in these countries in columns 5 and 6 is insignificant. However, the output gap in the expenditure equation is significant only at a level of 15%, indicating that pro-cyclicality in South-eastern European countries is probably driven by expenditures, which rise in expansions and fall in recessions.

Finally, in the last two columns we also investigate the finding that, in the entire sample, elections cause falling revenues and rising expenditures (columns 2 and 3). Interacting election years with country group dummies in columns 7 and 8 shows that these results are completely driven by old EU member states. In this group, in election years, policy-makers try to affect their chances of re-election by lowering revenues (presumably by lowering taxes or offering tax-credits) and particularly by increasing expenditures. On the other hand, there is no such effect in transition countries, which is somewhat surprising since governing parties in these countries are almost regularly accused of heavy spending in election years. Nevertheless, these results are in line with findings in previous sections. In particular, they confirm previous results from Table 3.3 that elections have an important negative effect only in old EU member states. In addition, they are in line with findings in Subsection 3.4.1 that plurality electoral systems have a negative effect on fiscal policy in old EU member states. There we suspected that this might reflect the presence of pork-barrel projects, which is indirectly confirmed with the finding of higher spending in election years in old EU member states in column 8 of Table 3.10.

Column:	1	2	3	4	5	6	7	8
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nom. GDP	Cyclically-adjusted revenues (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary expenditures (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary balance (HP trend GDP), % of nom. GDP	Cyclically-adjusted revenues (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary expenditures (HP trend GDP), % of nom. GDP	Cyclically-adjusted revenues (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary expenditures (HP trend GDP), % of nom. GDP
lagged dependent variable	0.69***	0.55*	0.74***	0.70***	0.89***	0.59***	0.33	0.70***
	(0.07)	(0.30)	(0.26)	(0.07)	(0.16)	(0.15)	(0.32)	(0.22)
output gap, % of HP trend GDP	-0.15**	-0.19	-0.06				-0.26**	-0.11
	(0.07)	(0.12)	(0.09)				(0.11)	(0.08)
output gap*EU17 interaction				0.02	-0.20***	-0.41***		
				(0.12)	(0.07)	(0.12)		
output gap*NMS10 interaction				-0.18***	-0.17***	-0.12		
				(0.04)	(0.06)	(0.08)		
output gap*SEE6 interaction				-0.27***	-0.12	0.21		
				(0.06)	(0.52)	(0.14)		
lagged public debt, % of nom. GDP	0.01*	0.02	0.01	0.00	0.00	0.01	0.02	0.00
	(0.00)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
inflation rate	0.02***	-0.06*	-0.03	0.02***	0.00	-0.03***	-0.04**	-0.02
	(0.01)	(0.03)	(0.02)	(0.00)	(0.02)	(0.01)	(0.02)	(0.01)
dummy for Maastricht criteria (95-98)	0.66***	0.78	-0.19	0.83**	-0.10	-0.52	0.98	-0.03
	(0.20)	(0.74)	(0.73)	(0.35)	(0.33)	(0.47)	(0.73)	(0.62)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.32**	0.42***	-0.49**	-0.23	0.50***		
	(0.20)	(0.15)	(0.15)	(0.19)	(0.20)	(0.17)		
elections*EU17 interaction							-0.25*	0.50***
							(0.13)	(0.11)
elections*NMS10 interaction							-0.36	0.25
							(0.31)	(0.59)
elections*SEE6 interaction							-0.42	0.43
							(0.63)	(0.43)
dummy for EU17				0.21	4.64	16.97***	28.52**	12.68
				(0.48)	(6.87)	(5.86)	(13.43)	(9.15)
dummy for NMS10				-0.17	4.04	15.49**	25.47**	11.67
				(0.25)	(6.28)	(5.83)	(11.67)	(8.79)
dummy for SEE6				0.37	3.72	13.11**	25.22**	10.47
				(0.29)	(5.90)	(5.03)	(11.74)	(8.23)
constant	-0.23	17.71	10.12					
	(0.29)	(11.45)	(10.40)					
Observations	464	484	465	464	484	465	484	465
Number of instruments	20	22	20	28	30	28	26	26
Number of countries	33	33	33	33	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.04	0.04	0.00	0.00	0.03	0.25	0.04
Arellano-Bond test for AR(2) in differences	0.45	0.35	0.66	0.63	0.26	0.72	0.43	0.68
Hansen test of overid. restrictions p-value	0.69	0.16	0.33	0.85	0.19	0.54	0.41	0.38
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.26	0.40	0.58	0.34	0.20	0.28	0.35
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.13	0.25	0.88	0.14	0.92	0.59	0.38

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable (but 1/4 in columns 2, 5, 7 and 8) and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.10. The cyclical character of revenues and expenditures

We also wanted to check for asymmetries in the cyclical character of fiscal policy, i.e. whether policy-makers react differently to cyclical movements in expansions and recessions. Therefore, after reproducing the baseline results on cyclically-adjusted primary balances in the first column, in Table 3.11 below we report the results from the interaction of the output gap with dummy variables for expansions and recessions (defined as ones in cases of positive and negative output gap, respectively, and zero otherwise). According to results in the second column, there was considerable asymmetry in fiscal policy reactions. In expansions, policy-makers were reacting pro-cyclically by reducing budget balances (significantly negative coefficient on the output gap), while the reaction in recessions was a-cyclical. In the next two columns we check whether this reaction is dominated by revenues or primary expenditures. According to column 3, there is no particular asymmetry in revenues, i.e. the insignificant output gap interaction terms show revenues were a-cyclical in both expansions and recessions, which fits with the previous finding that revenues in the entire sample were a-cyclical (column 2 of Table 3.10). However, results in column 4 of Table 3.11 indicate that fiscal policy asymmetry was in fact a reflection of asymmetric reaction of expenditures. The significantly positive interaction term for expansions indicates that they resulted in policy-makers feeling comfortable about the effects and length of the boom, and hence were reacting by increasing expenditures, which amounts to pro-cyclical policy. On the other hand, the interaction term for recessions is negative and borderline significant (p=0.12), which means that they were reacting in a borderline counter-cyclical manner by increasing expenditures in recessions. Overall, these results mean that policy-makers tend to increase expenditures regardless of cyclical output movements. This might also explain the previous finding of a-cyclical expenditures in column 3 of Table 3.10, which might reflect the offseting effects of pro-cyclical expenditures in expansions and (borderline) counter-cyclical expenditures in recessions.

Columns	1	2	3	4
Dependant variable	Cyclically-adjusted primary balance (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary balance (HP trend GDP), % of nom. GDP	Cyclically-adjusted revenues (HP trend GDP), % of nom. GDP	Cyclically-adjusted primary expenditures (HP trend GDP), % of nom. GDP
lagged dependant variable	0.69***	0.72***	0.49*	0.43
	(0.07)	(0.08)	(0.28)	(0.32)
output gap, % of HP trend GDP	-0.15**			
	(0.07)			
output gap*expansions interaction		-0.54***	-0.07	0.30*
		(0.13)	(0.14)	(0.15)
output gap*recessions interaction		0.13	-0.35	-0.49
		(0.25)	(0.27)	(0.30)
lagged public debt, % of nom. GDP	0.01*	-0.00	0.03	0.03*
	(0.00)	(0.01)	(0.03)	(0.01)
inflation rate	0.02***	0.02**	-0.06***	-0.05
	(0.01)	(0.01)	(0.02)	(0.03)
dummy for Maastricht criteria (95-98)	0.66***	0.65***	0.89	0.37
	(0.20)	(0.24)	(0.80)	(1.05)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.61***	-0.35**	0.44***
	(0.20)	(0.22)	(0.16)	(0.15)
dummy for expansions		1.05**	19.83*	20.92
		(0.49)	(10.47)	(12.57)
dummy for recessions		0.78	19.84*	21.14*
		(0.66)	(10.13)	(12.42)
constant	-0.23			
	(0.29)			
Observations	464	464	484	465
Number of instruments	20	24	26	24
Number of countries	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.04	0.09
Arellano-Bond test for AR(2) in differences	0.45	0.56	0.45	0.67
Hansen test of overid. restrictions p-value	0.69	0.66	0.26	0.66
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.40	0.30	0.41
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.75	0.26	0.74

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable (1/4 in column 3) and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.11. Asymetries in discretionary fiscal policy

3.5.2 Sample splits and the effects of crisis

In Table 3.12, we analyse the robustness of the baseline results (reproduced in column 1) to sample splits at various points. First, we analyse possible effects of the introduction of the euro, so in column 2 we limit our sample to start in 1999. Key results do not change compared to the baseline. Indeed, discretionary policy in the entire sample is still highly inertial and quite pro-cyclical (i.e. the output gap is negative), elections have a significant negative impact on fiscal discipline, while the coefficient on debt maintains the very small size from before, although it is now insignificant. The main change is related to inflation, which is again estimated at the same size, but becomes insignificant when the first four years are dropped. We suspect that this is related to the significant adjustment in the early years, when some transition countries were still fighting with high inflation, while future euro area members were bringing down inflation in their efforts to meet the Maastricht entrance criteria. Indeed, in the baseline (column 1) we control for euro run-up effects with a dummy variable that equals 1 for original euro area members between 1995 and 1998 and 0 otherwise, but this variable drops out from column 2 because of the sample shortening.

We proceed by analysing the baseline results on cyclicality in particular country groups, which are reproduced in column 3. We are interested whether they are robust to splitting the sample in 2004, which corresponds to the largest EU-enlargement. This sub-sample analysis, which splits the entire sample almost in half (9 and 7 years, respectively), is presented in the last two columns of Table 3.12 and it yields some important insights. According to these results, the cyclical character in EU17 and in SEE6 did not change before and after 2004. In the old EU member states, the insignificant output gap indicates that discretionary policy was a-cyclical in both sub-samples, while the negative output gap for SEE6 means it was pro-cyclical all the time (albeit a bit less so in the latter years). However, there is a considerable change for the new EU member states. In this group, the pro-cyclicality in the entire period (column 3) is driven by the latter years, when the output gap is significantly negative (column 5), while discretionary policy before 2004 was a-cyclical, as indicated by the insignificant output gap in column 4. Indeed, these results indicate that, once in the EU, policy-makers in these countries felt less pressured to implement disciplined fiscal policies, so the character of fiscal policy shifted from a-cyclical to pro-cyclical.

Column:	1	2	3	4	5
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP				
lagged dependent variable	0.69***	0.71***	0.70***	0.56***	0.75***
	(0.07)	(0.09)	(0.07)	(0.12)	(0.07)
output gap, % of HP trend GDP	-0.15**	-0.17**			
	(0.07)	(0.06)			
output gap*EU17 interaction			0.02	-0.03	0.03
			(0.12)	(0.10)	(0.17)
output gap*NMS10 interaction			-0.18***	-0.02	-0.27***
			(0.04)	(0.12)	(0.07)
output gap*SEE6 interaction			-0.27***	-0.66**	-0.48***
			(0.06)	(0.26)	(0.12)
lagged public debt, % of nom. GDP	0.01*	0.00	0.00	0.01	0.00
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
inflation rate	0.02***	-0.02	0.02***	0.02***	0.07
	(0.01)	(0.02)	(0.00)	(0.01)	(0.07)
dummy for Maastricht criteria (95-98)	0.66***		0.83**	1.31*	
	(0.20)		(0.35)	(0.73)	
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.69***	-0.49**	-0.30	-0.41
	(0.20)	(0.20)	(0.19)	(0.28)	(0.31)
dummy for EU17			0.21	-0.60	-0.49
			(0.48)	(1.01)	(0.68)
dummy for NMS10			-0.17	-1.28	-0.33
			(0.25)	(0.96)	(0.53)
dummy for SEE6			0.37	-2.22	0.23
			(0.29)	(1.34)	(0.54)
constant	-0.23	0.18			
	(0.29)	(0.33)			
Observations	464	372	464	236	228
Number of instruments	20	19	28	28	25
Number of countries	33	33	33	31	33
Countries included (all=EU27+SEE6)	all	all	all	all w/o Bosnia and Serbia	all
Period (maximum per country)	1995-2010	1999-2010	1995-2010	1995-2003	2004-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	1995-2003	2004-2010
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.01	0.00
Arellano-Bond test for AR(2) in differences	0.45	0.47	0.63	0.75	0.81
Hansen test of overid. restrictions p-value	0.69	0.81	0.85	0.50	0.73
GMM instruments for levels: Hansen test excluding group p-value	0.42	0.71	0.58	0.42	0.31
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78	0.63	0.88	0.49	0.98

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.12. Robustness to sample splits

We continue robustness checks related to sample splits by returning to the puzzling results in Section 3.3. For ease of comparison, baseline results on overall and discretionary fiscal policy by country groups from Table 3.3 are reproduced in the first two columns of Table 3.13, and now we show the year dummies. The puzzle is related to the a-cyclicality of both discretionary and overall policy in old EU member states (insignificant output gap in these countries in the first two columns), which indicates that automatic stabilizers were not effective in shifting the a-cyclical discretionary policy towards a counter-cyclical overall fiscal policy. Our suspicion that this effect might be driven by crisis years is supported by the highly significant negative year dummies in the recent years in the first two columns, indicating that both discretionary and overall balances were more negative during the crisis. Therefore, we decided to omit 2009 and 2010 from the sample in order to isolate the cyclical character in 'normal' years. Results for discretionary and overall policy for the shorter sample in country groups are shown in columns 3 and 4. Omitting 2009 and 2010 does not affect results for NMS10 and SEE6, since in these countries discretionary policy is again pro-cyclical (negative output gap indicating balances worsen in expansions and improve in recessions), while overall policy in these countries is a-cyclical, indicating that automatic stabilisers were effective in offsetting the pro-cyclical discretionary policy. However, there are significant differences in old EU member states. Omitting the crisis years again results in a-cyclical discretionary policy, but the significantly positive output gap in the last column indicates that overall policy was indeed counter-cyclical, i.e. balances were rising in expansions and falling in recessions. This result is in accordance with expectations, as it indicates that, in 'normal' times, automatic stabilizers are effective in old EU member states as well, since they move the a-cyclical discretionary policy into a counter-cyclical overall policy. Overall, this result indicates that the crisis did affect the effectiveness of automatic stabilizers in old EU member states (effective in 'normal' times but not in crisis years), whereas no such change can be detected in the two groups of transition countries, where stabilizers are effective throughout the period.

Column:	1	2	3	4
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP	Overall, unadjusted primary balance, % of nominal GDP	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP	Overall, unadjusted primary balance, % of nominal GDP
lagged dependent variable	0.70***	0.72***	0.66***	0.63***
	(0.07)	(0.08)	(0.09)	(0.14)
output gap*EU17 interaction	0.02	0.18	0.13	0.43**
	(0.12)	(0.13)	(0.12)	(0.17)
output gap*NMS10 interaction	-0.18***	-0.02	-0.13***	0.03
	(0.04)	(0.04)	(0.05)	(0.05)
output gap*SEE6 interaction	-0.27***	0.01	-0.38***	-0.12
	(0.06)	(0.06)	(0.10)	(0.12)
lagged public debt, % of nom. GDP	0.00	-0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
inflation rate	0.02***	0.01**	0.02***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
dummy for Maastricht criteria (95-98)	0.83**	0.85**	0.83**	1.03***
	(0.35)	(0.39)	(0.34)	(0.37)
dummy for parliamentary elections (1 if elections held in that year)	-0.49**	-0.51**	-0.39*	-0.46**
	(0.19)	(0.22)	(0.21)	(0.23)
dummy for 2002	-0.62	-0.69*	-0.43	-0.63
	(0.38)	(0.39)	(0.44)	(0.47)
dummy for 2003	-0.23	-0.44	-0.13	-0.28
	(0.26)	(0.28)	(0.38)	(0.44)
dummy for 2004	-0.13	-0.07	-0.08	0.11
	(0.31)	(0.32)	(0.48)	(0.52)
dummy for 2005	0.19	0.27	0.24	0.31
	(0.31)	(0.36)	(0.40)	(0.48)
dummy for 2006	-0.17	0.05	-0.16	0.08
	(0.25)	(0.26)	(0.40)	(0.44)
dummy for 2007	0.13	0.17	-0.15	0.04
	(0.44)	(0.47)	(0.57)	(0.63)
dummy for 2008	-1.29***	-2.09***	-1.45***	-1.95***
	(0.41)	(0.41)	(0.47)	(0.65)
dummy for 2009	-2.15***	-4.30***		
	(0.45)	(0.46)		
dummy for 2010	-0.58*	-0.43		
	(0.34)	(0.56)		
dummy for EU17	0.21	0.47	0.08	0.07
	(0.48)	(0.56)	(0.69)	(0.83)
dummy for NMS10	-0.17	0.16	-0.42	-0.31
	(0.25)	(0.35)	(0.42)	(0.52)
dummy for SEE6	0.37	0.53	0.23	0.13
	(0.29)	(0.33)	(0.75)	(0.96)
Observations	464	467	399	402
Number of instruments	28	28	26	26
Number of countries	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2008	1995-2008
Year dummies included (not shown)	2002-2010	2002-2010	2002-2008	2002-2008
p-value for F-statistics, joint significance test	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(1) in differences	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in differences	0.63	0.54	0.93	0.74
Hansen test of overid. restrictions p-value	0.85	0.58	0.16	0.11
GMM instruments for levels: Hansen test excluding group p-value	0.58	0.30	0.16	0.13
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.88	0.80	0.27	0.20

Source: Author's estimations.

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used.

Table 3.13. Effects of the crisis

3.5.3 Jack-knifing

In this subsection, we further analyse the robustness of baseline results on cyclicality for the entire sample and across country groups. In particular, we use the jack-knifing procedure to analyse whether our results are driven by any particular country. According to the Stata reference manual, the jack-knife is a relatively old method

> "…to produce an alternative, first-order unbiased estimator for a statistic; a data-dependent way to calculate the standard error of the statistic and to obtain significance levels and confidence intervals; and a way of producing measures called pseudo-values for each observation, reflecting the observation's influence on the overall statistic." (StataCorp, 2009, p. 793).

In the context of our analysis, jack-knifing is used to calculate pseudo-coefficients when omitting one country at a time and re-estimating using the same specification and time period. This yields *N* such pseudo-coefficients for each variable in an estimation (33 for the entire sample in our case), as well as the accompanying standard errors. Then, the "mean of the pseudo-values is the alternative, first-order unbiased estimator…, and the standard error of the mean of the pseudo-values is an estimator for the standard error" (StataCorp, 2009, p. 794). In effect, this means that the jack-knifing produces several outputs that can be useful in distinguishing whether a particular country is driving the results.

First, in Table 3.14 we start by reproducing the baseline results on cyclicality in the entire sample in column 1, while in the second column we report the results from the jack-knifing procedure[53]. In line with the description of the procedure above, jack-knifing does not change the coefficient estimates, but it does calculate other standard errors. However, the standard errors are not too different from those in the baseline, meaning that the key variables maintain their significance. The only exception is debt, which is now insignificant (a change in p-value from 0.07 to 0.2). Further, in columns 3 and 4 we repeat the same procedure with the baseline results on the cyclical character of fiscal policy in different country groups. Again, baseline results on the cyclicality of discretionary policy across country groups are quite robust, since jack-knifing does not affect the significance of the interaction between country dummies and the output gap.

[53] The estimation output from jack-knifing in Stata does not report any additional information beyond the ones reported in Table 3.14.

Column:	1	2	3	4
Estimation:	Baseline	Jack-knifed standard errors	Baseline	Jack-knifed standard errors
Dependent variable:	Cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP			
lagged dependent variable	0.69***	0.69***	0.70***	0.70***
	(0.07)	(0.08)	(0.07)	(0.1)
output gap, % of HP trend GDP	-0.15**	-0.15**		
	(0.07)	(0.07)		
output gap*EU17 interaction			0.02	0.02
			(0.12)	(0.23)
output gap*NMS10 interaction			-0.18***	-0.18***
			(0.04)	(0.07)
output gap*SEE6 interaction			-0.27***	-0.27***
			(0.06)	(0.1)
lagged public debt, % of nom. GDP	0.01*	0.01	0.00	0.00
	(0.00)	(0.01)	(0.01)	(0.01)
inflation rate	0.02***	0.02***	0.02***	0.02
	(0.01)	(0.01)	(0.00)	(0.04)
dummy for Maastricht criteria (95-98)	0.66***	0.66***	0.83**	0.83*
	(0.20)	(0.24)	(0.35)	(0.45)
dummy for parliamentary elections (1 if elections held in that year)	-0.56***	-0.56***	-0.49**	-0.49*
	(0.20)	(0.21)	(0.19)	(0.26)
dummy for EU17			0.21	0.21
			(0.48)	(0.64)
dummy for NMS10			-0.17	-0.17
			(0.25)	(0.33)
dummy for SEE6			0.37	0.37
			(0.29)	(0.37)
constant	-0.23	-0.23		
	(0.29)	(0.37)		
Observations	464	464	464	464
Number of instruments	20		28	
Number of countries	33	33	33	33
Countries included (all=EU27+SEE6)	all	all	all	all
Period (maximum per country)	1995-2010	1995-2010	1995-2010	1995-2010
Year dummies included (not shown)	2002-2010	2002-2010	2002-2010	2002-2010
p-value for F-statistics, joint significance test	0.00		0.00	
Arellano-Bond test for AR(1) in differences	0.00		0.00	
Arellano-Bond test for AR(2) in differences	0.45		0.63	
Hansen test of overid. restrictions p-value	0.69		0.85	
GMM instruments for levels: Hansen test excluding group p-value	0.42		0.58	
GMM instruments for levels: Diff-in-Hansen test of exogeneity of instruments p-value	0.78		0.88	

Source: Author's estimations.

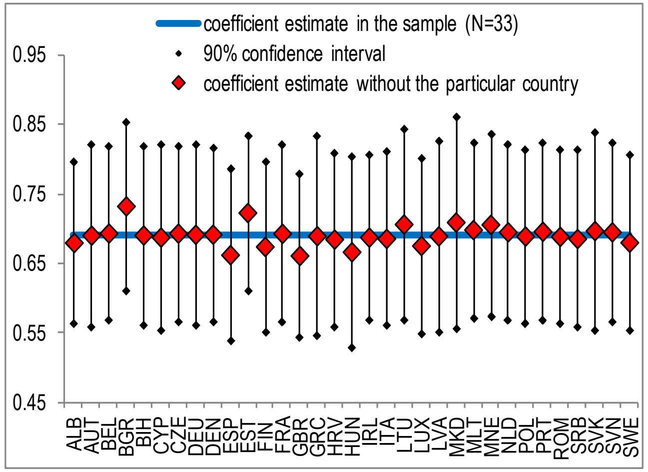
Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Internal instruments are used for endogenous variables (the lagged dependent variable and the output gap). Lag limits are 1/2 for the lagged dependent variable and 2/3 for the output gap. The 'collapse' option is always used. The estimation output from jack-knife in Stata does not report any information beyond the ones reported above.

Table 3.14. Jack-knifing of baseline results for cyclicality in the entire sample and for cyclicality across country groups

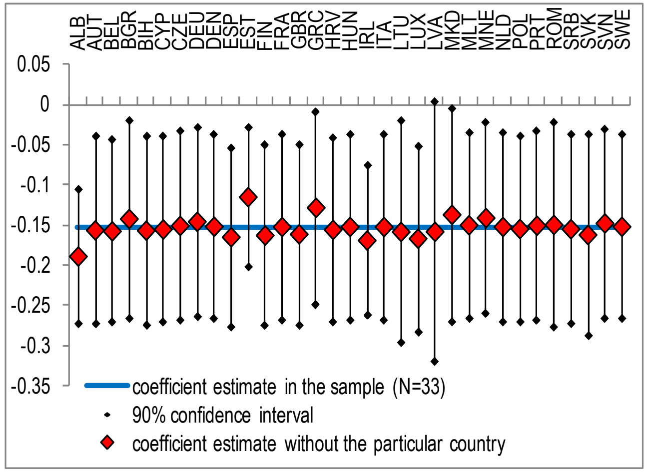
Despite the fact that the coefficients are very robust, we decided to check further for the effect of particular countries by analysing the pseudo-values in more detail. Therefore, in Figure 3.2 we report the pseudo-values for each variable in the baseline estimation of discretionary policy in the entire sample (column 2 in Table 3.14). These graphs contain the pseudo-coefficient of each variable if a particular country is dropped from the sample (the big diamonds), but also the 90% confidence interval for the pseudo-coefficient by using the jack-knifed standard error (the vertical lines) and the point estimate for each coefficient when the entire sample is used without dropping any country (the horizontal line). Panel (a) shows that the coefficient on lagged fiscal policy is very robust to dropping any country from the sample, since all pseudo-coefficients are close to the point estimate for the entire sample and significant, as the confidence intervals are far from zero. According to panel (b), the negative coefficient on the output gap indicating pro-cyclicality is also quote robust, as in most cases the pseudo-coefficients are close to the point estimate for the entire sample. However, there are a few countries whose omission would cause the confidence interval to just about cross the zero line, meaning that the output gap coefficient in those cases would be still be significant, but only at just above 10%. Further, in panel (c), the confidence interval on the debt coefficient in several cases does not include the zero line, indicating that there are several countries whose omission would result in the coefficient on debt becoming significant at 10% (contrasting with insignificance in the baseline results). However, in all cases the pseudo-coefficients on the debt coefficient are close to the estimate for the entire sample and remain very small. Panels (d) and (e) show that baseline results on elections and Maastricht criteria are quite robust. Indeed, all pseudo-coefficients are close to the baseline estimate for the entire sample, and the omission of any country would still not change their significance, as confidence intervals never cross the zero line. On the other hand, panel (f) indicates that pseudo-coefficients on inflation are significant and very close to the baseline estimate when dropping any country except Romania. Indeed, the wide confidence interval that includes zero when dropping Romania indicates that it is in fact driving the significance of this variable, as omitting Romania would make inflation insignificant. We suspect that this reflects the continuously high inflation in Romania, which has the highest average inflation in the sample of 31.3% between 1995 and 2010.

In Figure 3.3 we perform a similar check on baseline results of the cyclicality of discretionary policy across country groups (column 4 in Table 3.14). Panel (a) shows that the observed a-cyclical discretionary policy in old EU member states is entirely driven by Greece. Indeed, dropping Greece has substantial effects, as the pseudo-coefficient of the output gap shifts from 0.02 to 0.22 and becomes highly significant. Therefore, if we dropped Greece from our sample, we would find counter-cyclical discretionary policy in old EU member states instead of a-cyclical as in baseline. On the other hand, the omission of any other country yields pseudo-coefficients that are fairly close to the baseline point estimate, and they are all insignificant since the 90% confidence interval includes the zero line, thus supporting the baseline finding of a-cyclical discretionary policy in old EU member states. Further, panels (b) and (c) of Figure 3.3 show that pro-cyclicality in the two groups of transition countries is quite robust. Indeed, fiscal policy in NMS10 and SEE6 remains significantly pro-cyclical if any country is omitted, since confidence intervals never cross the zero line. However, in a few cases, omitting particular countries does have some impact on the coefficient size.

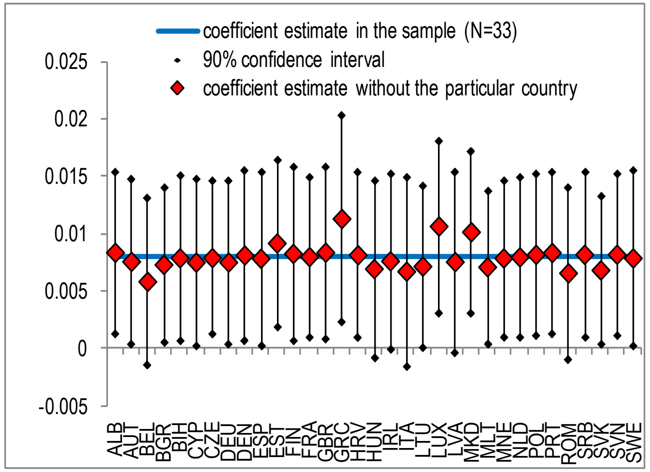
In light of these findings, we also check whether there is some other country driving the results on cyclicality across country groups if we first drop Greece. However, no other country has such an impact. Panel (d) of Figure 3.3 shows that the coefficient estimate for old EU member states when dropping any additional country moves around the point estimate from the sample that only omits Greece, while confidence intervals above zero also show that discretionary policy is counter-cyclical in all cases. As expected, robustness is also maintained for transition countries in panels (e) and (f) when dropping any additional country besides Greece.



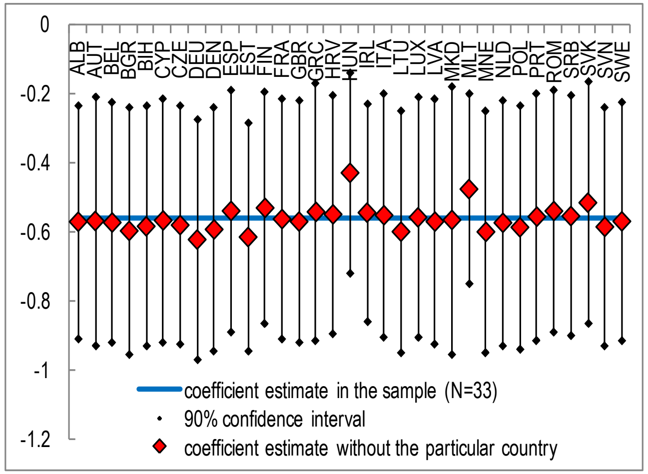
a. lagged dependent variable



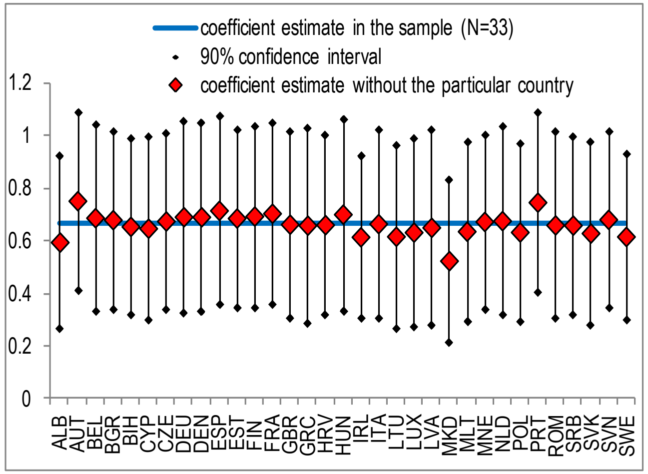
b. output gap



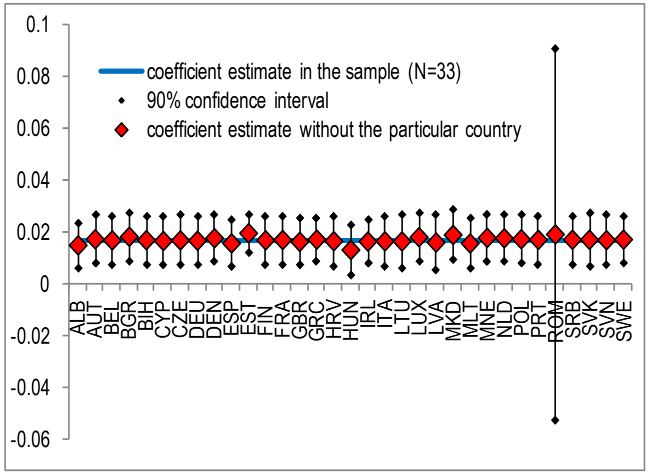
c. lagged debt to GDP ratio



d. election dummy

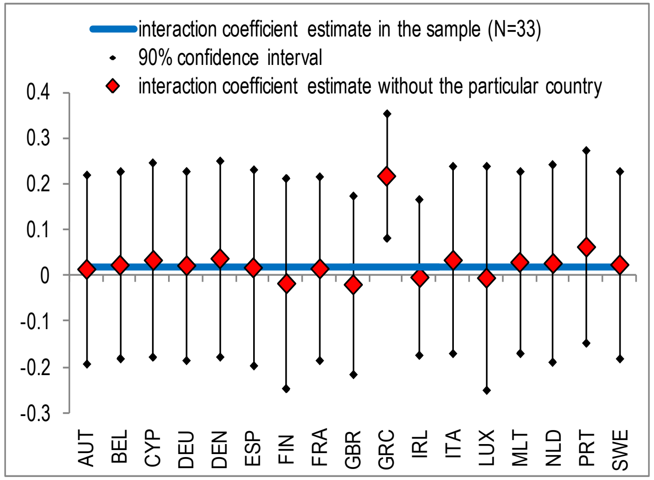


e. Maastricht criteria

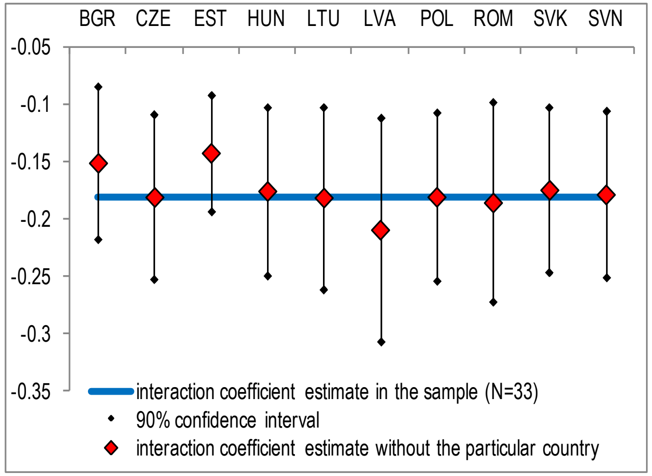


f. inflation

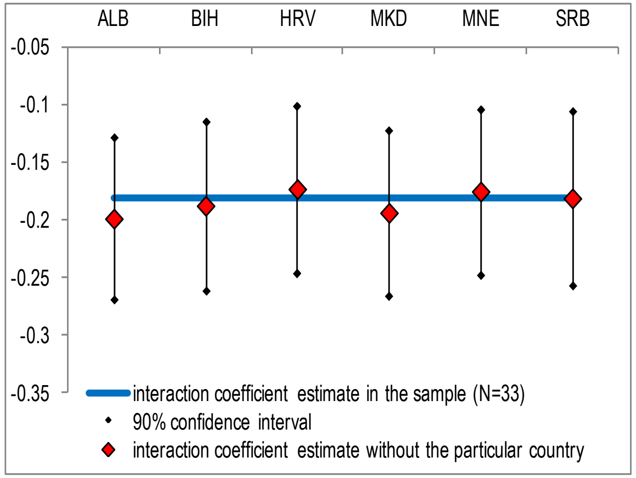
Figure 3.2. Robustness of baseline results in the entire sample to country omissions from the sample (jack-knifing)



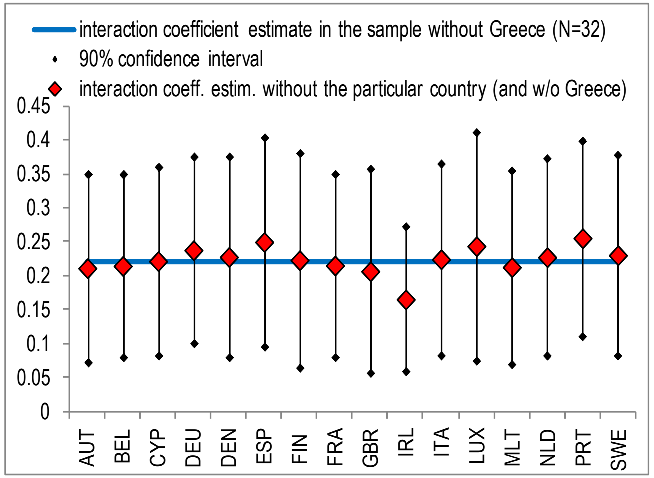
a. output gap * EU17 interaction



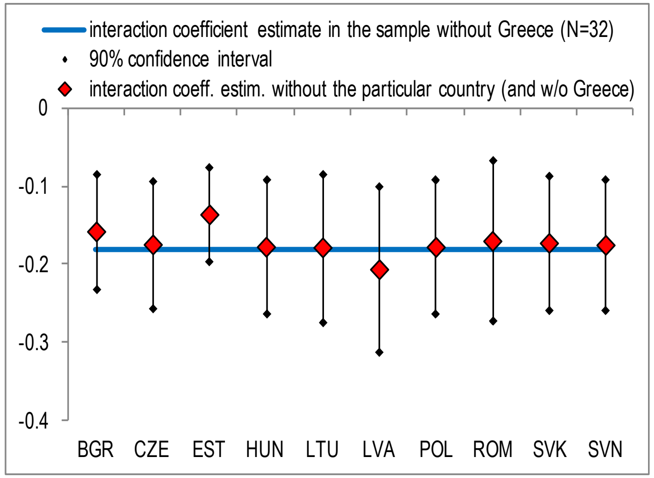
b. output gap * NMS10 interaction



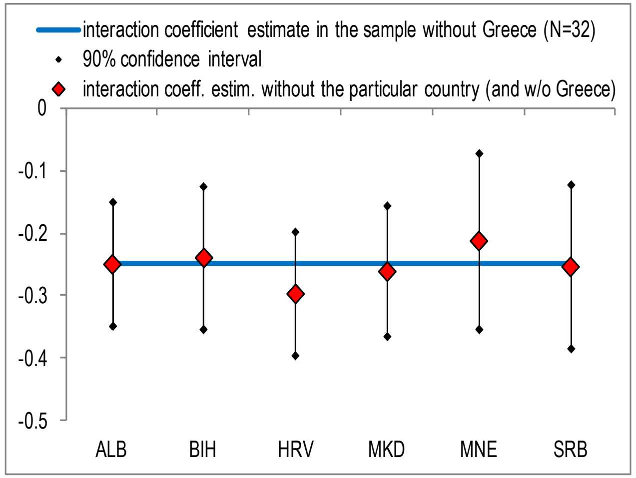
c. output gap * SEE6 interaction



d. output gap * EU17 interaction (without Greece)



e. output gap * NMS10 interaction (without Greece)



f. output gap * SEE6 interaction (without Greece)

Figure 3.3. Robustness of baseline results on cyclicality across country groups to country omissions from the sample (jack-knifing): using the entire sample (panels a-c) and omitting Greece from the sample (panels d-f)

3.6 Conclusions

This chapter has investigated the cyclical character and determinants of discretionary and overall fiscal policy in 33 European countries between 1995 and 2010. The absence of an overall theory on the cyclical character and determinants of fiscal policy and the relatively small sample size greatly affect our model specification and estimation strategy. Consequently, we start from a relatively simple model, and then extend it with numerous variables. This makes it possible to both investigate the robustness of the baseline result on cyclicality to the introduction of additional variables as well as to analyse their direct effect on fiscal policy. After a comprehensive discussion of estimation methods, we decided to use system GMM as the most appropriate method for our sample and our aim of study.

Baseline results show that discretionary fiscal policy in the entire sample between 1995 and 2010 has been pro-cyclical, i.e. it has aggravated economic fluctuations, whereas overall policy has been a-cyclical, reflecting the effect of automatic stabilizers. In addition, we find that policy-makers have paid little attention to public debt movements, which resonates well with the recent European debt crisis. Further, we find considerable differences in the cyclical character among country groups. In the transition countries, overall fiscal policy is a-cyclical, but discretionary policy is pro-cyclical, especially in South-eastern Europe, which means that policymakers in these countries react to economic fluctuations in a destabilizing manner. On the other hand, both discretionary and overall policies are a-cyclical in old EU member states, indicating that neither automatic stabilizers, nor policymaker actions are affecting economic fluctuations. However, robustness checks show that this result in old EU member states is driven by the recent crisis years, as overall policy was previously counter-cyclical due to effective automatic stabilizers. Further, discretionary policy is considerably more relaxed in election years in old EU member states, but there is no such effect in the two groups of transition countries. In addition, the founding euro area members undertook significant fiscal adjustment before the euro introduction. However, there is little evidence that the common currency in itself is imposing more discipline, as the Stability and Growth Pact is not affecting fiscal outcomes and the cyclical character of fiscal policy.

Baseline results are extended with numerous political, institutional and other factors suggested by theoretical or practical considerations. It must be noted that baseline results on cyclicality are very robust to these extensions. In this part, we find that determinants of fiscal policy often differ among country groups. In transition countries, the number of checks in the system worsens fiscal outcomes, which provides some evidence for voracity effects, which are however not found in old member states. The strength of government in old and particularly new EU member states is an important factor for successful and considerable fiscal adjustment. In old EU member states and in South-eastern European countries, plurality electoral systems result in lower fiscal discipline. While this opposes theoretical predictions, a possible explanation is the existence of pork barrel projects, as policymakers employ fiscal policy to affect chances of their re-election. Further, we find no evidence of less disciplined and more pro-cyclical fiscal policies in democratic countries with corruption, although democracy and corruption separately improve balances in the entire sample. The ideological composition of cabinet has important implications in old member states, as left-oriented governments and moves to the left result in lower budget balances. However, this factor plays no role in new member states, which probably reflects more blurred ideological definitions in these countries, as well as stronger constraints on fiscal policy by other factors which went beyond party divisions. Indeed, we find that IMF arrangements acted as a strong disciplining factor on fiscal policy in transition countries, but only if they were actually used, while the mere existence of an arrangement has no impact on fiscal policy. On the other hand, there is no effect of the type of the exchange rate regime in any country group. Finally, we find that fiscal rules impose more disciplined policies in both old and new member states. On the other hand, the effect of fiscal governance depends on the particular governance type. In new member states, the prevalent contract type results in more disciplined policies, while the delegation type dominant in old member states results in lower fiscal discipline in these countries.

We also carry out numerous robustness checks of baseline results. In this part, we find that baseline results are fairly robust to sample splits for the introduction of the euro and for the EU enlargement, with the important exception that discretionary policy in new member states turns from a-cyclical to pro-cyclical once they gain EU membership. Further, shortening the sample for the recent crisis years yields unchanged results for transition countries, but counter-cyclical overall policy in old EU member states before the crisis, as noted above. Finally, robustness checks using jack-knifing also indicate that baseline results are fairly robust for the entire sample. However, regarding differences among country groups, the jack-knifing procedure shows that the finding of a-cyclical discretionary policy in old EU member states is completely driven by Greece, as its omission from the sample would result in finding counter-cyclical discretionary policy in these countries.

Our analysis provides several important recommendations for policy-makers. The finding of pro-cyclical discretionary policy in the two groups of transition countries means that in these countries discretionary measures by policy-makers are in fact exacerbating economic fluctuations. Therefore, considerable efforts are needed to eliminate the amplifying effect of discretionary measures on economic fluctuations, and to move discretionary policy in a counter-cyclical direction. This could be achieved by better and timelier estimates of cyclical output movements, as well as better macroeconomic forecasts. In turn, this could then help a better design and implementation of discretionary measures in order to react to forecasts of economic fluctuations, given the implementation lags of fiscal policy. The removal of the pro-cyclical character of discretionary policy would also contribute in overall policy becoming counter-cyclical, bearing on mind that automatic stabilizers are found to be effective in all groups of European countries. Further, policymakers in all three country groups need to pay much more attention to debt sustainability. The results of our analysis and the ongoing European debt crisis indicate that insufficient attention was paid to this issue in the past.

The analysis of various political, institutional and other determinants of fiscal policy also yields some important recommendations. Most notably, fiscal policy is less disciplined in election years, indicating that policy-makers employ fiscal policy in order to improve their re-election chances. Therefore, considerable efforts are needed to remove this political business cycle effect, which is found mostly in old EU member states, although transition countries are not expected to be immune to it as well. One way to do so would be the use of fiscal rules, which are already employed in several countries. Although we do not investigate this issue in detail, our analysis does suggest that the strength of fiscal rules has a disciplining effect on budget balances. In addition, efforts to increase levels of democratisation and to control corruption are also expected to lead to better fiscal outcomes. This is particularly important for South-eastern European countries, which still lag behind EU member states regarding these indicators. Finally, upon eventual membership in the EU, which is their long-term goal, South-eastern European countries should try to avoid the experience of new EU member states, which appear to have shifted towards pro-cyclical discretionary policy once they acceded to the EU.

Chapter 4 - Theoretical and empirical review on the macroeconomic effects of fiscal policy

4.1 Theoretical background

The effects of fiscal policy on output in the short-run (fiscal multipliers) have been the focus of macroeconomics since its establishment as a separate discipline in the wake of the Great Depression. However, after the failure of Keynesian models in 1970s, the focus of academic research moved towards monetary policy. Only in the late 1990s were empirical researchers starting to come back to the possible effects of fiscal policy on output, whereas the theoretical literature started to incorporate fiscal policy in theoretical models. The recent global economic and financial crisis and the restricted effectiveness of monetary policy due to the zero lower bound of interest rates reignited the interest of academics and policymakers in the effectiveness of fiscal policy, and in particular in the short-run effects on output. Indeed, as Romer (2011) notes, between 2009 and 2011 there have been more studies on the effects of fiscal policy than in the previous quarter century.

The theoretical prescriptions on the fiscal multiplier are fairly diverse, and depend on the model assumptions. Therefore, in presenting the various theoretical predictions, it is useful to start from the systematisation of theories[54] provided by an excellent theoretical and empirical review of Hebous (2011), and then briefly analyse the predicted size and signs of fiscal multipliers in the main theoretical studies. The first line of division of economic theories is whether they incorporate forward-looking behaviour by economic agents, and then whether they are applied to closed or open economies.

4.1.1 Traditional theories

Among the traditional theories, i.e. the ones without forward-looking behaviour, the classical theory predicts no effects of fiscal policy on output, which reflects the assumptions of fully flexible prices and a vertical aggregate supply curve. On the other hand, conventional Keynesian theory predicts that fiscal policy has an important effect on output movements, which is usually presented via the IS-LM framework for closed economies, appended by the Mundell-Fleming model for open economies. The main assumptions of Keynesian models are that prices are sticky, consumption depends on current and not on future income and usually that money supply is fixed. In these circumstances, in closed economies, higher government spending causes higher aggregate demand which increases output due to the sticky prices (non-vertical aggregate supply curve in the short-run). Higher output increases income, and therefore private consumption rises. The higher income also increases the money demand, which in turn contributes to higher interest rates, given the fixed money supply, and thus dampens private investments via the crowding out. However, overall investments can also be higher if private investments are more responsive to the higher output than to the higher interest rate or if part of the higher government spending takes the form of higher public investment. The tax multiplier has a similar

[54] Our survey is focused on the most important theoretical models, which are almost exclusively related to advanced countries (typically the United States). This explains the absence of theoretical models on fiscal policy for transition countries in our survey, which is similar to other studies that survey the theoretical literature (e.g. Hebous (2011) and Hemming et al. (2002)).

direction, although the effects of tax cuts have a lower magnitude due to the propensity to save part of the higher income. Therefore, conventional Keynesian theory predicts the fiscal multipliers are positive mostly due to their favourable effects on private consumption and possibly on private investment. However, Giavazzi and McMahon (2013) note that, while Keynesian theory also predicts a rise in real wages, it does not provide explicit prescriptions on the labour supply and the hours worked (due to the absence of wealth effects in Keynesian models), which is a key feature of modern models described below.

The Mundell-Fleming model extends the Keynesian IS-LM framework to open economies. However, an important additional distinction is necessary here, related to the exchange rate regime. In countries with flexible exchange rates and perfect capital mobility, the higher interest rate associated with higher aggregate demand will result in an inflow of capital. This will in turn cause nominal appreciation of the domestic currency, which also translates into real appreciation due to the sticky prices. Further, the real appreciation will worsen the trade balance, which offsets the positive effects of fiscal policy on output, although private consumption is still higher. On the other hand, in countries with fixed exchange rates, the central bank will respond to pressures for nominal appreciation by increasing the money supply, which in turn contributes further to higher output. Therefore, although there are variations depending on the extent of capital mobility or the expenditure switching effects, the general prediction of the Keynesian theory for open economies is that fiscal policy is effective in countries with a fixed exchange rate regime, and the opposite holds for countries with flexible exchange rates.

4.1.2 Modern (dynamic-optimising) theories

Traditional Keynesian models are hardly used in modern macroeconomics due to the lack of microeconomic foundations and the omission of rational expectations. Instead, modern macroeconomics has evolved to incorporate important theoretical and modelling insights of the 1970s and 1980s, by relying largely on Dynamic Stochastic General Equilibrium (DSGE) models, which are also used in advanced economies' central banks for policy analysis and forecasting. DSGE models rely on the neo-classical methodology of general equilibrium analysis of inter-temporal optimisation by rational economic agents. This means that DSGE models include forward looking economic agents, which form their decisions based on rational expectations. After deriving the optimising and equilibrium conditions and linearising around the steady state to get a set of linear equations and then defining model parameters by calibration or estimation, models are shocked by stochastic disturbances (e.g. fiscal or monetary policy shocks or productivity shocks) in order to find out the response of the main variables of interest.

DSGE models are not unique and can be broadly divided in two groups, depending on the modelling of prices and possibly, market structure, somewhat resembling the old division into classical economics and Keynesian theory. DSGE models that incorporate flexible prices and perfect competition in all markets belong to Real business cycle (RBC) models. On the other hand, New Keynesian DSGE models[55] typically include price rigidities and possibly other frictions in the economy. Most DSGE models, either of the RBC or the New Keynesian variety, are not focused on fiscal policy. Indeed, their primary focus is the analysis and explanation of business cycles, which relies on real shocks (RBC) or on various frictions in the economy which give rise to an effective monetary policy (New Keynesian). However, as discussed below, several recent DSGE models are extended to incorporate fiscal policy and to yield predictions for the effects of fiscal policy shocks (e.g. Linnemann and Schabert (2003) and Smets and Wouters (2007)). It should also be noted that most DSGE models apply to closed economies, although several studies extend them to open economies (e.g. Monacelli and Perotti (2010)), as discussed below.

Several authors build RBC models in order to analyse business cycles and the responses to various types of shocks (e.g. Aiyagari et al. (1992) or Baxter and King (1993)). In these models, the key channels for fiscal policy are wealth effects, inter-temporal effects and disturbances to first order conditions (Ramey, 2011b). In addition, there are no lending constraints for economic agents, the production function has constant returns to scale and the utility function is separable in consumption and leisure (Perotti, 2008), which makes them complements. The starting assumption in baseline RBC models is that government spending shocks are financed by lump-sum, i.e. non-distortionary taxes. Households, which are forward-looking, treat a government spending shock as an increase in the present value of future taxes. Therefore, due to the negative wealth effects they lower their current consumption and increase the labour supply, which in turn contributes to higher output. The higher labour supply also contributes to lower real wages and lower marginal productivity of labour, which in turn contributes to higher private

[55] For excellent reviews on the development of the new neoclassical synthesis as the consensus in modern macroeconomics, including the adoption of DSGE models and the New Keynesian theory, see Goodfriend (2007) and Woodford (2009).

investments due to the higher marginal productivity of capital. In the baseline RBC model, due to hypothesized Ricardian equivalence, it does not matter whether government spending is financed by a higher deficit or higher current taxes, while distortionary taxes such as labour income taxes would result in lower labour supply and lower output (Ramey, 2011b). In an extended version of the baseline RBC model, Burnside et al. (2004) introduce investment adjustment costs and persistent habits in personal consumption as important features of preferences and technology. However, the results of the baseline RBC model still hold, albeit with a more protracted response by employment and investment.

New Keynesian models also use the RBC methodology, which relies on inter-temporal optimisation by rational economic agents. However, New Keynesian models depart from the assumptions of a frictionless world inherent to RBC models, most notably by incorporating price stickiness and often monopolistic competition in DSGE models. Standard New Keynesian models such as the seminal models of Christiano et al. (2005), Smets and Wouters (2003) and Smets and Wouters (2007) are primarily focused on the response to monetary policy shocks[56], although the latter incorporate government spending shocks as well. Linnemann and Schabert (2003) are among the first to focus more closely on the role of fiscal policy in the New Keynesian models, and they also incorporate monopolistic competition in their model. The baseline predictions of New Keynesian models are similar to RBC models due to the prevalence of wealth effects. More precisely, in baseline New Keynesian models, the government spending shock also results in negative wealth effects, which cause households to lower their consumption and increase their labour supply. In circumstances of price stickiness and monopolistic competition, firms react to the higher demand by producing more output (Perotti, 2008). The higher output results in higher labour demand which offsets the increase in labour supply, resulting in higher real wages. Nevertheless, this increase in wages is generally insufficient to offset the dominant negative wealth effects on consumption (Beetsma and Giuliodori, 2011). Related to this, Linnemann and Schabert (2003) find that a positive response of consumption is possible only if monetary policy is sufficiently accommodative.

Overall, both the neoclassical theory (RBC models) and New Keynesian models find that government spending shocks cause higher output, although the size of the fiscal multiplier is generally lower than one. This implies lower private consumption and higher labour supply, whereas there are divergent predictions on real wages and labour demand. Therefore, the prediction on the reaction of output is insufficient to

[56] For a description of standard New Keynesian models, see Clarida et al. (1999) or Woodford (2003).

discriminate which theory describes macroeconomic reality better[57]. In addition, most empirical studies (surveyed in Section 4.2) also find that government spending has positive effects on output. More importantly, the predicted fall in private consumption in both theories is opposite to the findings in most of the empirical literature that government spending shocks cause higher consumption. This contradiction motivated several extensions of both RBC and New Keynesian models (surveyed below), aimed at reconciling theoretical results with empirical evidence. Indeed, empirical studies, which slightly preceded the more detailed incorporation of fiscal policy in theoretical models in the 2000s, have strongly affected the theoretical modelling of fiscal policy (Caldara and Kamps, 2008).

4.1.3 Extensions of baseline RBC and New Keynesian models

Various studies have provided extensions of baseline RBC and New Keynesian theoretical models. In several cases, these extensions are aimed at addressing the puzzle of lower private consumption in the wake of spending shocks in theoretical models, as opposed to the higher private consumption, which is found in most empirical studies. For instance, Linnemann (2006) uses an RBC model, but introduces non-separability in the utility of consumption and leisure, which makes them substitutes (as opposed to complements in baseline RBC), as well as an intertemporal consumption elasticity smaller than one. In such a setting, government spending shocks again cause higher labour supply and lower leisure due to negative wealth effects. However, now the fall in leisure causes a rise in the marginal utility of consumption, so the households both supply more labour and consume more[58] in order to compensate the negative wealth effects. As a result, for reasonable parameter values, in this model government spending shocks cause an increase in consumption, employment and output, while real wages are lower. Therefore, Linnemann (2006) concludes that the findings of the empirical literature conform to the standard theoretical framework of intertemporal optimisation by representative rational agents. Further, Ravn et al. (2006) extend an RBC model with monopolistic competition and 'deep habits' in the personal consumption of individual goods[59]. This

[57] Responses of private investment are less clear in theoretical models, and may depend on numerous factors (Perotti, 2008).
[58] However, Bilbiie (2009) notes that the positive response of consumption is possible only if it is an inferior good.
[59] 'Deep habits' refers to consumers forming habits from the consumption of individual goods, as opposed to the standard assumption of habit formation from the consumption of a single aggregate good (Ravn et al., 2006).

combination makes the price markup over marginal cost time-variant, unlike the time-invariant markups in most other models. Their main finding is that markups behave counter-cyclically in equilibrium. This means that the higher output as a result of the positive government spending shock also causes a decline in markups, which is in line with the empirical literature (Rotemberg and Woodford, 1999). Therefore, in this model, the increase in government spending has the usual wealth effects of a fall in consumption and higher labour supply, which would have a downward pressure on wages in the absence of deep habits. However, the countercyclical behaviour of markups due to the presence of deep habits (i.e. their fall) contributes to a higher demand for labour, which offsets the rise in labour supply and hence contributes to higher real wages in equilibrium. The higher real wages in turn lower leisure and increase consumption. Therefore, Ravn et al. (2006) conclude that their model modifies the standard RBC predictions, and moves them in line with empirical findings of higher consumption in the case of government spending shocks, although the magnitude of this rise is smaller than in most empirical studies. Finally, another way of finding a positive reaction of consumption to government spending shocks is to relax the assumption of intertemporal optimisation by economic agents, which is a strategy pursued by Galí et al. (2007). In their New Keynesian model, they incorporate the proposal by Mankiw (2000) that DSGE models should allow heterogeneity of households, since in reality part of them do not smooth consumption but instead consume all of their current disposable income (for reasons such as borrowing/lending constraints or myopia). Therefore, Galí et al. (2007) extend a standard New Keynesian model with sticky prices to allow the existence of Ricardian and non-Ricardian households, with the latter behaving according to a rule of thumb and consuming all their disposable income each period, without borrowing or saving. While standard results such as higher labour supply due to wealth effects are still present in the model, sticky prices enable real wages to rise as a result of government spending shocks. However, the combination of higher employment and rising real wages also contributes to higher current income, which increases the consumption of rule-of-thumb consumers. Galí et al. (2007) conclude that this also leads to a rise in overall consumption for empirically plausible parameter values, which brings results closer to the main findings in empirical studies. However, using the estimated euro area model by Smets and Wouters (2003) and extending it with rule-of-thumb consumers, Coenen and Straub (2005) find that there is low probability of a positive response of overall consumption to government spending shocks, mostly because of the low share of rule-of-thumb consumers, as well as large negative wealth effects. Regarding the model in Galí et al. (2007), Ramey (2011a) also notes that several "ultra-Keynesian" features such as sticky prices, high share of rule-of-thumb consumers and off-the-labour-supply-curve[60] assumptions are necessary to generate a positive response of private consumption to government spending.

The division into RBC and New Keynesian models can also be extended to a relatively diverse body of theoretical literature on open economies. The international business cycle model was laid out in a seminal paper by Backus et al. (1994), whereas the New Keynesian ideas dominate in the large field on new open economy macroeconomics, which is largely based on Obstfeld and Rogoff (1995). However, in the open economy literature there are additional factors which complicate the derivation of straightforward theoretical predictions on the effects of government spending shocks, such as the completeness of international asset markets, the openness and the extent of asset substitutability across borders[61] (Beetsma and Giuliodori, 2011).

In the frictionless international RBC model of Backus et al. (1994), a shock to government spending has a positive effect on output and a negative effect on private consumption due to negative wealth effects, which resembles the predictions of RBC models for closed economies. However, their model also predicts a worsening of terms of trade and of the trade balance. Further, the benchmark open economy DSGE model of Monacelli and Perotti (2010) also entails a fall in private consumption due to wealth effects, which causes real appreciation of the exchange rate due to international risk-sharing, and this result holds in a variety of model specifications. On the other hand, the Obstfeld and Rogoff (1995) model predicts that the fall in private consumption due to wealth effects also induces a fall in money demand, which under fixed money supply requires a rise in the price level in order to restore the money market equilibrium. Due to the purchasing power parity, the increase in the domestic price level further entails nominal depreciation of the domestic currency.

[60] This is the version of the model in Galí et al. (2007) that assumes imperfectly competitive labour markets, where households meet all the labour demand from firms as long as wages are above the households' marginal rate of substitution.

[61] A more detailed review of the theoretical literature on the effects of fiscal policy in open economies is beyond the scope of our study. See the appendix in Abbas et al. (2011) for a useful survey of the relevant literature and Corsetti and Muller (2006) for a discussion of the main issues related to the international fiscal policy transmission and twin deficits in theoretical models.

4.1.4 The sign and size of fiscal multipliers

There are also differences in the theoretical literature regarding the predicted size and even sign of fiscal multipliers, i.e. the effects of fiscal policy on output. For instance, Leeper (2010) notes that the one clear message from the vast empirical and theoretical literature is that fiscal multipliers are "all over the map". Coenen et al. (2012) note that despite numerous advantages of structural economic models, the incomplete consensus on structural features and calibration can have an important effect on results on fiscal multipliers. From the classes of models surveyed above, the old Keynesian models, represented in the IS-LM framework, have fiscal multipliers larger than one. On the other hand, the baseline RBC model of Baxter and King (1993) yields short-run output multiplier ranges between -2,5 and below 1, depending on whether government shocks are temporary or permanent, and whether they are financed by lump-sum or distortionary taxes. In their meta-regression analysis, Gechert and Will (2012) also note that the size of fiscal multipliers in neoclassical models is usually between zero and one. Extensions of the RBC framework also yield multipliers lower than one, which is related to the prevalence of Ricardian effects in these models in absence of frictions in the economy.

The addition of various frictions is generally not sufficient to bring multipliers above one, as findings from various New Keynesian DSGE models point out. For instance, in an estimated New Keynesian DSGE model for the euro area, Smets and Wouters (2003) find that output multipliers for government spending are positive, but lower than one, and this also holds with flexible prices and wages. Cogan et al. (2010) find similar results when using the estimated New Keynesian model on the US economy by Smets and Wouters (2007), i.e. that government spending has a positive effect on output, but the multiplier is still lower than one. When introducing rule-of-thumb households, they find a slightly higher multiplier, but this extension does not have a significant quantitative impact on results. In addition, in their extension of a standard sticky price New Keynesian model with rule-of-thumb (non-Ricardian) households, Galí et al. (2007) find that output multipliers are positive, but they exceed one only if labour markets are non-competitive or the share of rule-of-thumb households significantly exceeds the baseline of 50%. Indeed, Ramey (2011b) notes that these two features essentially transform the New Keynesian into an old Keynesian model. Further, there are several studies which compare fiscal multipliers for various New Keynesian models. For instance, Gechert and Will (2012) provide a meta-regression analysis of 89 theoretical and empirical papers on fiscal multipliers.

Regarding New Keynesian models, they note that the size of the fiscal multiplier is generally between zero and one, although it can exceed these bounds in several particular cases. For instance, multipliers can be negative (i.e. fiscal contractions can be expansionary) in cases of non-linear or non-Keynesian effects of fiscal policy[62]. Multipliers higher than one can be obtained when introducing rule-of-thumb households (as surveyed above) or when the monetary policy is at the zero-lower-bound. Indeed, the latter case, which is highly relevant in current economic circumstances in advanced countries, is probably the only one where there is some agreement in the literature that fiscal multipliers can be large. Several recent studies in the New Keynesian framework conclude that, in a deflationary environment and with monetary policy constrained by the zero lower bound of interest rates, higher government spending financed by higher deficits can yield higher inflationary expectations (e.g. Christiano et al. (2011) or Woodford (2011)). With constant nominal interest rates, higher expected inflation results in lower real interest rates, thus reigniting economic activity and yielding fiscal multipliers considerably larger than one. The results on large fiscal multipliers in circumstances with accommodative monetary policy, which includes circumstances of zero-lower-bound, are also confirmed by Coenen et al. (2012) in their detailed comparison of several structural DSGE models used in leading national and international policy institutions. More generally, they find that short-run fiscal multipliers in all models surveyed can be sizable, although the detailed results presented show that they exceed one only in a relatively limited number of cases, regardless of the model.

Overall, the models surveyed offer different routes to replicate the empirical findings of rising consumption in the wake of government spending shocks. Related to this, the size of the fiscal multiplier depends largely on the type of model used, various model assumptions and innovations, the type of fiscal instrument, the way of financing of government spending, the behaviour of monetary policy and the particular calibration or estimation also means there is still no consensus on the particular effects of government spending on output in the theoretical literature. This also applies to the transmission channels of fiscal policy effects on consumption and other important macroeconomic variables. This coincides with warnings by several other studies that there is no single fiscal multiplier. Therefore, in the next section we

[62] This is often labelled as expansionary fiscal consolidations (or equivalently recessionary fiscal expansions). Alesina and Ardagna (2010) note that such effects could work through demand channels (e.g. via positive wealth effects if current fiscal contraction reduces expectations for future contractions, or via lower premiums on government bonds) and through supply channels (via the labour market and the individual supply of labour). However, a more detailed survey of the theoretical literature on non-Keynesian effects of fiscal policy is beyond the scope of the current study.

will survey in more details the empirical literature on fiscal multipliers, which is even more voluminous than the theoretical literature. While results between theoretical models and empirical studies differ in several cases, not least the effects of fiscal policy on consumption, there are certainly channels in which they influence each other. For instance, important innovations in theoretical models have been introduced in order for them to be able to replicate the results found in empirical studies, particularly regarding the effects of fiscal policy on private consumption. More generally, the DSGE literature regularly uses VAR and other empirical evidence both to calibrate the models and to cross-check their results. On the other hand, empirical studies also rely on theoretical insights, particularly when designing the study setup and imposing identification restrictions. Last but not least, our focus on the empirical literature is also motivated by our interest in empirically analysing the effects of fiscal policy in European countries.

4.2 Empirical review - fiscal policy VARs

The return of fiscal policy in the focus of empirical studies is a result of three broad developments in economic theory and policy-making. First, large macro-econometric models widely used in the 1970s and 1980s were critically attacked by the seminal critiques by Lucas (1976) on the sensitivity of model parameters to structural changes and by Sims (1980) on the "incredible" identification assumptions, which made these models fall out of fashion. Instead, economic studies, including fiscal policy, moved towards the application of DSGE models based on optimisation (as surveyed above) and more sophisticated empirical methods, including Vector Auto Regressions, or VARs (surveyed below). Second, empirical studies on fiscal policy blossomed as a result of the inability of DSGE models to reach a conclusion on the effects of fiscal policy on output and consumption. Third, the empirical research was initially intended to enable the discrimination whether fiscal policy effects were closer to neo-classical or Keynesian predictions. However, in the recent years the focus moved towards the estimation of the size of the fiscal multiplier, in order to also address policy debates on whether fiscal stimulus was the appropriate measure to fight the recent global economic crisis (Ramey, 2013).

The wide field of empirical research on fiscal policy can be loosely grouped in three broad categories (Fatás and Mihov, 2001b). First, several studies focus on stabilisation properties of fiscal policies, i.e. the cyclical character and determinants of fiscal policy (as surveyed in Chapter 2 and empirically applied to European countries in Chapter 3). A second branch of the empirical literature pays more attention to macroeconomic effects of episodes of fiscal consolidations[63]. Finally, the third group of empirical studies focuses on the short-run effects of fiscal policy on output (fiscal multipliers) but also on other macroeconomic variables, which is also our main interest. The vast majority of studies do this by studying dynamic effects of fiscal policy via Vector Auto Regressions (VARs), which will hence be in the focus of our empirical review. However, due to the width and the richness of this literature, our review will primarily focus on the most important studies and their main methodological contributions, whereas comparatively less attention will be paid to results in studies. To put things into perspective, in his meta-regression analysis of 89 studies of fiscal policy multipliers, which also include those using other theoretical or empirical approaches, Gechert and Will (2012) count 255 estimates of output multipliers based on fiscal VARs, and numerous estimates of effects of other variables. Clearly, a comprehensive survey of the results is out of the scope of our literature review. Related to this, since our focus in this survey is on the main methodological approaches in the fiscal VAR literature and the main results in the most important studies, we also refrain from surveying the empirical studies on effects of fiscal policy in transition countries. Indeed, as discussed in detail below, the most important contributions in the fiscal VAR literature use data for advanced countries (primarily United States), whereas other studies typically only extend these methods and specifications to other countries, including a relatively limited number of studies on transition countries[64].

Before the literature survey, it should be noted that the main question asked in the empirical literature is "What are the effects of fiscal policy shocks?". This brings back the decomposition of fiscal policy in Chapter 2 and Chapter 3: fiscal policy can be decomposed into automatic stabilizers and discretionary policy; the latter can further be decomposed into endogenous or systematic discretionary policy and exogenous discretionary policy. Automatic stabilizers capture the automatic response of government revenues or spending to output movements, such as higher tax receipts in expansions or higher unemployment benefits in recessions. Systematic, or

[63] While clearly related to effects of fiscal policy on output, this branch of empirical literature is distinct because it focuses on identifying and analysing effects of episodes of fiscal consolidations, including cases of expansionary fiscal contractions. Some of the key contributions in this literature include Giavazzi and Pagano (1990), Giavazzi and Pagano (1996), Alesina and Perotti (1997), Alesina and Ardagna (2010) and Guajardo et al. (2011). However, since our aim is to analyse the effects of fiscal policy in general, and not the effects of fiscal consolidation episodes, we do not survey this literature in more detail.

[64] For analysis of effects of fiscal policy in transition countries using fiscal VARs, see for instance Jemec et al. (2011) for Slovenia, Ravnik and Zilic (2011) for Croatia and Franta (2012) for the Czech Republic.

endogenous discretionary policy captures the response of policy-makers to economic movements, such as lowering taxes or increasing spending in recessions. Finally, exogenous fiscal policy covers changes in government revenues or spending that are not directly related to output movements, but undertaken for various other reasons, such as wars, political or ideological motives or the need to meet the Maastricht Treaty conditions in the European context[65]. It is exactly this part that constitutes the focus of empirical studies, including our study in the following chapter, i.e. the effects of exogenous fiscal policy measures (fiscal policy shocks) in European countries. On the other hand, cyclicality studies, including our empirical study in Chapter 3, focus mostly on the endogenous discretionary policy, i.e. how policymakers react to business cycles.

There are two main problems in the empirical research in this field. The first problem is related to the identification of exogenous fiscal policy. This in fact covers two related issues (Alesina and Giavazzi, 2013): the fact that government spending, revenues and output move together, and the fact that they also affect and are affected by other factors such as prices, exchange rates and interest rates. The correlation and the dependence on other factors then make it difficult to isolate truly exogenous fiscal policy (fiscal policy shocks), which is a crucial point before estimating its effects on output and other macroeconomic variables. The second main problem in empirical research is related to anticipation effects, or fiscal policy foresight. This is related to the fact that economic agents might anticipate future fiscal policy and therefore change their current behaviour. If the econometric estimation ignores this effect of anticipated policy on current variables, then the estimated response of output and other variables may be wrongly attributed to current fiscal policy, which may hence yield biased fiscal multipliers. The approach to the identification of fiscal policy shocks is in fact the main feature that distinguishes the five approaches in the VAR literature. In addition, they also pay different attention to the importance and treatment of the anticipation problem.

Therefore, next we will first discuss the five main identification approaches in the VAR literature on fiscal policy and the accompanying main empirical findings. In order to facilitate exposition, when describing them and the main results of studies using them we will deliberately downplay some methodological problems. Indeed, after the presentation of the main identification approaches, we will compare and

[65] In their seminal study of monetary policy in the US, Bernanke and Mihov (1998) note that exogenous policy shocks reflect many random factors that affect policy decisions, such as personalities of policymakers, political factors, data revisions and various technical issues. They also note that, if there are no exogenous shocks, the effects of policy on the economy can not be identified by any econometric method.

contrast them in the light of the identification and anticipation problems, as well as some other methodological and data issues (Section 4.3). Finally, in the last section we will present panel VAR as one of the key extensions of the main VAR approaches.

Before moving to identification approaches, it is useful to briefly present some key features of fiscal VARs that are dominant in the literature. A common feature in almost all fiscal VARs is that they include government spending, government revenues[66] and output at the least. In light of the seminal study by Blanchard and Perotti (2002), there is general agreement that at least these three endogenous variables should be included in VARs aimed at analysing the effects of fiscal policy. The vast majority of studies also include additional variables, particularly inflation and interest rates. Indeed, there are arguments that these five variables make up the minimal necessary set for the investigation of dynamic effects of fiscal policy and are sufficient to describe the dynamic properties of the economy (Fatás and Mihov, 2001b). Further, many VARs also include several other macroeconomic variables, such as labour market variables, GDP components or budget components. However, it should be noted that studies seldom provide explicit justifications for their particular choice of variables or their functional form. Nevertheless, the set of endogenous variables included in fiscal VARs is generally aimed at capturing the key aspects of the transmission mechanism of fiscal policy. Related to this, the set of variables also reflects the particular focus of the investigation as well as the need to make a distinction between key theoretical predictions (e.g. private consumption, wages or employment). On the other hand, VARs are usually kept to several variables in order to avoid VAR over-parameterisation. Bearing all this on mind, before moving on to a discussion of the identification approaches in fiscal VARs, we summarise the key aspects of specification of fiscal VARs that use the most common identification approaches in Table 4.1 in the end of this section. Due to the sheer size of the literature, it is impossible to include all dimensions of studies in a single table. Therefore, in Table 4.1 we focus mostly on the endogenous variables included and their functional form, and abstract from other features of fiscal VARs.

Further, most empirical studies use quarterly data, although some studies argue in favour of annual data[67]. The vast majority of studies employ time series

[66] Fatás and Mihov (2001b) note that it is recommended to enter spending and revenues separately and not the budget deficit, since economic theories differ in the predictions of the effects of spending and revenues. This advice is followed by almost all of the literature (Table 4.1).

[67] The issue of data frequency is discussed further in Section 4.3 and in the next chapter. In order to avoid repetition, the discussion of this and other important details of empirical studies that are mentioned in the literature review (cash-based or accrual fiscal data, short- or long-run interest rates, the functional form of variables) is mostly relegated to Section 4.3 as well as the next chapter, where it is linked to the design of our study.

analysis, whereas a few recent studies also incorporate panel estimation (Section 4.4 and the next chapter). Further, the vast majority of studies routinely impose short-run restrictions, and not long-run ones. Finally, the main focus in VARs is the identification of exogenous fiscal policy, and then the interpretation of impulse responses of other variables to fiscal policy shocks, while part of them also report calculated estimates of fiscal multipliers.

In order to facilitate the discussion, we will briefly present the general VAR setup and its transformation in order to be able to identify structural shocks, such as government spending shocks or revenue shocks. In doing so, we follow standard textbook descriptions such as Enders (1994) and the survey on fiscal VARs by Caldara and Kamps (2008).

The reduced form VAR can be represented as:

$$X_t = A(L)X_{t-1} + u_t \qquad \text{Eq. 19}$$

where X is a vector of k endogenous variables (government spending, revenues and output at the least, and potentially other variables), $A(L)$ is the m-th order lag-polynomial (typically 4 lags for quarterly data), and u_t represents a k-length vector of reduced form disturbances with $E[u_t]=0$, $E[u_t u_t']=\Sigma_u$ and $E[u_t u_s']=0$ for $s \neq t$. The VAR can also include additional elements such as constants, time trends, seasonal dummies or exogenous variables, but here we abstract from them to maintain simplicity.

The problem with the reduced-form VAR in Eq. 19 above is that disturbances u_t will in general be mutually correlated if contemporaneous relations between variables are not taken into account (Corsetti and Muller, 2006). As a consequence, reduced-form VARs do not have a structural, economic interpretation. Therefore, the reduced-form should be transformed into a structural model, which is done by pre-multiplying the reduced form by a $k \times k$ matrix A_0:

$$A_0 X_t = A_0 A(L)X_{t-1} + A_0 u_t \qquad \text{Eq. 20}$$

or

$$A_0 X_t = A_0 A(L)X_{t-1} + Be_t \qquad \text{Eq. 21}$$

where

$$A_0 u_t = Be_t \qquad \text{Eq. 22}$$

The last equation gives the relations between reduced form disturbances u_t and structural shocks e_t. Usually it is assumed that there is no correlation between structural shocks, i.e. the variance-covariance matrix Σ_e of structural disturbances is diagonal. Further, the matrix A_0 in Eq. 22 describes contemporaneous relations between the endogenous variables in X, while the matrix B describes the linear relationship between reduced form disturbances and structural shocks. However, without restrictions in A_0 and B, the model is not identified. Indeed, there are several ways to impose restrictions[68], i.e. to achieve identification, which is crucial in order to be able to interpret structural shocks in a meaningful manner. After identification, each variable can be written in a moving average representation, which enables the calculation of dynamic responses to structural shocks, usually presented through impulse responses (Rusnak, 2011). Depending on the manner in which they impose short-run restrictions to identify fiscal policy shocks, the fiscal VAR literature[69] is commonly grouped in five main categories, which will be discussed in the next subsections:

- VARs with recursive identification, which use the relatively simple Cholesky decomposition;
- Blanchard-Perotti VARs, which apply the identification proposed by Blanchard and Perotti (2002);
- VARs with sign restrictions on impulse responses;
- Event-study VARs, which use exogenous events such as military build-ups to identify exogenous fiscal policy shocks;
- Narrative VARs, which use congressional or legislative records to isolate exogenous fiscal policy shocks.

In the following sections, we discuss the key features and results of the most important studies using these approaches, with a focus on recursive and BP SVAR as the most commonly used approaches (Rusnak, 2011). As noted above, before doing so, in Table 4.1 below we present key features of fiscal VARs, with a focus on endogenous variables included and their functional form. We abstract from other features of fiscal VARs, both for ease exposition, and the multitude of aspects of fiscal VARs that

[68] One can impose long-run or short-run restrictions. Long-run restrictions, originally proposed by Blanchard and Quah (1989) are usually derived from economic theory, which usually provides more predictions than for short-run relations. However, in line with the dominant studies of fiscal policy effects, we focus on short-run identification restrictions.
[69] The last two approaches were originally presented as single equations and later extended to VARs (as discussed in the following two sections).

are impossible to be captured in a single table. Related to this, in the table we mostly focus on the first three identification approaches. Due to their specifics, but also due to their less frequent use (as discussed below), in Table 4.1 we abstract from key studies using event-study and narrative approaches, but in subsections 4.2.4 and 4.2.5 we do discuss the most important studies using these approaches.

Study	Country coverage	Period	Identi-fication method	Endogenous variables in baseline VAR	Endogenous variables in additional specifications	Other comments
Fatás and Mihov (2001b)	United States	1960-1996, quarterly data	recursive	Real government spending, real GDP, GDP deflator, real net-taxes and real 3-month treasury bill interest rate (all in logs except interest rates).	GDP components (consumption or investment and their components); labour market variables (real wages, hours and employment); private and official budget projections.	Additional variables are added one at a time and ordered after government spending.
Monacelli et al. (2010)	United States	1954-2006, quarterly data	recursive	Real government consumption, real GDP, real private consumption of non-durables and services (all in logs and per capita terms), nominal 3-month treasury bills interest rate, marginal income tax rate and 1 or 2 labour market variables.	Various labour market variables: employment, hours, unemployment, labour force, vacancies, job finding probability, separation rate, real product wages, mark-up in manufacturing.	Additional variables are added one or two at a time.
Kim and Roubini (2008)	United States	1973-2004, quarterly data	recursive	Log of real GDP, primary budget deficit as a share of GDP, current account deficit as a share of GDP, 3-month real interest rate and log of the real exchange rate.	Various budget components and current account components as a share of GDP. Extensions with alternative definitions of variables.	Additional variables are added one at a time, adding to the baseline set of variables or substituting some of their components.
Corsetti and Muller (2006)	US, Australia, UK and Canada (country-by-country VARs)	1979-2005 (2004 for Australia), quarterly data	recursive	Real government spending, real GDP (both in logs and per capita terms), primary budget balance as a share of GDP, inflation, long-term nominal interest rate, log of terms of trade and trade balance as a share of GDP. Second specification that omits government spending and replaces trade balance with the current account balance.	In the first specification, the trade balance is replaced in turn with investment and private consumption. In the second specification, the current account balance is replaced with the household savings ratio.	/

Study	Country coverage	Period	Identi-fication method	Endogenous variables in baseline VAR	Endogenous variables in additional specifications	Other comments
Caldara and Kamps (2008)	United States	1955-2006, quarterly data	recursive, BP, sign restrictions, event-study	Real government spending, real net-taxes, real GDP (all in logs and per capita terms), GDP deflator inflation rate and the short-term interest rate.	GDP components (consumption or investment and their components); labour market variables (real wages, employment and hours).	Additional variables are added one at a time.
Blanchard and Perotti (2002)	United States	1960-1997, quarterly data	BP SVAR	Real government spending, real net-taxes and real GDP (all in logs and per capita terms).	GDP components.	Additional variables are added one at a time and ordered last. They also check for anticipation effects and analyse sub-periods and an extended sample.
Perotti (2005)	Australia, Canada, West Germany, UK, US (country-by-country VARs)	1960-2001, quarterly data (Canada from 1961; UK from 1963; Germany until 1989)	BP SVAR	Real government spending, real net-taxes and real GDP (all in logs and per capita terms), GDP deflator inflation rate, 10-year nominal interest rate.	GDP components.	Additional variables are added one at a time. Also analysis of sub-samples before and after 1980 (1974 for Germany).
Perotti (2008)	Mostly United States, but also Australia, Canada and the UK (country-by-country VARs)	1947-2005 for US and early 1960s to 2006 for other countries in quarterly VARs. Longer series for annual VARs.	BP SVAR, event-study	Real government spending, marginal income tax rate, real GDP, real private consumption on nondurables and services, real private gross fixed capital formation (except tax rates, all in logs and per capita terms), log of hours in the non-farm business sector and log of real product hourly compensation in the non-farm business sector.	Alternative specifications with labour market variables replaced with the GDP deflator inflation rate and the 3-months nominal interest rate; also with the tax rate replaced with net-taxes. War-dummies are added for the event-study approach. Budget projections to check for anticipation effects.	VARs with fewer variables for some quarterly and all annual VARs. Annual VARs use extended samples, some going back to 1889.

Study	Country coverage	Period	Identi-fication method	Endogenous variables in baseline VAR	Endogenous variables in additional specifications	Other comments
Heppke-Falk et al. (2010)	Germany	1974-2004, quarterly data	BP SVAR	Real GDP, GDP deflator inflation rate, nominal short-term interest rate, real government direct spending and real government primary net-revenues (all in logs except inflation and interest rates).	Private consumption and investment. Various spending and revenue components. Expected spending to check for anticipation effects.	GDP and budget components are added by replacing respective aggregates. Cash-based instead of accrual fiscal data due to data availability.
de Castro and Hernández de Cos (2008)	Spain	1980-2004, quarterly data	BP SVAR	Real government spending, real net-taxes, real GDP, GDP deflator and the 3-year interest rate.	Private consumption and investment. Various spending and revenue components.	Fiscal data are a mixture of cash-based and accrual data due to availability. Additional GDP components are added one at a time, while budget components replace respective aggregates.
Giordano et al. (2007)	Italy	1982-2004, quarterly data	BP SVAR	Real private GDP, private GDP deflator inflation rate, private employment, 10-year nominal interest rate, real government spending on goods and services, real government wages and real net-taxes (all in logs except interest rates).	Private consumption and investment. Total government spending instead of spending on goods and services and government wages.	GDP components are added instead of private GDP. Cash-based instead of accrual fiscal data due to data availability.
Marcellino (2006)	France, Germany, Italy and Spain (country-by-country VARs)	1981-2001, semi-annual data	BP SVAR	Short-term foreign interest rate, short-term domestic interest rate, log nominal exchange rate to the Deutsche Mark (US dollar for Germany), total spending, total revenues, output gap (all 3 as shares of GDP), CPI inflation rate.	Public debt as a share of GDP. Various spending and revenue components.	Public debt is added last. Budget components are added by replacing respective aggregates.

Study	Country coverage	Period	Identi-fication method	Endogenous variables in baseline VAR	Endogenous variables in additional specifications	Other comments
Favero and Giavazzi (2007)	United States	1960-2005 (from 1950 for the narrative approach), quarterly data	BP SVAR and narrative approach	Real primary government spending, real government revenues, real GDP (all in logs and per capita terms), GDP deflator inflation rate and average cost servicing the debt.	Public debt as a share of GDP.	Also analysis of sub-samples before and after 1980.
Mountford and Uhlig (2009)	United States	1955-2000, quarterly data	sign restrictions	Real GDP, real private consumption, real government spending, real government revenues, real private residential investment, real private non-residential investment (all in per capita terms), Federal Funds interest rate, adjusted monetary base, producer price index of crude metals and GDP deflator (all in logs except interest rates)	/	/

Table 4.1. Summary of the main features of country-by-country fiscal VAR studies using the recursive approach, the BP SVAR approach or sign restrictions to identify fiscal shocks
(Note: Main or baseline specifications are presented and deterministic terms are ignored for ease of exposition.)

4.2.1 VARs with recursive identification

The recursive identification was first proposed in a seminal article by Sims (1980), and has since become one of the most used empirical approaches in macroeconomics, particularly in monetary policy studies. Briefly, it restricts the B matrix to an identity matrix, and A_0 to a lower triangular matrix with diagonal elements equal to 1. This implies that the decomposition of the variance-covariance matrix Σ_u is achieved via the Cholesky decomposition. However, the Cholesky decomposition implies causal ordering of variables, i.e. it specifies a particular relation between reduced-form disturbances u_t and structural shocks e_t (see Eq. 23 below for an example). The causal ordering means that variables that are ordered first are allowed to have a contemporaneous effect on later variables, but later variables do not contemporaneously affect the variables ordered before them (later effects are allowed). Therefore, in the recursive identification, the ordering of variables can have an important effect on results, so the restrictions implied by that ordering must rely on particular theoretical guidance or institutional information.

The popularity of recursive VAR is probably due to its relative simplicity. It is widely used in the monetary policy literature, where identification restrictions are somewhat less contentious. Fatás and Mihov (2001b) were among the first to extend the use of recursive VARs to fiscal policy. Their main focus is on effects of government spending, since it is the main point where predictions of various theories diverge. In their baseline specification, Fatás and Mihov (2001b) include five endogenous variables in the VAR, which they consider to be a minimal set necessary to investigate dynamic effects of fiscal policy, with the following ordering: real government spending G, GDP Y, the GDP deflator inflation rate π, real net-tax revenues R and the real three-month treasury bill interest rate i. Caldara and Kamps (2008) use the same ordering with similar variables in their comparison of fiscal VARs across various identification approaches. In the context of the discussion above, this means that the relation between reduced-form disturbances u_t and structural shocks e_t (or the expansion of Eq. 22 above) in these studies takes the following form:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -\alpha_{YG} & 1 & 0 & 0 & 0 \\ -\alpha_{\pi G} & -\alpha_{\pi Y} & 1 & 0 & 0 \\ -\alpha_{RG} & -\alpha_{RY} & -\alpha_{R\pi} & 1 & 0 \\ -\alpha_{iG} & -\alpha_{iY} & -\alpha_{i\pi} & -\alpha_{iR} & 1 \end{bmatrix} \begin{bmatrix} u_t^G \\ u_t^Y \\ u_t^\pi \\ u_t^R \\ u_t^i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^G \\ e_t^Y \\ e_t^\pi \\ e_t^R \\ e_t^i \end{bmatrix} \qquad \text{Eq. 23}$$

In Eq. 23, $a_{n,m}$ coefficients of the A_0 matrix capture contemporaneous responses of variable n to a shock in variable m, u_t are reduced-form disturbances and e_t^k are structural shocks to the k variable, i.e. the B matrix. This particular ordering has the following implications. Government spending shocks are identified on the basis of decision lags of fiscal policy, which means that spending does not contemporaneously react to output movements and other variables. This identification of spending shocks is widely accepted, since decision lags imply that it takes longer than a quarter for policy-makers to respond to movements in output and other economic factors (Blanchard and Perotti, 2002). Certainly, unemployment benefits do react to output movements as an automatic stabilizer, but their share in total government spending is fairly small. In addition, in most studies they are left out since revenues or taxes are defined in "net" terms, i.e. total revenues minus transfers. Therefore, the restriction imposed is that government spending can contemporaneously affect output and all other variables, but is not affected by them within the same quarter. Further, ordering GDP as the second variable means that it can be contemporaneously affected by government spending only, whereas it can have a contemporaneous effect on other variables. This is also not contentious, since higher government spending will generally show up in GDP figures contemporaneously. In addition, GDP can have an immediate impact on variables ordered further down, such as prices or tax revenues. Prices are ordered third, meaning that they can react contemporaneously to government spending and GDP, and are allowed to have a contemporaneous impact on tax revenues and interest rates. Further, tax revenues are ordered fourth, which means they can react contemporaneously to all variables except interest rates. The contemporaneous reaction of taxes to GDP (and prices) is also generally accepted, since it is expected that GDP and price shocks affect the tax base, which in turn affects tax revenues (Caldara and Kamps, 2008). Ordering tax revenues in this way thus allows them to reflect automatic stabilizers and inflationary effects on revenues. Finally, interest rates are ordered last since they are the ones generally expected to react immediately to other economic movements (e.g. higher interest rates in cases of inflationary pressures), but their transmission to other variables usually occurs with a delay of at least a quarter. Related to this, it is also common to define spending and revenues net of interest payments (e.g. Caldara and Kamps (2008)), which further justifies the lack of contemporaneous effects of interest rates on fiscal variables.

While most of the implications of this particular ordering are generally accepted in the literature, there is one important case where there is considerable disagreement - the ordering of tax revenues after government spending and output.

This particular ordering implies that revenues are allowed to react contemporaneously to government spending and output but not vice versa; or spending determines revenues but revenue decisions are taken only once spending is determined, which Fatás and Mihov (2001b) note is plausible, but not testable. In addition, this particular ordering allows for contemporaneous effects of output and inflation on taxes, but not for any contemporaneous feedback from taxes to output (and inflation). Alternatively, if taxes would be ordered before GDP, this would allow a contemporaneous effect of taxes on output, but would restrict the opposite effect to zero, thus implying an absence of automatic stabilizers.

Researchers have dealt with this issue in several ways. For instance, Fatás and Mihov (2001b) claim that they intentionally leave the response of tax revenues unrestricted, i.e. allow them to respond to most other variables in the tradition of prominent semi-structural VARs[70] of monetary policy (e.g. Bernanke and Mihov (1998)) since their focus is on tracing the effects of spending shocks and comparing them to theoretical predictions. Similar to this, some studies focus exclusively on government spending. Indeed, if one is focused on studying the effects only of the first variable ordered in the VAR (government spending in this case), then the ordering of the other variables does not matter (Christiano et al., 1999). Other studies use more elaborate identification approaches from the ones surveyed below, which allow them to trace more carefully effects of not only of government spending shocks, but also of revenue shocks.

The main finding by Fatás and Mihov (2001b) is that, in the US, government spending shocks have a positive and persistent effect on output, with an output multiplier larger than one, as well as a positive impact on real interest rates. However, since this reaction is consistent with a wide array of economic theories, they also provide several extensions and robustness checks of the baseline VAR (Table 4.1 above). Their main finding in this part is that the rise in output in the baseline results is driven by the persistent rise in all components of consumption, whereas the reaction of investments is fairly low and mostly insignificant. In addition, private consumption increases are particularly pronounced in cases of government wage shocks. Further, while government spending increases private employment, it has little impact on total wages or hours worked, although there is a strong positive reaction by manufacturing wages and hours. Therefore, they conclude that empirical results deviate considerably from a baseline RBC model they also analyse, and are

[70] Semi-structural VARs refer to VARs that leave some of the relationships in a model unrestricted, and impose contemporaneous identification restrictions only on variables that are relevant for the issue being studied (Bernanke and Mihov, 1998).

closer to Keynesian predictions. The main deviations consist in the positive reaction of consumption, as well as in the observed positive correlation between consumption and employment in the VAR results, as opposed to their opposite movements in the RBC model. Finally, robustness checks indicate that, when augmenting the VAR with fiscal policy forecasts in order to control for possible anticipation effects, baseline results still hold, although error bands are somewhat wider.

Caldara and Kamps (2008) use a similar specification of the baseline VAR and extensions in their analysis of effects of fiscal policy in the US between 1955 and 2006 through various identification approaches (Table 4.1 above). Unlike Fatás and Mihov (2001b), they analyse both government spending and tax shocks, and also carry out some policy analysis. Their main results from the baseline VAR show a persistent positive reaction of output to government spending shocks, with the output multiplier reaching a peak of 2 after 3 to 4 years. In addition, net taxes also rise following a government spending shock, albeit less than spending. Similar to Fatás and Mihov (2001b), they find that higher government spending increases private consumption, whereas the investment response is mostly insignificant. There is also a similar, insignificant response of hours worked, while Caldara and Kamps (2008) diverge in finding that the real product wage increases persistently. Therefore, their empirical results regarding increases of consumption and real wages are in line with most New Keynesian predictions, although the insignificant reaction of hours worked is at odds with the theoretical prediction of rising employment. As far as tax shocks are concerned, they find that there is an insignificant reaction of government spending, which implies a deficit-reducing effect. Overall, their separate analysis of spending and tax shocks thus points to significant positive spending multipliers and an absence of tax multipliers.

Additional studies extend Cholesky VARs to investigate effects of fiscal policy to the open economy context. One of the first such studies is Kim and Roubini (2008), who are primarily interested in the effects of fiscal policy on the current account and the real exchange rate in the United States in the post-Breton Woods period. Unlike most other studies (Table 4.1 above), their baseline specification includes budget deficits instead of spending or taxes, which is in line with their aim to study the "twin deficit" hypothesis. Their main finding is that higher budget deficits cause persistent output increases and higher real interest rates, in line with finding of other studies surveyed above. However, budget deficit shocks also result in improved current account balances and real exchange rate depreciation, thus pointing to "twin divergence" instead of "twin deficits". These results are quite robust to a wide array of checks such as alternative definitions of the budget deficit, various budget components and current account components. Therefore, they note that the result is contrary to the predictions of most theoretical models, while the models that predict such behaviour include different mechanisms from the ones they find in their extensions of the baseline specification. The extensions indicate that the improved current account in the wake of higher budget deficits reflects Ricardian responses, which increase private saving, as well as crowding out effects, since private investment declines. Overall, higher private saving and lower private investment thus offset the higher budget deficit in the short run. Further, the real depreciation is a result mostly of nominal depreciation and not of relative price changes, which points to price stickiness, in line with assumptions in most New Keynesian models.

Corsetti and Muller (2006) extend the study by Kim and Roubini (2008) to Australia, UK and Canada, which differ in their trade openness[71] (Table 4.1 above). For the US, they confirm earlier findings that fiscal expansions do not worsen the external balance, and might even improve it, but they have a negative impact on private investment. Similar findings are reached for Australia, which has an intermediate level of openness. On the other hand, they find evidence for twin deficits for the more open economies of UK and Canada, where expansionary fiscal policy shocks worsen the external balance, while there is little impact on private investments. Therefore, they find some empirical evidence for the predictions of their theoretical model that the effects of fiscal policy depend crucially on the level of openness and shock persistence. However, results on the reaction of relative prices and interest rates point to some uncertainty regarding the precise transmission channels of fiscal policy.

4.2.2 Blanchard-Perotti structural VARs

The main drawback of the recursive identification is the crucial importance laid on the ordering of variables, since that translates into contemporaneous restrictions that are imposed on the reaction of variables to structural shocks. Therefore, an alternative identification approach for fiscal policy shocks was first laid out by the seminal paper by Blanchard and Perotti (2002) in a fairly simple model consisted of government spending, taxes and output. It was later expanded by Perotti (2005) to also include inflation and interest rates. We follow the explanations in the

[71] Corsetti and Muller (2006) refer to the 2003 mimeo version of the Kim and Roubini (2008) study.

latter study to lay out the intuition behind what has since become known as Blanchard-Perotti Structural VAR[72], henceforth BP-SVAR.

Perotti (2005) sets out a VAR with the following ordering: real government spending per capita, real net primary revenues per capita, real output per capita, the GDP deflator inflation rate and 10-year nominal interest rates[73]. The initial point in the identification of structural shocks consists in the decomposition of reduced-form VAR disturbances u_G and u_R of the spending and revenue equations respectively as linear combinations of three components: automatic reaction of fiscal policy (to output, but also to inflation and interest rates); systematic or endogenous discretionary response of fiscal policy; and exogenous discretionary policy or structural fiscal policy shocks (Eq. 24 and Eq. 25).

$$u_t^G = \alpha_{GY} u_t^Y + \alpha_{G\pi} u_t^{\pi} + \alpha_{Gi} u_t^i + \overbrace{\beta_{GR} e_t^R + e_t^G}^{\substack{\text{exogenous discretionary policy} \\ \text{(structural fiscal policy shocks)}}} \quad \text{Eq. 24}$$

$$u_t^R = \underbrace{\alpha_{RY} u_t^Y + \alpha_{R\pi} u_t^{\pi} + \alpha_{Ri} u_t^i}_{\substack{\text{automatic + systematic discretionary} \\ \text{response of fiscal policy to output,} \\ \text{inflation and interest rates}}} + \beta_{RG} e_t^G + e_t^R \quad \text{Eq. 25}$$

In these equations, α coefficients capture the contemporaneous reaction of government spending and revenues, in the first and second equation respectively, to economic movements (output, inflation and interest rates). In other words, α coefficients represent the sum of the automatic response and systematic discretionary policy. The equations also capture the contemporaneous response of spending and revenues to fiscal policy shocks, e_t^G and e_t^R. Indeed, e_t^G and e_t^R represent the exogenous policy, or structural spending and revenue shocks respectively, and it is assumed that their contemporaneous covariance is zero, but they are clearly correlated with

[72] Following the literature, we denote all VARs where identification restrictions are imposed as structural VARs (SVARs), including recursive VARs. Perotti (2011b) acknowledges this practice, but notes that there is nothing structural in recursive VARs, since they rely on a simple Cholesky decomposition, unlike other approaches that use different identification methods.

[73] The inclusion of long-term interest rates is justified by the argument that they are more important for consumption and investment than short-term interest rates. However, the use of short-term rates is quite common in the literature (Table 4.1), which often reflects data availability, but is also included as a better indicator of monetary policy.

reduced-form residuals u_t^G and u_t^R. In order to identify the structural shocks, the key assumption is that there is an absence of systematic discretionary policy within the quarter. This is a reasonable assumption, which rests in the well known decision lags of fiscal policy, since it takes more than a quarter for policymakers to react to economic movements (Blanchard and Perotti, 2002). Therefore, in the absence of a contemporaneous discretionary response, α coefficients in Eq. 24 and Eq. 25 above represent only the automatic response of spending and revenues respectively to economic movements, or their output, inflation and interest rate elasticities in this case. The major contribution of Blanchard and Perotti (2002) and Perotti (2005) is that they calculate these elasticities on the basis of a careful study of institutional information, statutory tax brackets, statutory unemployment benefits and other information. This is done in a similar manner to the calculation of automatic stabilizers by official institutions such as OECD and the European Commission, as surveyed in Chapter 2. Once these elasticities are obtained (α coefficients), the cyclically-adjusted fiscal shocks can be calculated in the following manner, i.e. by subtracting the automatic response from overall reduced-form disturbances:

$$u_t^{G,CA} = u_t^G - \left(\alpha_{GY} u_t^Y + \alpha_{G\pi} u_t^{\pi} + \alpha_{Gi} u_t^i\right) \quad \text{Eq. 26}$$

$$u_t^{R,CA} = u_t^R - (\alpha_{RY} u_t^Y + \alpha_{R\pi} u_t^{\pi} + \alpha_{Ri} u_{t)}^i \quad \text{Eq. 27}$$

From Eq. 24 and Eq. 25 above, the right hand side of Eq. 26 and Eq. 27 can be replaced by the following relations:

$$u_t^{G,CA} = \beta_{GR} e_t^R + e_t^G \quad \text{Eq. 28}$$

$$u_t^{R,CA} = \beta_{RG} e_t^G + e_t^R \quad \text{Eq. 29}$$

Therefore, it is clear that cyclically-adjusted spending and revenue shocks are no more than linear combinations of the two structural fiscal policy shocks, e_t^G and e_t^R. In order to identify structural shocks, a final assumption is necessary regarding the restriction that is needed on the β coefficients to make one of them equal to zero. Perotti (2005) claims that there is little theoretical or empirical guidance on how to identify them, so he tries both options. However, he finds little difference whether β_{RG} is identified and estimated and β_{GR} is restricted to zero or vice versa, so he uses β_{GR} =0 as a benchmark. Effectively, this means that decisions on spending are taken before those on revenues. After applying this procedure to identify exogenous, or structural fiscal policy shocks, it is relatively straightforward to use them to analyse the response of output and other economic variables to these shocks.

Eq. 30 below presents the matrix representation of restrictions imposed in the BP SVAR approach, as used by Perotti (2005) for the SVAR on the United States data. It is important to note here that it differs in several important aspects from a recursive identification, which would have a lower triangular A_0 matrix in the left hand side, where all α coefficients above the diagonal would be restricted to zero, and those below the diagonal would be freely estimated. In addition, the B matrix in the right hand side would be an identity matrix for recursive identification, whereas here one of its elements (β_{RG}) is estimated, as noted above. This means that, with this ordering of variables, in the Cholesky identification α_{RY} and $\alpha_{R\pi}$ would be restricted to zero, so there would be no contemporaneous effects of output and inflation to taxes. The crucial advantage of the BP approach is that, instead of a zero restriction, it imposes restrictions on these coefficients on the basis of calculated elasticities from institutional information. For instance, Perotti (2005) imposes 1.85 and 1.25 for net revenue elasticity to output and inflation respectively for the United States. In addition, instead of a zero restriction, Perotti (2005) also calculates the inflation elasticity of government spending to be equal to -0.5, arguing that government wages do not react contemporaneously to inflation, which means government employees have a reduction in real wages in cases of inflation shocks. Finally, the different ordering and the additional restrictions now also allow an estimation of a contemporaneous effect of taxes to output and inflation. This means that coefficients α_{YR} and $\alpha_{\pi R}$ are unrestricted, as opposed to being restricted to zero in the recursive identification when taxes are ordered after output and inflation. Other assumptions are similar to the recursive identification. For instance, the output elasticity of government spending net of transfers is set to zero (α_{GY}). In addition, the definition of fiscal variables net of interest means that interest rate changes do not have a contemporaneous effect on government spending and net revenues, so the interest elasticity of spending and revenues is also set to zero (α_{Gi} and α_{Ri}).

$$\begin{bmatrix} 1 & 0 & 0 & 0.5 & 0 \\ 0 & 1 & -1.85 & -1.25 & 0 \\ -\alpha_{YG} & -\alpha_{YR} & 1 & 0 & 0 \\ -\alpha_{\pi G} & -\alpha_{\pi R} & -\alpha_{\pi Y} & 1 & 0 \\ -\alpha_{iG} & -\alpha_{iR} & -\alpha_{iY} & -\alpha_{i\pi} & 1 \end{bmatrix} \begin{bmatrix} u_t^G \\ u_t^R \\ u_t^Y \\ u_t^\pi \\ u_t^i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{RG} & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^G \\ e_t^R \\ e_t^Y \\ e_t^\pi \\ e_t^i \end{bmatrix} \qquad \text{Eq. 30}$$

A natural point to start the review of empirical literature using this approach is the study that first proposed it by Blanchard and Perotti (2002). They include three variables in their baseline VAR on US data: real government spending per capita, real net taxes per capita (without transfers and interest payments) and real GDP per capita (Table 4.1 above). As noted above, the important innovation in their paper is that they identify government spending and net tax shocks by incorporating institutional information to calculate output elasticities of various components of taxes and spending. They find that government spending shocks have a positive effect and tax shocks have a negative effect on output. This conclusion is fairly robust to various extensions, such as the inclusion of deterministic or stochastic trends, various dummy variables, checks for anticipation effects or the analysis of sub-periods. In addition, fiscal multipliers are generally small and close to one, while the contemporaneous spending multiplier is marginally higher than the tax multiplier. They also extend the study to GDP components. In this part, they find that the positive effect of spending shocks on output works through a positive response of private consumption, whereas the response of investments is negative, as is the response of exports and imports. In addition, they find that investment declines both in cases of spending and tax shocks. Therefore, they conclude that the results point to mixed support for traditional theories: the positive response of consumption to government spending shocks is at odds with the neoclassical theory, whereas the fall in investments both for higher taxes and higher spending is at odds with the Keynesian theory which predicts opposite reactions to the two shocks.

Perotti (2005) extends the study by Blanchard and Perotti (2002) to US and four other OECD countries on which he is able to find non-interpolated quarterly data (Table 4.1 above)[74]. He also extends the VAR with inflation and 10-year nominal interest rates in the VAR, arguing that the latter are more important for consumption and investment decisions compared to short-term rates. There are numerous results from various specifications, sub-samples and robustness checks, but the study also presents some fairly robust findings. Fiscal policy multipliers are generally small and the multiplier exceeds one only in US and Germany. However, this is mostly driven by the initial period, since splitting the sample yields multipliers larger than one in few cases before 1980. Indeed, there is consistent evidence that government spending multipliers have become weaker over time, and after 1980 the response of GDP,

[74] This study is further extended by Perotti (2008) in order to shed more light on the response of consumption and real wages in US and three other OECD countries (Table 4.1 above). In their comparison of identification approaches in fiscal VARs, discussed in Subsection 4.3.2, Caldara and Kamps (2008) also employ the BP SVAR approach, and find similar results to their application of the recursive approach (discussed above).

consumption and especially investment is either very small or negative. Tax multipliers are smaller than one in all countries, and they are again driven by the first sub-period, since after 1980 they are consistently negative in all countries except Canada. Additional checks confirm that there is little evidence for frequent claims that tax cuts are more effective than spending increases. Further, spending shocks have a generally positive effect on nominal and real interest rates after 1980, whereas government spending generally has small effects on prices.

While most studies focus on the United States, there are several studies that extend the BP SVAR approach to other, mostly developed countries (Table 4.1 above). For instance, Heppke-Falk et al. (2010) study effects of fiscal policy in Germany between 1974 and 2004. They note that they could be using a Vector Error Correction Mechanism approach, since variables are all integrated of order one, but decide to estimate a SVAR instead because the economic interpretation of cointegrating vectors in VECM can be difficult with many disaggregated time series (i.e. it is difficult to find and impose economically meaningful cointegrating restrictions). Baseline results indicate that the positive response of output to spending is only significant at impact and the multiplier is lower than one, whereas the response of output to revenue shocks is insignificant. Prices only increase in cases of spending shocks, whereas the response of interest rates is insignificant for both spending and revenue shocks. Further, government spending shocks have a significant positive impact on consumption only, whereas responses of both consumption and investment to revenue shocks are insignificant, in line with most findings for the US.

Further, Giordano et al. (2007) apply the BP SVAR approach to Italy between 1982 and 2004 (Table 4.1 above). It should also be noted that, similar to some other studies (e.g. Heppke-Falk et al. (2010) for Germany), due to data availability they also use cash-based data for the fiscal variables, although non-interpolated quarterly data on an accrual basis are generally preferred (as discussed in Subsection 4.3.1). From the spending components, only purchases of goods and services have a significant effect on GDP, with cumulative multipliers larger than one up to four years after the shock. Government purchase multipliers at the higher range of the ones in OECD countries are attributed to the low persistence of fiscal shocks, as well as the negative response of net revenues, which further stimulates economic activity. Further, government spending generally has a small positive effect on inflation, and an insignificant effect on interest rates. In addition, higher government purchases of goods and services also increase private consumption and investment, while the effects of total government spending are insignificant. Finally, they find that the effects of revenue shocks are very small.

The studies surveyed here share not only a relatively common set of variables in the baseline VAR (Table 4.1 above), but they also omit debt from their investigation[75]. However, this issue has attracted some attention in the recent literature. For instance, Favero and Giavazzi (2007) criticise the omission of debt from standard VARs, since a fiscal shock is expected to constrain future revenues and/or spending in order to meet the intertemporal budget constraint. Indeed, they criticise the VAR literature because it ignores the debt dynamics that follows the fiscal shock, as well as the possible reaction of taxes and spending to the debt level. This omission could yield incorrect impulse responses due to potentially biased estimates and implausible implicit debt paths. They also note that the usual argument that variables usually included in VARs already include the elements that enter in the government intertemporal budget constraint is not sufficient to account for these possible effects. Therefore, they estimate two versions of VARs similar to Perotti (2005): one without, and the second with an inclusion of the debt-to-GDP ratio. However, most conclusions of the baseline studies on the effects of fiscal shocks remain qualitatively unchanged. The most important exception is related to the response of long-term interest rates to fiscal shocks. Indeed, they find that, in the second analysed sub-period (1981-2006), long-term interest rates initially fall in cases of spending shocks (as in the 1960-1979), but rise over time if the debt feedback is included.

4.2.3 Sign restrictions

The third approach to the identification of fiscal policy shocks consists of imposing sign restrictions on VAR impulse responses. This method was first proposed in the context of monetary policy studies by Uhlig (1999), and was later extended to fiscal policy studies by Canova and Pappa (2007) and Mountford and Uhlig (2009). However, as Rusnak (2011) notes in his survey of fiscal multiplier studies, the sign restriction approach is used far less than the recursive and BP SVAR approaches. Therefore, here we only present the key features of this approach as used by Mountford and Uhlig (2009) as one of the most important studies[76].

[75] One exception is Marcellino (2006) in their analysis of the effects of fiscal policy shocks in the four largest euro area countries. They find that baseline results are fairly robust to the inclusion of public debt.

[76] Caldara and Kamps (2008) also apply the sign restrictions approach in their study of US fiscal policy using various identification approaches (Table 4.1 above).

Unlike the previous two approaches, the sign restrictions approach does not impose size restrictions on the contemporaneous relations between variables. Instead, it imposes restrictions on the signs of the impulse responses of variables to particular shocks. The identification is achieved by assuming that various variables react in a different manner to various shocks. In addition, unlike the recursive and the BP SVAR approach, the sign restrictions approach does not prescribe the number of restrictions in order to reach identification, and it is possible to identify shocks with few restrictions. Instead, the necessary restrictions depend on the number and nature of shocks one aims to identify and in particular on the successful discrimination between the reactions to the identified shocks and to other shocks affecting the variables.

The sign restrictions approach is relatively flexible on the number and manner in which shocks are identified. Mountford and Uhlig (2009) use Bayesian estimation[77] to analyse fiscal policy effects in the US between 1955 and 2000 (Table 4.1 above). They identify five shocks (of which three are fiscal) by imposing a mix of zero and sign restrictions on the impulse response of various variables in the VAR for the current and three periods ahead. Shocks which move output, consumption, non-residential investment and revenues all in the same direction are identified as business cycle shocks. However, this restriction also employs a crucial identification assumption: all movements of both GDP and revenues in the same direction are attributed to business cycle shocks, which thus reflect expansions driving the rise of government revenues, not vice versa. While this is a reasonable assumption, it does have an important drawback that it does not allow for potentially important episodes of expansionary fiscal contractions (e.g. higher GDP in the wake of higher taxes). Further, shocks causing higher interest rates, lower monetary base and lower prices up to a year later are identified as monetary policy shocks, which is a fairly standard approach in the literature.

An important point in the identification of fiscal policy shocks is the assumption that they are orthogonal to business cycle shocks, and potentially to monetary policy shocks. The orthogonality constraint means that business cycle shocks and monetary policy shocks are identified before fiscal policy shocks, i.e. it is excluded that the response of fiscal variables to fiscal policy shocks is the same as the response to the two other shocks. The implication is that all responses of fiscal

[77] Bayesian estimation is common when sign restrictions are imposed, which are hardly ever applied with classical estimation, although Moon et al. (2011) propose a method to do so. On the other hand, the other identification approaches are possible with both estimation methods. Indeed, Caldara and Kamps (2008) also use Bayesian methods in their comparison of fiscal VARs, but note that median impulse responses are virtually the same as point estimates with the classical approach.

variables consistent with business cycle and monetary policy shocks are attributed to them, whereas the residual responses are then attributed to fiscal policy shocks.

Mountford and Uhlig (2009) identify three separate fiscal policy shocks by restricting the response only of fiscal variables in the current and future three quarters. The identification of three shocks aims to capture the variety of fiscal policies and possible policy mixes: revenue shocks (revenues rise and spending is kept unchanged, implying higher budget surpluses), deficit-financed spending shocks (spending rises and revenues are kept unchanged, which implies deeper budget deficits) and balanced budget spending shocks (higher expenditures financed by higher revenues). Their main results indicate that it is important to control for the business cycle shock, but not for the monetary policy shock. Deficit-financed spending shocks have a relatively weak positive short-term impact on output, with the spending multiplier well below one. In addition, spending shocks have little impact on private consumption and interest rates, but they strongly crowd out both residential and non-residential private investment. On the other hand, deficit financed tax-cuts (i.e. negative revenue shocks) have a very effective positive impact on output, with a multiplier that is initially low but rises to two after two years, as well as a positive impact on private consumption.

4.2.4 The event-study approach

The event-study approach[78] uses exogenous information on military build-ups to identify fiscal policy shocks and study their impact on the economy and has been applied exclusively to US data. In essence, it identifies military build-up episodes based on various news sources, which are treated as exogenous because they are not related to domestic economic movements but driven by foreign policy considerations. It was first introduced by Ramey and Shapiro (1998), who used a univariate context to study the response of various variables to spending shocks, which were captured by dummy variables representing several large military build-up episodes in the US after the Second World War (the Korean War, the Vietnam War and the Carter-Reagan build-up). Edelberg et al. (1999) and Burnside et al. (2004) extended it to a VAR approach, which has since become common in this literature. Finally, a similar

[78] The event-study approach is sometimes labelled "dummy variable" approach, but this is not entirely correct in terms of the extensions in Ramey (2011a). We also avoid the label "narrative approach" and in line with common practice apply it to the approach in the next subsection.

approach that utilises military spending with long annual US data is used by Hall (2009) and Barro and Redlick (2011).

The proponents of the event-study approach claim that it has several advantages over the other approaches, particularly the recursive identification and BP SVARs (as discussed in Subsection 4.3.1). On the other hand, the event-study approach is only appropriate for studying spending shocks and not revenue shocks. In addition, it is only applicable to the United States, since it is difficult to identify large military spending episodes in other countries. Therefore, due to its importance in exposing methodological criticisms of recursive and BP SVARs, here we explain the main features of this approach and some important results based on the important study by Ramey (2011a), but we abstract from extensive details of this method.

The main aim of Ramey (2011a) is to compare the results of several versions of the event-study approach to BP SVARs for government spending shocks. She starts from a fairly standard VAR consisted of real government spending, real GDP, hours worked, real private consumption, real private fixed investment, marginal tax rates and real product wages. In her baseline version, she extends the VAR with a dummy variable for four military episodes, which are identified based on news sources reporting large expected rises in defence spending induced by foreign policy considerations. The military dates variable is ordered first in the VAR and its shocks (identified recursively) are used as government spending shocks, similar to the BP SVAR which orders government spending first and identifies spending shocks in a recursive manner. In the wake of spending shocks, GDP and hours worked rise in both approaches, although by more in the event-study approach. However, the BP SVAR approach also finds higher private consumption and real wages, in line with most New Keynesian predictions, whereas the event-study approach finds lower private consumption and wages, consistent with the RBC literature. Using additional checks, Ramey (2011a) traces this difference to timing issues. That is, she argues that the event-study approach correctly takes into account anticipated effects, and hence it better captures the response of the other variables to exogenous spending shocks. In contrast, it is argued that what the BP SVAR identifies as exogenous spending shocks are in fact anticipated spending rises, thus leading to spurious findings of positive responses of GDP, consumption and wages to spending shocks. Indeed, delaying the shocks identified via military dates yields similar results to the original BP SVAR approach, indicating that in the latter there is a delay in the identification of shocks, which accounts for the difference in results between the two approaches.

4.2.5 The narrative approach

The narrative approach is based on a similar idea as the event-study approach, but uses a more comprehensive and careful investigation of various sources of information to identify exogenous changes in fiscal policy. It was first proposed by Romer and Romer (2004) in the context of monetary policy, and was extended to fiscal policy or more precisely to tax shocks in the seminal contribution by Romer and Romer (2010). The narrative approach consists of a careful study of official presidential and legislative records to uncover the motivation behind changes in taxes. This in fact represents the main advantage of the narrative approach, i.e. it does not rely on potentially contentious identification restrictions to identify exogenous fiscal policy shocks like the first three approaches. However, similar to the event-study approach, this method is also inapplicable beyond the United States and a few other developed countries to which it has recently been extended[79]. Indeed, it requires the existence and investigation of detailed and sufficiently long public and official records containing the intentions behind fiscal policy changes. Such records are either not available, or not easily accessible (not least for linguistic reasons) for several European countries, which are our main focus. Therefore, since we will not be using this method in our empirical analysis, here we will present only the main results in the key paper in this literature. In addition, for the same reasons, here we will refrain from a detailed description of important methodological extensions with potential effects on the results, which will be discussed in Section 4.3.

Romer and Romer (2010) use official information such as Presidential speeches and Congressional records to create a series of shocks to government revenues, including their size, timing and motivation between 1947 and 2006. They distinguish two types of legislated tax changes: endogenous changes, which are taken as counter-cyclical measure or in response to spending movements, and exogenous changes, which are taken as a result of concerns about inherited deficits, long-run growth or other reasons. Then, in their baseline specification they use this series of revenue shocks as a determinant of output changes in a single equation framework, although

[79] Using official budget sources on fiscal policy between 1945 and 2009, Cloyne (2013) constructs a narrative dataset and applies this approach to analyse effects of tax changes in the United Kingdom. In addition, using historical records such as budget speeches and IMF documents, Devries et al. (2011) build a database of fiscal consolidation episodes in 17 OECD countries between 1978 and 2009 which is used by Guajardo et al. (2011) in their application of the narrative approach to study the effects of consolidations on economic activity. They also note that no other multi-country dataset based on the narrative approach has been compiled.

they also present some simple VAR results[80]. Their main results indicate that exogenous revenue shocks have a significant and quick impact on output, with the fiscal multiplier for tax cuts around three. Robustness checks confirm the main results, with the multiplier higher than two. In addition, they find that the response of output is quite persistent, and that it is driven mostly by higher private investments. On the other hand, broader measures of revenue shocks result in considerably lower multipliers than exogenous tax changes, thus providing strong arguments for correct identification of the motivation of tax changes in order to avoid biased results.

4.3 Summary of fiscal VAR studies

The previous sections described the main approaches to the identification of fiscal policy shocks in the fiscal VAR literature, as well as the main results of the most important studies of each approach. There are two main conclusions that arise from this survey. First, various approaches have significant differences in the restrictions imposed to identify fiscal policy shocks, as well as in the treatment of the anticipation problem in fiscal policy. The next subsection will discuss these issues more closely, as well as the related issue of the frequency and type of data used in fiscal VARs. Second, in the wake of the lack of agreement regarding the size and even the direction of fiscal policy effects, a question naturally arises whether there are systematic reasons for the different results in the literature. This will be the focus of Subsection 4.3.2. We will discuss these issues by comparing and contrasting the five main approaches and pointing to some important aspects. However, in both sections we will focus on main issues and arguments only, as a detailed discussion of these issues is beyond the scope of our study. For the sake of brevity, we will be concise on the features of particular approaches, since these issues were discussed in Section 4.2.

4.3.1 Reconsideration of the main problems of VAR studies

The identification of fiscal policy in the recursive and the BP SVAR approach exploits the delay between economic movements and reactions by policymakers, which typically appear at least a quarter after economic movements (Blanchard and Perotti, 2002). The recursive approach uses this information to identify government

[80] As discussed below, the narrative approach has been extended to a VAR framework by Perotti (2011a) and Favero and Giavazzi (2012).

spending shocks by ordering government spending first in the VAR. This procedure is well accepted and fairly straightforward, reflecting the fact that recursive VARs are one of the main tools of modern empirical macroeconomics. However, the weakness of the recursive approach is that the identification of other shocks might be problematic, since it depends on how variables are ordered and involves the imposition of potentially contentious zero restrictions on the contemporaneous relations between other variables.

There are three main ways to deal with this problem. First, some authors focus only on government spending shocks. Indeed, as long as one is interested only in the shock to the variable ordered first in the VAR (government spending in this case), the ordering of other variables does not matter (Christiano et al., 1999). Second, a few authors proceed with using recursive identification to analyse revenue shocks as well, noting that the results are subject to the drawbacks regarding identification restrictions. Third, some studies use alternative identification approaches. Among them, the approach most closely related to the recursive VAR is the BP SVAR. Its initial point is also related to decision lags, which imply that contemporaneously there is no discretionary response of fiscal policy to economic movements. The BP SVAR approach also identifies government spending shocks via recursive identification by ordering them first. However, it pays much more attention to the identification of revenue shocks, which is based on a careful investigation of institutional and legal sources regarding contemporaneous relations between variables.

Proponents of the BP SVAR approach note that an important condition for both the recursive and the BP SVAR approach is that one uses quarterly data on fiscal variables, preferably on an accrual basis and not interpolated from annual data. It is argued that the quarterly frequency is crucial because identification relies on decision lags, i.e. on policymakers not reacting to economic movements in the same period. Further, some authors argue that the fiscal data used should be recorded on an accrual basis, not a cash basis[81] (Perotti, 2005). While the use of the accrual method is prescribed by modern macroeconomic accounting standards, often these series are not very long, since data have often been recorded on a cash basis in the past and often continue to do so, at least partially. Indeed, there are very few countries, mostly developed ones, where long enough accrual data are available. All this leads some authors to use cash-based data in lack of any other option for the countries they are

[81] The cash method registers fiscal receipts and outlays when the budget receives or makes the payment. The accrual method registers revenues and spending at the time of the activity for which they are received or paid. Public investments are one of the main areas where discrepancies arise due to long implementation periods and the particular details of the method used to register the payments and the activity. For an intuitive description and more details on these issues, see Perotti (2005).

studying (e.g. Heppke-Falk et al. (2010) for Germany and Giordano et al. (2007) for Italy). This also applies to most transition countries, where long enough series of fiscal data are only available on a cash basis. In addition, it is often argued that one should use non-interpolated fiscal data, i.e. data originally collected at quarterly frequency since interpolation from annual data might induce a wrong seasonal pattern as well as impute incorrect dynamics in the data, thus yielding potentially spurious results (Ilzetzki et al., 2013). Indeed, in the studies surveyed above, authors often restrict the sample to the countries where non-interpolated quarterly data are available. However, this is also a data availability issue, since national statistics often only publish fiscal data which are explicitly or implicitly interpolated from annual data at various degrees.

While both the recursive and the BP SVAR approach with quarterly data exploit the decision lags in fiscal policy to identify fiscal policy shocks, they are often criticised because they ignore legislative and implementation lags as an important feature of the fiscal policy process. These lags imply that fiscal policy measures are often proposed, discussed or decided well before they actually come into force and have an effect on the economy. Economic agents might therefore anticipate future fiscal policy and change their current behaviour, which gives rise to the anticipation problem, or the problem of fiscal policy foresight. If the econometric estimation ignores this effect of anticipated fiscal policy on current variables, then the estimated response of output and other variables may be wrongly attributed to current fiscal policy, which may hence yield biased fiscal multipliers[82]. The serious econometric implications of fiscal foresight were analysed theoretically in an influential paper by Leeper et al. (2009), who focus on tax shocks but their findings can be generalised to spending shocks as well. According to them, with fiscal foresight, in equilibrium there is a misalignment between the information set available to the econometrician and the one available to economic agents in reality. This prevents the recovery of structural shocks from the data in a conventional manner in standard VARs. Formally, fiscal foresight results in equilibrium time series with a non-fundamental representation as they contain a non-invertible moving average component.

In view of this criticism regarding the problems of fiscal foresight, the empirical literature generally proceeds in one of the following three manners to address the fiscal foresight problem. First, numerous authors continue to use the recursive or the BP SVAR approach, which as the meta-regression analysis in Rusnak (2011) shows, are still by far the most used empirical approaches in studying the

[82] See Perotti (2011b) for an algebraical exposition of the resulting bias in SVARs.

effects of fiscal policy. However, most of these studies do recognise potential consequences of anticipated policy, but rely on various arguments why they are likely to be small and hence can be neglected. For instance, Perotti (2005) shows that the effects of government spending shocks are inadequately estimated only if the omitted announcement shock is serially correlated. In such a case, the estimated fiscal policy shock also picks up the direct effect of the omitted shock on output, as well as indirect effects via interest rates, which generally reflect announcement shocks immediately. He also notes that the extent to which the expected fiscal policy by the private sector relies on official policy announcements is ultimately an empirical issue. Indeed, his analysis for the US and four other OECD countries shows that policy announcements are generally unable to predict reduced-form VAR spending and revenue residuals[83]. This indicates that policy announcements have little impact on how the private sector forms its expectations and how it behaves. In addition, he notes that the importance of the estimated shock being unanticipated depends on unanticipated and anticipated shocks having different effects, which is a controversial empirical issue. Further, Mertens and Ravn (2010) develop a fiscal SVAR estimator for cases when fiscal shocks are anticipated. They conclude that anticipated effects are problematic in standard VARs if the anticipation rate is low[84] (which is contrary to standard economic theory) and if anticipated shocks are important. However, in their empirical application to US data they fail to find evidence that would oppose the findings of the standard VAR studies. The DSGE investigation of identification approaches in Chahrour et al. (2012) also fails to find evidence that the BP SVAR approach is biased due to anticipated effects. Moreover, several authors explicitly or implicitly use the findings by other studies such as Giannone and Reichlin (2006), Yang (2007) and Sims (2012). Their findings imply that including forward looking variables in the VAR can mitigate the fiscal foresight problem and the accompanying non-invertibility arising from fiscal foresight, and consequently minimise the potential bias in VARs. According to these studies, variables such as private consumption, investment, prices or interest rates react to anticipated fiscal policy, implying that their inclusion can be used to capture future policy, i.e. as a way to control for anticipated policy. Therefore, empirical studies typically include some or all of these variables in the VAR in order to capture anticipated effects of fiscal policy and identify proper unexpected fiscal shocks. Doing so helps not only to minimise the fiscal foresight problem, but also to discriminate

[83] Most studies using the recursive or the BP SVAR approach, including some of the studies surveyed in Section 4.2.2 above, also check for possible anticipation effects in similar manners, but tend to find that their baseline results are quite robust.
[84] Low anticipation rates mean economic agents discount future news at higher rates.

among competing economic theories, which have different predictions about the response of these variables to fiscal shocks.

A second way to deal with the anticipation problem is to use annual instead of quarterly data. The main advantage of using annual data in this context is that fiscal policy is less likely to be anticipated one year ahead than one or two quarters ahead (Perotti, 2008). Beetsma and Giuliodori (2011) note that an additional important advantage of using annual data is that the recovered shocks are more realistic, since new fiscal impulses typically do not appear at quarterly frequency, but once a year when the budget is adopted (and perhaps in mid-year budget supplements). They also note that advantages of annual data include the avoidance of: (i) particular quarterly features of certain taxes or government outlays and (ii) seasonality problems. Last but not least, annual data may often be the only fiscal data available, since in many cases, including some European countries and most transition countries, long enough series of non-interpolated quarterly data are not available. However, while the use of annual data does help with the anticipation problem, it might make identification of fiscal policy shocks more difficult. This is due to the fact that identification in the recursive and BP SVAR approaches relies on decision lags, i.e. on the assumption that policymakers do not react contemporaneously to output movements. This is reasonable at quarterly frequency, but with annual data this implies that they do not react to economic movements during the year. However, although this might seem as a too strong assumption, there is no consensus on this issue in the literature. One argument for relying on annual data again relates to the fact that there is only one important fiscal event in a year - the government budget. Therefore, budget limits on spending, revenues and deficits may constrain policymakers from responding quickly to contemporaneous economic movements. In addition, Beetsma et al. (2006) and Beetsma et al. (2009) provide some robustness checks with quarterly data that show that identification restrictions with annual data are plausible for countries where this exercise could be carried out, i.e. where non-interpolated quarterly fiscal data exist. Their findings are often used as an additional argument for proceeding with annual data in part of the literature (besides the data availability problem). Indeed, there are several studies which use fiscal VARs with annual data. For instance, Bénétrix and Lane (2009) use a VAR with recursive identification to analyse effects of government spending shocks in Ireland. In addition, several of the studies surveyed in Section 4.2 extend their baseline quarterly VAR studies to annual data, typically on the US and a few other OECD countries for which long enough data are available (e.g. Perotti

(2008)). Last but not least, annual data are typically used in studies which employ the panel VAR approach, surveyed below.

A third way to deal with both the anticipation problem (and the potentially contentious identification restrictions) in the recursive VAR and BP SVAR is to use an alternative identification approach. Indeed, all the three alternative approaches were developed with the aim to overcome the pitfalls of recursive VARs and BP SVARs regarding identification restrictions and consequences of anticipated fiscal policy. For instance, proponents of the sign restrictions approach (e.g. Mountford and Uhlig (2009)) claim that it successfully handles the anticipation problem, which is achieved not by imposing zero or quantitative restrictions on contemporaneous relations between variables, but by imposing restrictions on the sign of their contemporaneous and future responses to particular fiscal shocks. Further, the restrictions to identify fiscal policy shocks can be imposed in a relatively "atheoretical" or "agnostic" manner, thus avoiding the imposition of potentially contentious identification restrictions based on ordering or institutional information. More precisely, fiscal shocks can be identified by imposing restrictions on the response fiscal variables (and imposing orthogonality to other identified shocks, as described in Subsection 4.2.3), and not by imposing restrictions on the movement of output, consumption and investment. Therefore, the method is "agnostic" regarding the response of these key non-fiscal variables of interest to fiscal shocks (Mountford and Uhlig, 2009). In addition, identification relies purely on the data, and not on institutional and other information to separate fiscal policy shocks from business cycle shocks (i.e. automatic stabilizers). Last but not least, restrictions can be imposed in a minimalistic manner, e.g. by not identifying all the shocks but only the ones in the focus of the particular study. Nevertheless, despite its relative flexibility, the sign restrictions approach is among the least used in studies of effects of fiscal policy (Rusnak, 2011). This probably reflects some of its drawbacks, such as the dependence of identification of various shocks on fiscal policy shocks being orthogonal to business cycle shocks, thus preventing "non-Keynesian" effects of fiscal policy (expansionary fiscal contractions) which are sometimes found in the empirical literature. In addition, Perotti (2005) notes that, while it deals with anticipation effects, the sign restrictions approach cannot identify the exact timing of fiscal shocks.

The final two identification approaches rely on incorporating external information from narrative records into the estimation of fiscal policy shocks and the analysis of their effects. The event-study approach has been applied to spending shocks, whereas the narrative approach has been applied to revenue shocks.

Proponents of the event-study approach claim that its main advantage lies in achieving identification not by imposing potentially contentious restrictions, but by using military episodes or expected defence spending, which are generally accepted to be exogenous to domestic economic movements. Related to this, Ramey (2011a) claims that the advantage of event-study VARs in dealing with the anticipation problem explains the different results compared to recursive and BP approaches[85], which are argued to be therefore unable to properly deal with the anticipation problem. The final approach in fiscal VAR studies is the narrative approach, which was proposed by Romer and Romer (2010) originally in a single equation setting and later extended in a VAR. It identifies revenue shocks by relying on official fiscal policy records such as Presidential speeches and Congressional records. Overall, both the event-study approach and the narrative approach claim that they avoid imposing contentious identification restrictions by relying instead on external information to identify fiscal policy shocks. Equally as important, they claim that the anticipation problem is minimised because these external information enable capturing the proper timing of the exogenous shock, which is more realistic than the recovery of shocks based on potentially contentious identification restrictions, since in the latter case responses to shocks might in reality reflect responses to anticipated fiscal policy.

However, these approaches are not universally accepted in the literature. For instance, Perotti (2008) argues that the foundations for the results of the event-study approach in Ramey (2011a) are not robust and they reflect the fact that military episodes are different, which limits their relevance for the effects of fiscal policy in normal times[86]. Besides, he also argues that the reliance on this method suffers from a severe small sample problem, which raises the possibility that military episodes are in fact capturing other important shocks possibly hitting the economy at the same time. Similar to the procedure followed in some other BP SVAR studies, he also checks and fails to find evidence that official budget forecasts Granger-cause SVAR shocks, which indicates that fiscal policy shocks identified via BP SVARs are not anticipated. In addition, Perotti (2011b) re-examines and extends the exercises in Ramey (2011a) to conclude that there is no fundamental difference in results if both the BP SVAR and the event-study are applied to the same specification and sample, which implies that the BP SVAR approach remains appropriate for empirical studies. However, Ramey (2011c) replies that findings in Perotti (2011b) are incorrect if one carefully compares the two approaches with the same specification to estimate identical samples, which

[85] As noted above, the BP SVAR approach also relies on recursive identification of spending shocks.
[86] These checks are performed on the 2006 working paper version of Ramey (2011a).

indeed yields different results between the event-study approach and BP SVARs[87]. Regarding the narrative approach, its extensions into a VAR by Perotti (2011a) and particularly Favero and Giavazzi (2012) show that results in fact often resemble the ones of the standard BP SVAR approach, thus bringing into question the advantages of the narrative approach. In addition, Mertens and Ravn (2012) argue that about half of the exogenous tax changes in the narrative approach proposed by Romer and Romer (2010) have in fact been anticipated, with a median anticipation horizon of six quarters. More importantly, both the event-study and the narrative approach have so far been almost exclusively applied to the United States. Indeed, their essential ideas make them almost impossible to apply in the context of other countries, especially transition countries. More precisely, the event-study approach relies on exogenous military build-up dates, which are hardly important outside the US. In addition, the narrative approach requires the existence in the public domain and the careful investigation of detailed official records of fiscal policy for a sufficiently long period. Again, this is generally not the case for countries other than the US and a very few other developed countries. Therefore, due to these practical constraints, as well as the inconclusive evidence on the advantages of the event-study and narrative approaches regarding the anticipation problem, the empirical literature still mostly relies on the recursive approach and BP SVARs to identify fiscal policy shocks and analyse their effects on the economy.

Another important drawback of the empirical, as well as the theoretical literature, is that very little attention is paid to the size of the fiscal multiplier in recessions. Indeed, the original Keynesian proposals on fiscal stimulus were aimed precisely at circumstances of deep recessions, with high unemployment and low capacity utilisation. Parker (2011) investigates the reasons why the literature is unable to provide a robust answer to the question regarding possibly different effects of fiscal policy in recessions and expansions, and also proposes some suggestions how to rectify this. He notes that the main reason for the inability to answer this question is methodological, since the literature typically employs linear models or linear solution methods which assume identical efficiency of fiscal policy in recessions and expansions. Indeed, variability is excluded in most DSGE models due to the fact that they are usually linearised around a single point, whereas VAR models are unable to cope with state dependence. He suggests that theoretical models should start to incorporate nonlinearities in the demand elasticity of output, which is already

[87] The debate between Roberto Perotti and Valerie Ramey is much more detailed and nuanced, but describing it in more details is beyond the scope of our study.

attracting some attention, particularly in the literature on the zero-lower-bound surveyed above. However, Parker (2011) notes that in those studies the non-linearity does not depend on the state of the economy but on fixed interest rates. On the other hand, problems are more difficult regarding the quantification of effects in VARs. The inference in standard VARs essentially depends on their linear structure, and large changes are required to incorporate state dependences in a VAR. In addition, recessions and especially deep recessions are quite rare in the data used in most studies (Table 4.1 above). Consequently, even if state dependence is modelled in a VAR, the data-intensive estimation would further exacerbate the weak inference problem in VARs, which would probably yield imprecise estimates of the multiplier. Therefore, he argues that more attention should be paid to microeconomic studies on the effects of fiscal policy, since they can estimate the partial equilibrium response of agents to particular policies. Ramey (2011b) also notes that empirical cross-state studies for the US can yield important insights on the effects of fiscal policy. However, she warns that transforming those findings into a quantification of the overall fiscal multiplier is not straightforward. It should be noted that this literature is constrained by the fact that appropriate microeconomic and cross-state data are only available for the United States. On the other hand, the recent literature also provides some advances in studying different effects of fiscal policy in recessions and expansions via extensions of conventional macroeconomic techniques. Most notably, Auerbach and Gorodnichenko (2012) use regime switching SVARs in the US context, allowing different effects of government spending and revenues over business cycles. If no endogenous regime change is allowed, than they find that impact spending multipliers are the same, but cumulative multipliers are around 2 in recessions and slightly negative in expansions. In addition, when they allow for feedback and endogenous change in regimes in response to spending shocks, spending multipliers are typically between 0 and 0.5 in expansions, and between 1 and 1.5 in recessions, although in this case the size of the multiplier varies considerably in particular points in time. However, Auerbach and Gorodnichenko (2012) note that calculating full dynamic responses in the latter case is complicated, whereas Ramey (2011b) warns that the estimation of these models is not trivial, and many important issues arise in the process[88]. The same authors extend this approach to several OECD countries in Auerbach and Gorodnichenko (2013). They confirm their previous finding that spending multipliers are larger in recessions, and they also find that the response of

[88] Besides these reasons, these methods are inapplicable for our analysis, since they require longer series than the ones available for European countries, particularly transition countries.

several other variables also varies with the cycle. On the other hand, Pereira and Lopes (2014) use Bayesian time-varying parameters VAR with BP identification to analyse spending and revenue shocks in the US between 1965 and 2009. They find a considerable decline in the effectiveness of net-taxes in stimulating output, as well as a decline in the effectiveness of spending, which is however much smaller and fairly imprecisely estimated. In addition, there is only moderate evidence that the size of the tax multiplier in recessions has increased over time. Further, Kirchner et al. (2010) use Bayesian time-varying parameters VAR with recursive identification to analyse effects of government spending shocks in the euro area between 1980 and 2008. Their main findings indicate that the effectiveness of government spending on stimulating output in the short term has increased until the late 1980s and decreased thereafter to about 0.5 in the current decade, while there has also been a considerable decline in long-term multipliers.

4.3.2 Sources of different results of fiscal VAR studies

There are several broad conclusions that may be drawn regarding the size of the fiscal multiplier and the transmission of fiscal shocks in the economy, exceptions in some studies notwithstanding. Most studies using the recursive and the BP SVAR approach tend to find that the government spending multiplier is positive and its size is usually around one. Most often, spending shocks have a positive effect on private consumption, an insignificant or negative effect on private investment, and mostly a positive effect on real wages and employment. These findings are generally in line with the New Keynesian predictions on effects of government spending shocks. On the other hand, findings of other identification approaches are fairly mixed. The event-study approach also finds a positive effect of spending shocks on output, with the fiscal multiplier around one, as well as a positive effect on hours worked, but a negative effect on consumption and real wages. Therefore, this approach tends to confirm neoclassical predictions regarding the effects of government spending. Further, the sign restrictions approach finds that spending multipliers are positive but lower than one, and there is also a generally positive reaction of private consumption. In addition, the sign restrictions approach finds strong positive multipliers of tax cuts. A strong positive effect of tax cuts is also found in the original study using the narrative approach, while later studies extending the same approach to a VAR tend to find somewhat lower multipliers, which are however still above one.

On the other hand, studies using the recursive and the BP SVAR approach typically find that revenue multipliers are lower than one or insignificant.

The diversity of results on fiscal multipliers, on the transmission mechanism of fiscal policy and on the connections to theoretical predictions is a well known feature of this literature, and it has also attracted various comments and suggestions by authors. For instance, Perotti (2008) notes that while economists mostly agree regarding the effects and transmission of monetary policy, there is little consensus regarding the theoretical predictions and the interpretation of empirical results on the effects and the transmission of fiscal policy. Leeper (2010) notes that the lack of consensus reflects difficulties in studying different datasets, econometric techniques and economic models. However, he also notes that results often diverge even when the same country and time period is concerned. Therefore, he argues that the wide range of results brings the literature into a 'fiscal multiplier morass', which is attributed to fiscal policy relying on unsystematic speculation, or what is labelled 'fiscal alchemy' as opposed to 'monetary science'. Further, in a brief survey of key empirical studies, Ramey (2011b) finds that most of them give fairly similar answers regarding the spending multiplier (between 0.6 and 1.8), despite differences in samples, specification and identification approaches. However, she also notes that the range within studies themselves is almost as wide as the one between studies, and that standard errors are typically large. When excluding lower estimates reflecting tax-financing of spending increases, and higher estimates reflecting extraordinary recessionary circumstances, she finds that the multiplier for deficit-financed temporary spending increases is plausibly between 0.8 and 1.5. However, the uncertainty involved also means that the multiplier could be somewhere between 0.5 and 2, which presumably limits the usefulness of empirical studies in policy debates. Further, Spilimbergo et al. (2009) also note that the range of fiscal multipliers is fairly wide. For instance, multipliers are between 0.3 and 0.6 for revenues, 0.5 and 1.8 for capital spending and 0.3 and 1 for other spending. In addition, they note that multipliers for low income countries generally lie between negative and 0.5. Finally, the descriptive analysis in Rusnak (2011) shows that there are no systematic differences regarding the size of the spending multiplier across four identification approaches in fiscal VARs, but that the average estimated multiplier for the US is considerably higher than for other countries.

Our survey of empirical studies and the comments by various other authors indicate that it is fairly difficult to pin point the precise source of the diversity of results on effects of fiscal policy. Indeed, this diversity could reflect a wide variety of factors, including but not limited to different countries and time periods included, different identification restrictions, possible consequences of anticipation effects, slightly different specifications (Table 4.1 above) or structural country differences. Therefore, any data reduction exercise or tabular presentation of findings would likely provide only superficial evidence, without being able to provide an answer on the systematic reasons for the diversity of findings. On the other hand, a careful investigation of the reasons for this diversity is a fairly complicated task due to the wide array of factors mentioned above and is therefore well beyond the scope of our study. However, there have been several careful attempts to reconcile the findings across various studies and to try to find systematic reasons for their diversity. Understandably, this literature is in itself both wide and detailed, so next we briefly review its main findings.

As noted above, there is a relatively long debate between two leading economists in this field, Roberto Perotti and Valerie Ramey, regarding the proper method to identify government spending shocks and the importance of anticipation effects (Perotti (2008), Ramey (2011a), Perotti (2011b) and Ramey (2011c)). Perotti is a strong advocate of the BP SVAR approach. His studies tend to find that the spending multiplier is positive and around one, and that spending shocks have a positive effect on consumption, real wages and employment, thus bringing results in line with the New Keynesian predictions. However, Ramey finds that these results are entirely due to the wrong timing of spending shocks in the BP SVAR approach, in particular its omission of importance of anticipation effects (Ramey, 2011a). She argues that when spending shocks are correctly identified with the event-study approach, the findings are in line with neoclassical predictions, particularly regarding the negative response of consumption and real wages and positive response of hours worked. While there are many important points in the debate, essentially it does not provide a useful conclusion on the proper identification method, and not even on whether results differ across methods. As Alesina and Giavazzi (2013) summarise it, Ramey believes that the event-study approach using exogenous military events is the best way to identify exogenous fiscal policy and that it is important to account for anticipation effects, while Perotti believes that the event-study approach suffers from a small-sample bias (due to very few war episodes) and incomplete consideration of other important factors, and that controlling for anticipation effects does not matter.

Caldara and Kamps (2008) provide a careful comparison of results across the first four identification approaches on the same sample of US data (Table 4.1 above) Their main findings are that the qualitative response of key variables to spending shocks in the recursive, BP SVAR and sign restrictions approaches is fairly similar and close to some of the New Keynesian predictions, although there are some differences regarding the size of the fiscal multiplier. On the other hand, results of the event-study approach are more in line with neoclassical predictions. Further, they find more divergent responses to revenue shocks across the first three identification approaches (with the event-study approach being inapplicable for revenue shocks). Their further investigation attributes this discrepancy regarding tax multipliers to the size of the automatic stabilizers which is estimated or calibrated for the various approaches. Both the recursive approach and the standard BP SVAR approach yield small automatic stabilizers, unlike large stabilizers in the sign-restrictions approach and in the BP SVAR approach when this parameter is freely estimated (instead of being calibrated based on institutional information). Therefore, they conclude that this uncertainty about the size of automatic stabilizers translates into different results of tax cut multipliers, which suggests that more attention should be paid to the modelling of tax shocks and the cyclical adjustment of taxes in fiscal VARs.

In a more recent study, these authors come back to the sources of different results in fiscal VAR studies and to the possibility of the construction of robust fiscal multipliers with SVARs (Caldara and Kamps, 2012). They again show that different restrictions across identification approaches about the output elasticity of taxes and spending yield widely different fiscal multipliers, but that there is a way to map estimates of elasticities into fiscal multipliers. Therefore, they propose that output elasticities of taxes and spending should be imposed in the form of probability distributions of elasticities based on empirical evidence. They note that this differs from the existing approaches, which either impose a 'dogmatic' single value of the output elasticity, or are very loose and impose almost no output elasticity of taxes and spending. When narrowing the elasticities to empirically plausible estimates, they find that the median tax multiplier becomes larger than one after five quarters, whereas the median spending multiplier exceeds one across all horizons. In addition, there is a high probability that private consumption responds positively to spending shocks, in line with New Keynesian predictions.

Several studies also focus on the reconciliation of the findings of the narrative approach proposed by Romer and Romer (2010) with the ones in the BP SVAR literature. The baseline version of Romer and Romer (2010) relies on single equation regression of output on revenue shocks, although they also present some simple VAR results. However, Favero and Giavazzi (2012) pay more attention to the incorporation of narrative revenue shocks in a standard VAR framework, akin to the ones of

Blanchard and Perotti (2002) and Perotti (2008) and argue that their method is robust to anticipation effects. Their main motivation is to reconcile the two methods, particularly bearing on mind the large multipliers in the narrative approach compared to fairly small positive multipliers (which do not exceed unity) typical for the BP SVAR literature. When they use a VAR to analyse the effects of tax shocks identified with the narrative approach instead of the limited information approach of single equations used by Romer and Romer (2010), they find little difference in results, and multipliers are closer to the lower ones in the BP SVAR literature. Therefore, they argue that the discrepancy in results on the size of the tax multiplier is not due to the different identification of the shocks, but to the different models used. On the other hand, Chahrour et al. (2012) build a DSGE model to analyse the reasons for the different sizes of tax multipliers in the narrative and the BP SVAR approach. Their main findings indicate that this discrepancy is not due to the different transmission mechanism in the two approaches (i.e. different model specification); rather, it reflects either the failure of both approaches to identify the same tax shocks or small-sample uncertainty. Perotti (2011a) further extends the database and the methodology to incorporate shocks identified via the narrative approach in a VAR, allowing for different impacts of endogenous and exogenous changes. He finds that multipliers are somewhere between the large multipliers in Romer and Romer (2010) and lower multipliers found by Favero and Giavazzi (2012).

Finally, two recent meta-regression analyses also aim to provide an answer to the sources of discrepancy in the empirical literature regarding the size of the fiscal multipliers. Rusnak (2011) analyses 27 studies that contain 135 estimates of impulse responses, predominantly using the recursive and BP SVAR approaches. As noted above, in the descriptive analysis he finds that there is no systematic difference on spending multipliers regarding identification approaches, while the average multiplier is higher in the US than in other countries. The meta-regression analysis suggests that there is little systematic effect from estimation characteristics, although the effect is rather imprecisely estimated, while detailed results suggest that multipliers are somewhat lower for the sign-restrictions approach. However, the main finding from the meta-regression is that the discrepancy regarding the size of the multiplier is mostly due to structural country characteristics, while differences in study design are less important. There are strong indications that high levels of public debt, higher trade openness and higher average short-term interest rates all decrease the size of the multiplier. Interestingly, he also finds that studies using annual data tend to find significantly higher multipliers. Further, Gechert and Will (2012) provide a wider and more detailed meta-regression analysis of 89 theoretical and empirical studies including 749 observations of multiplier values (of which 255 are from fiscal VARs). They classify and analyse studies alongside several important dimensions, such as the type of fiscal impulse, the model class, the multiplier calculation method and additional controls, which enables them to reach more nuanced conclusions. Their main finding indicates that multipliers of public investment in empirical studies are significantly higher than the ones for overall spending, whereas there is no significant difference among other spending sub-components and taxes. Regarding fiscal VARs, regressions omitting controls and additional variables indicate that the recursive, BP SVAR and narrative approaches have significantly higher fiscal multipliers than the sign-restrictions and event-study approaches, mostly in line with our survey above. However, these differences among identification approaches disappear once controls and additional variables are included more carefully, such as the way the multiplier is calculated (at peak or the integral of the impulse response), the horizon included in the calculation of the multiplier, the time span and frequency of the data and the share of imports in GDP. For instance, they find that multipliers calculated at peak are larger than integral (cumulative) multipliers, and multipliers are also larger if calculated over a longer horizon. This change in results mostly reflects the fact that different identification approaches yield different shapes of impulse responses, which are related to the way the fiscal multiplier is calculated and the horizon included in the calculation. In addition, multipliers are higher if time series are longer, but lower if more recent years are included in the sample, although authors warn that most studies do not include the recent stimulus packages. Further, similar to Rusnak (2011), they find that multipliers are lower for economies with a higher share of imports, but differ from Rusnak (2011) in finding that studies using annual data tend to find lower multipliers. Therefore, their overall conclusion is that the size of the multiplier depends crucially on the particular setting and method chosen, which should be taken into consideration in policy debates.

4.4 Panel VARs

The studies surveyed above use conventional VARs in a time series context, including those studying fiscal policy in several countries by using separate VARs for each country, typically with quarterly data. However, a strand of the recent literature employs panel VARs (PVARs) to study the effects of fiscal policy shocks in several countries together. One of the main advantages of the PVAR approach is that it enables the study of fiscal policy effects in a larger sample of countries, for which data series may not be long enough for country-by-country VARs. Most studies using PVAR use annual data, which are often the only series available, since sufficiently long non-interpolated quarterly data are often not available, as noted above. In addition, an important advantage of the PVAR is that it combines the conventional VAR approach of treating all variables as endogenous with the panel approach, which allows for unobserved country heterogeneity. Studies surveyed below typically pool the observations for various countries over years and estimate the reduced-form VAR in Eq. 31. However, the PVAR imposes cross-country homogeneity, which might be a strong assumption when one analyses various countries, although studies tend to focus on countries with similar characteristics. Therefore, in order to account for country differences, additional elements are often included in the estimation, most notably country and/or time fixed effects, time trends or exogenous variables, while some studies also use various sample splits. The inclusion of additional terms, particularly fixed effects, and more generally the combination of VAR and panel estimation, give rise to particular methodological issues and challenges, most notably the LSDV bias in dynamic panels as well as the need for proper treatment of country heterogeneity. However, in this part we will only briefly survey the studies employing the PVAR on fiscal policy, and refrain from a more detailed methodological discussion, which will be provided in Chapter 5, where we will use this approach in our empirical study[89].

$$X_{i,t} = A(L)X_{i,t-1} + u_{i,t} \qquad \text{Eq. 31}$$

Beetsma and Giuliodori (2011) provide an extensive analysis of effects of government spending shocks using the PVAR approach with annual data and recursive identification in the European context. Their baseline VAR consists of real government spending, real cyclically-adjusted net taxes, real GDP, nominal long-term interest rate and real effective exchange rate for 14 EU countries between 1970 and 2004. To account for heterogeneity, they also include country fixed effects, country-specific time trends and time dummies. Their main results show that government spending has a positive impact on output, with the fiscal multiplier larger than one.

[89] For an extensive description of PVARs, important methodological issues and their treatment, see Juessen and Linnemann (2010) and Canova and Ciccarelli (2013).

In addition, they find that higher government spending results in higher budget deficits, as well as higher interest rates and real appreciation. Beetsma and Giuliodori (2011) also provide numerous extensions and robustness checks. For instance, modifying the deterministic terms does not have a considerable impact on baseline results. More importantly, using various sensitivity checks, they find little evidence that the anticipation problem affects their results. They also address the potential problems of recursive identification with annual data first by relaxing the assumption of a zero-contemporaneous effect of output on spending, and then by using private instead of total GDP. However, in both cases the baseline results on the positive effects of spending on output are largely unchanged. Further, the results of alternative specifications and sub-samples indicate that private consumption and investment rise in the wake of spending shocks, while imports rise and exports fall, thus indicating evidence for the 'twin deficit' hypothesis. In addition, when splitting the sample according to trade openness, they find that higher government spending has a smaller positive output effect and a stronger and more persistent negative impact on trade balances in open economies.

The PVAR with annual data has also been used to analyse the effects of government spending on the current account and the real exchange rate, for instance by Bénétrix and Lane (2013) and Endegnanew et al. (2012). Bénétrix and Lane (2013) analyse 11 EMU countries between 1970 and 2006, although their main focus is not on fiscal multipliers but on the effects of shocks to particular components of government spending on the real exchange rate. In their VAR they include various components of real government spending (one at a time), the real GDP and the CPI-based real exchange rate, which are all in logs and expressed as deviations from the other 10 EMU countries. They also include country fixed effects and country specific time trends in order to address country heterogeneity, as well as year dummies to eliminate cross-country contemporaneous residual correlation. In line with the dominant practice in this literature, they use the recursive approach to identify the government spending shock. Similar to Beetsma and Giuliodori (2011), their main findings indicate that government spending shocks appreciate the real exchange rate, although the magnitude and persistence differs across components.

Endegnanew et al. (2012) also use PVAR with recursive identification to analyse effects of government spending in microstates and possible differences with other countries[90] between 1970 and 2009. Unlike the previous two studies, but in line

[90] They have 155 countries in their sample, of which 42 are microstates, defined as countries with a population lower than 2 million.

with significant parts of the literature in other areas (e.g. Love and Zicchino (2002)), instead of mean-differencing of the variables they use forward mean differencing in order to remove country fixed effects and avoid the LSDV bias, i.e. they use the Helmert transformation based on Arellano and Bover (1995). They find that the effects of spending shocks on output are very small in both sub-samples, albeit less persistent in microstates. However, there are significant differences in the response of the current account, which deteriorates by double as much in microstates as in other countries, probably reflecting the typically higher openness of the former. Finally, government consumption shocks have no effect on the real exchange rate in the global sample, but they result in real appreciation on impact in microstates.

Ilzetzki et al. (2013) use PVAR with recursive identification to analyse effects of fiscal policy in a diverse unbalanced sample of 20 high-income and 24 developing countries for which they are able to find non-interpolated quarterly data between 1970 and 2007 (with a typical span of about ten years per country). Their main VAR specification is fairly simple, and it includes deviations of real government consumption and real GDP from trend. However, the main results are mostly robust to the extensions of the baseline specification to include deviations of real government investment from trend, the current account balance, the short-term policy interest rate and change in the real exchange rate. In order to account for country heterogeneity, they split the sample by various country characteristics, which also enables them to analyse more closely how they affect the effectiveness of fiscal policy. They find that government consumption shocks have a positive effect on output in developed countries, with the cumulative fiscal multiplier lower than one, while their effect in developing countries is insignificant. There are also significant differences in the effects of fiscal policy on output depending on the exchange rate regime. The additional analysis shows that this difference is due to the response of monetary policy, which indicates that the extent of monetary policy accommodation is crucial when one analyses fiscal multipliers. Indeed, they find that the cumulative multiplier in fixed exchange rate regimes is sometimes larger than one, while it is effectively zero in countries with flexible exchange rates. In line with most other studies, they also find that country trade openness is another crucial determinant of effects of fiscal policy, with the cumulative fiscal multiplier exceeding one in relatively closed economies and negative in more open economies. These differences in results on the multiplier hold regardless if the differences in openness reflect trade barriers or the size of the internal market. Further, they find that when splitting the sample according to high public debt episodes, debt levels above 60% of GDP result in negative cumulative fiscal multipliers, as opposed to positive multipliers with lower indebtedness. In addition, there is some evidence that the cumulative government investment multiplier is close to one and significantly higher than the government consumption multiplier in developing countries, although there is no significant difference in the effect of the two components in high-income countries. Overall, these findings lead them to conclude that the trends of higher trade openness, higher exchange rate flexibility and higher public debts could be expected to lower the effectiveness of fiscal policy in the future.

The key features of the empirical studies that use panel VAR to analyse fiscal policy are presented in Table 4.2 below. The aim of this table is not only to summarise the features and the uses of panel VAR in analysing fiscal policy, but also to help during the design of our empirical study in the following chapter and to compare it to the existing studies. Again, we abstract from presenting results of these studies (discussed above) for ease of exposition, as they are impossible to capture in a single table.

Study	Country coverage	Period	Identifi-cation method	Endogenous variables in baseline VAR	Deterministic terms	Additional specifications and other comments
Bénétrix and Lane (2013)	11 EMU countries (EMU12 except Luxembourg)	1970-2006, annual	Recursive	Various components of real government spending (one at a time), real GDP and the CPI-based real effective exchange rate (all in logs, expressed as deviations from the other 10 EMU countries).	Country fixed effects, country-specific time trends, year dummies.	Alternative specifications: jack-knifing, adding the remaining government spending, sub-periods, adding public debt, replacing CPI-based real effective exchange rate with alternatives.
Endegnanew et al. (2012)	155 countries	1970-2009, annual	Recursive	Real government consumption, real GDP, current account as a share of GDP, real effective exchange rate (all in logs except the current account).	Country fixed effects.	Besides the global sample, also an analysis of microstates, defined as countries with a population lower than 2 million. Forward mean differencing is used (Helmert transformation), with GMM estimation.
Ilzetzki et al. (2013)	44 countries (20 developed and 24 developing)	1970-2007, quarterly (typical span 10 years per country)	Recursive	Real government consumption and real GDP (both as deviations from quadratic trend).	Country fixed effects.	Also the baseline bi-variate PVAR for sub-sample analysis (based on country income, exchange rate regime, trade openness and high-debt episodes). Alternative specifications include the real effective exchange rate (in first differences), real government consumption and investment (both as deviations from quadratic trend), the current account as a share of GDP and the monetary policy interest rate.
Beetsma et al. (2006)	14 EU countries (EU15 except Luxembourg)	1965-2004, annual	Recursive	Real government spending, real cyclically-adjusted net taxes, real GDP (all in logs).	Country fixed effects, country-specific time trends, year dummies.	Extensions of the model with the log of the price level, the short-term nominal interest rate and the log of the real effective exchange rate. Sub-samples for country size and original EU member states. Alternative specifications: private instead of total GDP and government consumption and investment instead of total spending. Checks for identification restrictions (smaller PVARs for fewer countries with quarterly data). Also an extensive analysis of a panel trade model and fiscal policy spill-overs via trade in the EU.

Study	Country coverage	Period	Identifi-cation method	Endogenous variables in baseline VAR	Deterministic terms	Additional specifications and other comments
Beetsma and Giuliodori (2011)	14 EU countries (EU15 except Luxembourg)	1970-2004, annual	Recursive	Real government spending, real cyclically-adjusted net taxes, real GDP, the nominal long-term interest rate and the real effective exchange rate (all in logs except the interest rate).	Country fixed effects, country-specific time trends, year dummies.	Robustness checks: removing year dummies, quadratic instead of linear country-specific time trends, differences instead of levels. Various checks for anticipation effects and identifying restrictions. Alternative specifications with unadjusted taxes, public debt and real wages, as well as GDP components instead of total GDP. Sub-samples for various periods and trade openness. Also an analysis of fiscal spill-overs in the EU.
Almunia et al. (2010)	27 countries	1925-1939, annual	Recursive	Real government spending, real GDP, real government revenues (all in logs), central bank discount rate.	Country fixed effects, country-specific time trends, year dummies.	Robustness checks: removal of deterministic terms, total instead of defence spending, non-defence spending as an additional variable, different variable ordering, first differences instead of levels.
Agnello and Sousa (2011)	10 developed countries	1970-2007, quarterly	Recursive	Property price index, GDP, GDP deflator, primary budget deficit, short-term interest rates, equity price index (all in logs except the interest rate).	Country fixed effects.	Alternative specification with spending instead of deficit. Also an analysis of effects of fiscal policy shocks during bust episodes in housing prices. Forward mean differencing is used (Helmert transformation), with GMM estimation.

Table 4.2. Summary of the main features of fiscal panel VAR studies
(Note: Main or baseline specifications are presented)

4.5 Conclusions

The review of modern theoretical models and empirical studies on the effects of fiscal policy reveals that there is relatively little consensus in the modern literature regarding the size of the fiscal multiplier and the transmission mechanism of fiscal policy shocks. Theoretical studies relying on RBC models tend to find that fiscal policy has modest effects on output, which generally do not exceed one. In addition, expansionary fiscal policy increases labour supply and lowers private consumption due to the dominance of wealth effects. The New Keynesian literature, which augments the RBC model with price stickiness and possibly other frictions, also tends to find that wealth effects dominate and that the output multiplier is between zero and one, although it differs regarding the predictions on the labour demand and real wages. Further extensions of baseline New Keynesian models introduce additional frictions in order to replicate the prevalent finding in the empirical literature that higher government spending has positive effects on private consumption, albeit with limited success. Overall, the theoretical predictions on the size of the fiscal multiplier and the transmission mechanism depend on a wide range of factors, such as the model features, the type of fiscal instrument, the particular calibration or estimation and the behaviour of monetary policy. The only case where the theoretical literature appears to agree is that fiscal policy is very effective in current circumstances of recessionary developments and accommodative monetary policy.

There is also a wide array of results on the size of the fiscal multiplier and the transmission mechanism in the empirical literature, which is dominated by VAR studies imposing various types of restrictions in order to identify exogenous fiscal policy shocks. Typically, studies using the recursive and the Blanchard-Perotti SVAR tend to find results in line with New Keynesian predictions, whereas studies using the event-study approach are mostly in line with neoclassical predictions regarding the effects of government spending. In addition, studies using sign restrictions or the narrative approach tend to find relatively high tax multipliers, resembling traditional Keynesian predictions. However, there is generally little agreement in the empirical literature where this divergence in results is coming from, and whether it stems from the particular type of identification restrictions imposed and the manner in which various approaches deal with the anticipation problem. On the other hand, there appears to be some consensus that structural country characteristics have an important effect on the size of the fiscal multiplier. For instance, the meta-regression analysis of fiscal VARs by Rusnak (2011) finds that high levels of public debt, higher trade openness and higher average short-term interest rates all decrease the size of the fiscal multiplier.

Therefore, the conclusion of our theoretical and empirical review is in line with some comments in the literature that there is no such thing as "*the* fiscal multiplier". For instance, Spilimbergo et al. (2009) note that fiscal multipliers are country-, time- and circumstance-specific. In addition, Carroll (2009) notes that questions about "*the* multiplier" are like questions about "*the* temperature" since both vary across time and space, whereas more attention should be paid to the important factors affecting this variance of results. Further, there is still a lively debate regarding empirical techniques, which yields no definite answer on "*the* technique" to be used in estimation. However, when designing our empirical investigation in the next chapter, we will utilise the discussions in this chapter on features advantages and disadvantages of the recursive, BP-SVAR and sign restrictions approaches using country VARs, as well as panel VARs. Related to this, we will not consider the event-study and the narrative approach, since they are hardly applicable outside the US context, while our aim is to empirically analyse the effects of fiscal policy in European countries. Last but not least, in line with the literature, we will also decide on the particular empirical methodology based on the length, frequency and type of data available.

Chapter 5 - Empirical investigation of the effects of fiscal policy in European countries, with particular reference to transition countries

5.1 Introduction

The aim of this chapter is to address the second main issue of the thesis - what are the effects of fiscal policy in European countries (old and new EU member states). The empirical investigation in this chapter will focus on four key questions of academic and policy importance: i. what is the short- to medium-run effect of fiscal policy on output, i.e. what is the size and sign of fiscal multipliers; ii. what are the short- to medium-run effects of fiscal policy on other key macroeconomic variables;

iii. how do main country structural characteristics affect the size and sign of fiscal multipliers; iv. what is the transmission mechanism of fiscal policy, i.e. is it more closely related to neo-classical predictions or to New Keynesian predictions.

The empirical investigation will draw on the review of the relevant theoretical and empirical literature in Chapter 4, and we will pay particular attention to the discussions and recommendations of the empirical literature when designing our empirical analysis. However, due to the extensive size of the empirical literature, which was surveyed in the previous chapter, we will only refer to particular points and arguments in other studies when justifying our methodological choices, and will refrain from a more detailed discussion in order to avoid unnecessary repetition with the previous chapter.

While the empirical analysis provided here is directly linked to the literature review provided in the previous chapter, it is also linked to Chapter 3, which focused on empirical investigation of the cyclical character and determinants of fiscal policy in European countries. This connection is important in three main aspects. First, the empirical analysis here refers to the same decomposition of overall fiscal policy into automatic stabilizers and discretionary policy, with the latter consisted of endogenous (systematic) and exogenous fiscal policy. Indeed, one of the main aims in Chapter 3 was to analyse the cyclical character of the systematic (endogenous) fiscal policy, and some attention was also paid to overall fiscal policy. In addition, by the incorporation of additional political, institutional and other variables, in Chapter 3 we also tried to analyse important influences on exogenous policy. On the other hand, in line with the relevant literature, the aim of the empirical investigation provided in this chapter is to identify exogenous fiscal policy (i.e. fiscal policy shocks) and analyse its effects on output and other macroeconomic variables. In terms of the decomposition of fiscal policy in Chapter 3, and particularly Figure 3.1, here we will focus on exogenous fiscal policy, whereas in Chapter 3 we analysed both endogenous discretionary policy (via the output gap) and exogenous policy (via the additional indicators). In particular, in this chapter we focus on identifying exogenous fiscal policy shocks and analysing their impact on output and other macroeconomic variables. Our use of the VAR methodology implies that the 'normal' fiscal policy rule is already captured in the VAR (via the inclusion of government spending, revenues and GDP), while we focus on policy shocks, which correspond to exogenous fiscal policy in terms of Chapter 3 and particularly Figure 3.1. The second way in which this chapter relates to Chapter 3 is via the empirical specification in its broader sense. In Chapter 3, we were effectively analysing the effects of output on fiscal balances, and interpreting them as the cyclical stance of fiscal policy. On the other hand, in this chapter we try to analyse the opposite: the effects of fiscal policy on output, and on other macroeconomic variables. In other words, here we try to analyse the opposite question to the one in Chapter 3, notwithstanding the focus on different components of overall fiscal policy (discussed above). The third point of connection to Chapter 3 is directly related to the main questions of investigation in this chapter, and also has a fundamental policy importance. More precisely, if fiscal multipliers are low, and if fiscal policy has little effect on macroeconomic movements, then the issue of the cyclical character loses a great part of its importance. Indeed, if fiscal policy can not affect output movements, it does not matter too much whether it is counter-, a- or pro-cyclical. On the other hand, large fiscal multipliers warrant a more aggressive use of counter-cyclical fiscal policy, since in such a case fiscal policy would be effective in stabilising the business cycle.

As Chapter 4 showed, there is already an extensive body of literature on the effects of fiscal policy. The aim of this chapter is to build upon it and extend it in several important aspects. First, unlike the vast majority of studies, which focus on a single country (mostly the US) or a few developed countries, our study will focus on 27 EU member states. Related to this, the study will also include most European transition countries, which is an important extension bearing on mind the relative scarcity of empirical studies on the effects of fiscal policy in transition countries (as noted in the previous chapter). In order to study fiscal policy in a group of countries, we will use panel VAR, which has become available relatively recently and is able to combine the advantages of panel and VAR methods. Second, our study will pay particular attention to the methodological recommendations and suggestions in the relevant literature, which is expected to enable a proper identification of fiscal policy and consequently make it possible to reach valid results on the effects of fiscal policy. Third, the study will provide extensive investigation of the possible influence of country structural characteristics on the effects of fiscal policy. By doing so, it will be in line with recommendations that there is no *the* fiscal multiplier, but that fiscal multipliers are country-, time- and circumstance-specific (Spilimbergo et al., 2009). Fourth, the study will aim to provide additional details on the transmission mechanism of fiscal policy, thus enabling an indirect test on the predictions of the two main macroeconomic theories on the effects of fiscal policy. Finally, based on the results of the extensive investigation, the study aims to provide recommendations that would be useful to policymakers when designing and implementing fiscal policy.

This chapter proceeds as follows. The next section presents the methodology of investigation and the data. Section 5.3 analyses the effects of fiscal policy in the overall sample and in numerous sub-samples. Section 5.4 modifies the baseline specification in order to investigate the transmission mechanism in more detail, and also provides some robustness checks. Section 5.5 concludes.

5.2 Methodology and data

5.2.1 Initial remarks on the method of investigation and data

The empirical investigation critically depends on two choices regarding the methodology of investigation: the identification of exogenous fiscal policy shocks and the method of estimation. Since an extensive survey of the relevant literature and a discussion of advantages and drawbacks of the various approaches are already provided in the previous chapter, here we focus only on the methodology and specification to be used in our study. Certainly, we will refer to the relevant literature when making our choices.

Our empirical investigation of the effects of fiscal policy on output and other macroeconomic variables will be based on Panel Vector Auto Regression (panel VAR or PVAR), with annual data and with recursive identification of policy shocks. The choice of panel VAR deviates from the vast majority of the literature, which uses country VARs, although several recent studies also employ PVAR when researching fiscal policy or other issues (as discussed in the previous chapter). However, our choice of PVAR is a direct reflection of the aims of the study and data availability. As noted above, we want to study the effects of fiscal policy in European countries, as well as the possible influence of country characteristics and the transmission mechanism of fiscal policy. One way to do that might be to run country VARs, and then analyse the results in terms of the size of the multiplier or differences by structural characteristics. However, we are unable to use such an approach because of the length and the quality of available fiscal data for European countries (discussed below), particularly for transition countries. Therefore, we have decided to follow the dominant empirical literature in employing the VAR approach, but we pool the countries in one large group (and various sub-samples) in order to be able to address the aims of the study. Doing so also enables us to utilise one of the main advantages of the panel VAR method, which combines the conventional VAR approach of treating all variables as endogenous, with the panel approach, which allows for unobserved country heterogeneity.

In our investigation we will use annual instead of quarterly data, which are prevalent in the fiscal VAR literature, particularly in country-by-country VARs. This choice reflects both data availability and recommendations of the relevant empirical literature. It is often argued that, when using fiscal VARs with quarterly data, one should preferably use fiscal data collected on an accrual basis, not cash-basis, as well as use data that are collected at quarterly frequency, not interpolated from annual data (see Subsection 4.3.1 in the previous chapter for details and discussion). However, sufficiently long series of non-interpolated quarterly data collected on an accrual basis are only available for a very few developed countries. Therefore, due to our aim to study fiscal policy in a wider group of European countries, for which sufficiently long series of non-interpolated quarterly fiscal data on an accrual basis are simply not available, we choose to use annual data in our empirical analysis. Besides the data availability issue, Beetsma and Giuliodori (2011) note that the use of annual data has additional advantages in avoiding particular quarterly features of certain taxes or government outlays and avoiding seasonality problems.

The use of annual data has several important implications regarding the anticipation problem and the identification problem, which are essential features of fiscal VARs (see the discussion in Section 4.3 of the previous chapter for details). The anticipation problem, or the fiscal foresight problem, arises because economic agents might anticipate future fiscal policy and change their current behaviour. This could yield biased fiscal multipliers, i.e. a wrong attribution of the response of output and other variables to current fiscal policy, whereas in fact they are responding to anticipated future policy. However, while there are various discussions on the severity of the consequences of this problem with quarterly data (as discussed in the previous chapter), it is often argued that the use of annual data greatly ameliorates the anticipation problem, since fiscal policy is less likely to be anticipated one year ahead than one or two quarters ahead (Perotti, 2008). In order to further mitigate the anticipation problem, we will also include in the VAR several forward-looking variables such as prices and interest rates. This is in line with arguments in the literature (Giannone and Reichlin (2006), Yang (2007) and Sims (2012)) that the inclusion of various forward-looking variables mitigates the anticipation problem, since they react contemporaneously to anticipated fiscal policy, implying that they can be used to capture future fiscal policy.

While it is generally agreed that the use of annual data mitigates the anticipation problem, there are warnings that it might complicate the recursive identification of fiscal policy shocks, which we will use in the empirical investigation. Indeed, in the recursive and the BP SVAR approaches, the identification of fiscal policy shocks relies crucially on decision lags of fiscal policy, which reflect the generally accepted observation that policymakers do not react contemporaneously to output movements but this reaction has some delay. With recursive identification in a VAR with quarterly data, this is reflected by ordering government spending (and sometimes revenues) before output, implying that the former do not react to the latter within the same quarter. As discussed in Section 4.3 in the previous chapter, this might be a too strong assumption when using annual data, since it implies that policymakers do not react to economic movements during the year. However, there are several arguments that support the use of annual data even with recursive identification (besides data availability reasons). The main argument is the fact that there is only one important fiscal event in a year (the government budget), so policymakers are often constrained from responding quickly to contemporaneous economic movements. Related to this, Beetsma and Giuliodori (2011) note that with annual data that the recovered shocks are more realistic, since new fiscal impulses typically do not appear at quarterly frequency, but once a year when the budget is adopted (and perhaps in mid-year budget supplements). In addition, Beetsma et al. (2006) and Beetsma et al. (2009) provide robustness checks for several countries where non-interpolated quarterly fiscal data are available, and show that recursive identification restrictions for government spending shocks in a VAR with annual data are indeed plausible. Their results are often used as an argument supporting the use of annual data with recursive identification of fiscal policy shocks, including the studies using panel VAR surveyed in the previous chapter.

The last important issue in this initial discussion of the estimation approach is related to the method of identification of fiscal policy shocks. As mentioned above, we will also proceed with VAR estimation, in line with almost the entire empirical literature. In particular, we will focus on the short-run effects of fiscal policy, which reflects both the focus of the empirical literature as well as data availability, which prevents us from investigating long-run effects. However, when using VARs, an important choice has to be made regarding the identification of structural shocks (fiscal policy shocks in this case). As discussed in detail in Section 4.2 of the previous chapter, there are five main methods used in the literature to identify fiscal policy shocks in a VAR. However, the last two of them are inapplicable for our sample of countries: the event-study method has been applied only for the U.S. based on defence spending, whereas the narrative method requires the availability of detailed legislative records in order to extract policy shocks. We are also reluctant to use sign restrictions due to the drawbacks denoted in Section 4.3 such as the typical exclusion of some potentially important features (e.g. 'expansionary fiscal contractions'), and the difficulties of this method to precisely capture the timing of the shock (Perotti, 2005). Consequently, we are left with the choice between identification based on recursive ordering of variables and on the Blanchard-Perotti structural VAR (BP SVAR), which are by far the two most frequently used methods in the literature (Rusnak, 2011). However, the BP SVAR method also requires institutional information regarding the elasticity of government spending and revenues to output and inflation. Since such information is not available in sufficient detail for our sample of countries, we have chosen to proceed with the identification of fiscal policy shocks based on recursive identification. Consequently, our identification method is in line with all recent studies that use panel VAR to analyse effects of fiscal policy (Table 4.2).

As discussed in the previous chapter, and particularly in Section 4.3, the VAR with recursive identification is perhaps the most used approach in empirical macroeconomics. The identification of structural shocks in this method relies on the Cholesky decomposition of the variance-covariance matrix of the reduced-form disturbances (hence the alternative name "the Cholesky method"). A crucial part of this method consists of the causal ordering of variables, which means that variables that are ordered first in the VAR are allowed to have a contemporaneous effect on later variables, but later variables do not contemporaneously affect variables ordered before them. In the context of our study, we will follow the literature and order government spending first in the VAR, implying that government spending can contemporaneously affect other variables, but contemporaneous feedback effects are not possible[91]. Indeed, if one is interested only in the effects of the variable ordered first (government spending in this case), the ordering of the other variables does not matter (Christiano et al., 1999). However, this method is more problematic if one wants to analyse shocks to the other variables as well, since particular assumptions about timing need to be fulfilled. This is the reason why identification with recursive ordering is seldom used for analysing revenue shocks, i.e. the identification of revenue shocks requires additional assumptions on their contemporaneous links to government spending and output. Consequently, we will focus on government

[91] Incidentally, this way of identification of spending shocks is also common practice for the BP SVAR approach.

spending shocks when analysing the effects of fiscal policy, in line with the majority of the literature. Related to this, when discussing fiscal multipliers, effectively this will apply to government spending multipliers.

Our analysis uses annual data starting in 1995 and ending in 2012 (18 years), which is the longest period available at the time of writing. As noted above, we include 27 EU member countries in our analysis. Similar to our approach in Chapter 3, this group consists of 15 old EU member states plus Malta and Cyprus, as well as the 10 new EU member states from Central and Eastern Europe (the 2004 and 2007 enlargement cohorts). Due to the lack of sufficiently long disaggregated data on spending and revenues, which are required for the empirical analysis in this chapter, we are forced to omit South-eastern European countries from our sample. We briefly describe the data definition when specifying our baseline model in Section 5.3, while detailed data definitions and sources are provided in Appendix 5.1.

5.2.2 Description of panel VAR

As noted above, due to the aims of our study and the data availability, we have decided to use panel VAR in our analysis. Panel VAR shares a similar specification with standard time-series VAR, but also introduces cross-section specifics. The reduced form of panel VAR is:

$$X_{i,t} = A(L)X_{i,t-1} + CM_{i,t} + u_{i,t} \qquad \text{Eq. 32}$$

In the reduced-form VAR in Eq. 32, t indexes years and, unlike the standard VAR, i subscripts are added for cross-section units. X is a vector of k endogenous variables, *A(L)* is the m-th order lag-polynomial, M is a vector with possible additional elements (unit-specific intercepts, common or unit-specific time trends, period dummies or exogenous variables), and u represents a k-length vector of reduced-form disturbances. Similar to the standard time-series VAR, disturbances u will generally be contemporaneously correlated across equations, and serially uncorrelated, and it is assumed that they are uncorrelated across units in the panel VAR.

However, in order to proceed with economic interpretation, it is necessary to transform this reduced-form PVAR into its structural form, just like the time-series VAR. Since this transformation resembles the one for time-series VAR, which is already described in detail in Chapter 4, here we present only the general structural form of the PVAR that we will use in our analysis:

$$A_0 X_{i,t} = D(L) X_{i,t-1} + PM_{i,t} + \varepsilon_{it} \qquad \text{Eq. 33}$$

In Eq. 33, the *k x k* matrix A_0 with ones in the diagonal represents the contemporaneous relations between endogenous variables, whereas *D(L)* is the matrix polynomial in the lag operator *L* that captures the relation between endogenous variables *X* (e.g. GDP, government spending and revenues) and their lags. The vector of orthogonal structural shocks $e_{i,t}$ reflects the shocks to each equation in the VAR, with $var\ (\varepsilon_{i,t}) = \Omega$, i.e. structural shocks are independent across the time and cross-section dimensions. Pre-multiplying Eq. 33 with the A_0^{-1} matrix obtains the reduced form of VAR in Eq. 32 above (as discussed in detail in Chapter 4). Just like in standard VARs, in panel VAR the estimation proceeds equation by equation with OLS, meaning that the number of equations to be estimated equals the number of variables times the number of cross-section units (*k*i)*. In this representation of PVAR, slope coefficients are constant across units (slope homogeneity), effectively pooling the data across units in order to maintain degrees of freedom.

In order to be able to interpret shocks in an economically meaningful manner, identification restrictions must be imposed on the structural form of the VAR (Eq. 33). As noted above, we will use recursive identification in order to identify fiscal policy shocks (also discussed in detail in Chapter 4). The imposition of these restrictions implies that shocks to variables ordered first may affect later variables contemporaneously, but that shocks to the latter variables do not have a contemporaneous effect on earlier variables. This restriction is reflected in the zero elements in the A_0 matrix in Eq. 34 below, which expands the structural form of the panel VAR from Eq. 33, with α_{nm} elements representing the contemporaneous reaction of variable *m* to shocks in variable *n*. For ease of exposition, the panel VAR in Eq. 34 includes only government spending *g*, taxes *t* and output *y* (*k*=3) and one lag, while deterministic terms are omitted.

$$\underbrace{\begin{pmatrix} 1 & 0 & 0 \\ -\alpha_{gt} & 1 & 0 \\ -\alpha_{gy} & -\alpha_{ty} & 1 \end{pmatrix}}_{A_0} \underbrace{\begin{bmatrix} g_{i,t} \\ t_{i,t} \\ y_{i,t} \end{bmatrix}}_{X_{i,t}} = \underbrace{\begin{pmatrix} d_{11} & d_{12} & d_{13} \\ d_{21} & d_{22} & d_{23} \\ d_{31} & d_{32} & d_{33} \end{pmatrix} \begin{bmatrix} g_{i,t-1} \\ t_{i,t-1} \\ y_{i,t-1} \end{bmatrix}}_{D(L)\,X_{i,t-1}} + \underbrace{\begin{bmatrix} \varepsilon_{i,t}^{g} \\ \varepsilon_{i,t}^{t} \\ \varepsilon_{i,t}^{y} \end{bmatrix}}_{\varepsilon_{it}} \qquad \text{Eq. 34}$$

The panel VAR specification has several advantages that make it particularly useful for empirical application in macroeconomics. First, it has the advantage of the VAR methodology in treating all the variables as endogenous and interdependent in both a static and a dynamic sense (Canova and Ciccarelli, 2013). It also enables the analysis of a variety of shocks, both endogenous and exogenous. In addition, just like common VAR, PVAR also starts from a relatively general statistical model, with few or no theoretical restrictions imposed, thus allowing results to be driven by the data. However, in distinction from time-series VARs, in PVARs a cross-dimensional dimension is added, thus making it possible to exploit the heterogeneous information in cross-section data, but also to increase the sample size in order to eliminate idiosyncratic effects (Gavin and Theodorou, 2005). Related to this, Rebucci (2003) notes that pooling units increases the degrees of freedom and potentially the efficiency of estimates, thus reducing the risk of over-fitting. Last but not least, similar to standard VARs, in panel VARs each equation can be estimated by OLS, which is consistent and asymptotically efficient (Kireyev, 2000).

While the PVAR combines the features and hence the advantages of VAR and panel methods, it also combines their drawbacks, which might have important implications for the results. The first drawback is the imposition of slope homogeneity among units (constant D matrix in Eq. 34 above), which could lead to heterogeneity bias if in fact there is heterogeneity in data. Indeed, the imposition of slope homogeneity may limit the usefulness of these models for policy advice at the unit i.e. country level (Georgiadis, 2012). Therefore, in order to account for unobserved heterogeneity among countries, we will also introduce country fixed effects c_i (as well as a common time trend t_t[92]), thus following the dominant approach in the empirical literature using PVAR estimation (Table 4.2 in the previous chapter). This means that our baseline model to be estimated is the panel VAR with fixed effects (PVAR FE) in Eq. 35.

$$A_0 X_{i,t} = D(L) X_{i,t-1} + \ Pc_i + \ Ht_t \ + e_{it} \qquad \text{Eq. 35}$$

Due to data limitations, we are still forced to maintain homogenous slope coefficients, thus imposing the same dynamics across cross-section units. This approach is criticised by Canova and Ciccarelli (2013), who argue that in order to

[92] As noted below, we also estimate a specification with country-specific linear trends, which could also account for country heterogeneity. However, since the results are robust (Appendix 5.3), we proceed with the baseline version with a common time trend.

properly account for heterogeneity one should introduce slope coefficients varying across cross-sections, and possibly across time periods as well. However, besides serious data availability and computational issues, there are counter-arguments in the literature that a relatively simple model like this one is applicable when one is interested in common aspects in macroeconomic data and not idiosyncratic effects (Gavin and Theodorou, 2005) and that the PVAR FE model is not too restrictive if one is interested in average policy effects (Georgiadis, 2012). Besides, the dominant approach in empirical studies still relies on the imposition of common slope coefficients (Table 4.2 in the previous chapter). Therefore, we will also follow this approach, but we will further address heterogeneity by using cyclically-adjusted revenues in all our specifications, thus accounting for the part of heterogeneity arising from the differences in automatic stabilizers across countries. Last but not least, we will pay additional attention to heterogeneity by splitting our sample across various structural country characteristics in Section 5.3.

However, while the PVAR FE addresses unobserved country heterogeneity, it leads to the well known problem of biased coefficients in dynamic panels with fixed effects (Nickell, 1981). Indeed, dynamic panels with fixed effects yield downwards biased coefficients (the "Nickell bias"), although the bias declines with a longer time dimension, regardless of the cross-section size. As was noted in Chapter 3, using a Monte Carlo study on single-equation panel estimators for macroeconomic data, Judson and Owen (1997) conclude that LSDV yields considerable bias of the auto-regressive parameter - of up to 28% - when the sample consists of 20 periods and up to 20% even when the time dimension is increased to 30. Overall, the Nickell bias is well acknowledged in the empirical literature, since annual macroeconomic series are rarely long enough in order to sufficiently mitigate it. In addition, it is particularly relevant in our case with only 18 years of data. Generally, there are two options how to proceed, and we will briefly discuss them in order to justify our decision.

The first option would be to use an alternative estimator not liable to the Nickell bias, such as alternative panel estimation methods. Indeed, various authors estimate PVARs using GMM estimation based on the forward mean differencing or orthogonal deviations (the Helmert transformation) in order to remove fixed effects. This approach was originally proposed and implemented for PVARs by Love and Zichino (2006) and is used in PVARs for fiscal policy by several studies, e.g. Endegnanew et al. (2012) and Agnello and Sousa (2011). However, the main drawback of such an approach is that GMM estimation generally requires a higher number of cross-section units than the 27 countries available in our dataset. Further, GMM requires differencing, thus omitting sample information and potentially making inference less accurate (Canova and Ciccarelli, 2013). More importantly for our case, as discussed in Chapter 3 where we used system GMM to analyse the cyclical character and determinants of fiscal policy, GMM methods require careful identification of plausible instruments for the endogenous variables. On the other hand, in this chapter we have decided to use (panel) VAR methods precisely because they are capable to deal with endogeneity in a more straightforward manner, which is typical for studies of effects of fiscal policy. Last but not least, the Monte Carlo analysis of various macroeconomic panel VAR estimators in Juessen and Linnemann (2010) concludes that GMM estimators are relatively inferior to FE estimators due to the larger root mean square error.

An alternative class of estimators that could be applicable to PVARs would be the mean group estimator originally due to Pesaran and Smith (1995) for dynamic panel data models, which could in principle avoid both the Nickell bias and the heterogeneity bias noted above. Indeed, even with a large time dimension, fixed effects may be inconsistent due to the imposition of slope homogeneity that induces residual serial correlation when regressors are auto-correlated. Therefore, the mean group estimator could be extended to the panel VAR by estimating VARs for each unit separately and then averaging results across units (Canova and Ciccarelli, 2013). However, this approach is hardly ever used in fiscal policy studies (with the exception of Kireyev (2000)), and also very seldom even discussed as a possible alternative. This might reflect the fact that mean group estimators were originally designed for single equation panel models in order to avoid endogeneity, whereas their extension to panel VARs requires the introduction of a higher number of lags in the model, potentially resulting in a considerable loss of degrees of freedom. Related to this, the reluctance to use mean group estimators is supported by the results in the Monte Carlo analysis of several estimators by Rebucci (2003), who extends the mean group estimator to the PVAR. He concludes that slope heterogeneities should be very high in order to justify alternatives to pooled estimators, including PVAR FE, and that the time dimension should be longer than a typical macroeconomic data set in order to justify the use of mean group estimators. In other words, the small sample bias may be more detrimental to the mean group estimator than the slope heterogeneity bias is to the PVAR FE estimator (Towbin and Weber, 2013).

The second option to address the Nickell bias is to use PVAR FE with OLS estimation despite these drawbacks, and this will be our approach in the empirical estimation in the following sections. One argument for our choice of PVAR FE as the estimation method is that it is used in several important studies of fiscal policy, with various time dimensions (Table 4.2 in the previous chapter). For instance, the time dimension is equal to 40 years in Beetsma et al. (2006) and 35 years in Beetsma and Giuliodori (2011), but they also analyse sub-samples which are considerably shorter, i.e. 20 years in the first and 25 and 29 years in the second study. Similar to this, Bénétrix and Lane (2013) use PVAR FE with 37 years. Due to data limitations and the aim of the paper, Almunia et al. (2010) use PVAR FE with only 15 years in their study of effects of monetary and fiscal policy during the Great Depression. Further, Juessen and Linnemann (2010) note several published studies in other areas that have used PVAR FE with a time dimension that is shorter or only slightly longer that our sample. In addition, the Monte Carlo analysis of various PVAR FE estimators in Juessen and Linnemann (2010) generally supports our choice of this method. Their main results show that the (downward) bias of the PVAR FE coefficients is considerable even when the time dimension is large, whereas GMM estimators perform well in terms of the bias but poorly in terms of the root mean square error, thus leading the authors to recommend the use of bias-corrected PVAR FE, which is also analysed. However, VAR coefficients in themselves are hardly ever of interest in empirical studies, which focus on impulse response functions (IRFs) to particular structural shocks. Therefore, we base our choice on additional results in the same study, which proceeds to analyse impulse response functions of various PVAR estimators. Using both Monte Carlo analysis and a practical application on a fiscal VAR, Juessen and Linnemann (2010) conclude that although they tend to under-estimate the shock persistence, impulse responses from the PVAR FE are reasonably close to the true impulse responses or the impulse responses from bias-corrected PVAR FE. Indeed, the difference in impulse responses is virtually undistinguishable at impact and fairly low at short horizons (e.g. 1 or 2 years after the shock)[93]. This result is attributed to the fact that impulse responses are complicated non-linear functions of VAR coefficients, so it is possible for impulse responses to be considerably less biased than the VAR coefficients themselves. Although Juessen and Linnemann (2010) recommend the use of bias-corrected PVAR FE, they also warn that bias-correction methods might not be successful in reducing the bias when the time dimension is small, which certainly covers our case of 18 years[94]. Finally, as noted above, our decision to proceed with PVAR FE also relies on the arguments by Gavin and Theodorou (2005) that such a

[93] These comments are all derived from the graphs presented in Juessen and Linnemann (2010), as they do not provide precise quantitative results on the size of the bias of impulse responses.
[94] Besides, to the best of our knowledge, bias correction methods for panel VAR are still not available in standard software packages.

relatively simple model is applicable when one is interested in common aspects in macroeconomic data (responses to fiscal policy shocks in our case), and not in particular idiosyncratic effects.

5.3 Results of baseline specification and sub-sample analysis

5.3.1 Baseline specification

As noted in the previous section, we will use panel VAR (PVAR) with annual data and recursive identification of policy shocks in order to analyse the short- to medium-term effects of fiscal policy on macroeconomic variables. We will follow the practice and the arguments in the relevant empirical literature when defining our variables and the baseline specification. Here we discuss the main issues regarding the definition of series used, while the detailed definition and sources of data are presented in Appendix 5.1.

The survey of the literature in Chapter 4 (and particularly Table 4.1 and Table 4.2) indicates that there is no consensus on a single set of variables to be included in the VAR and on their definition, and justifications are seldom given for particular choices made. However, in light of the seminal study by Blanchard and Perotti (2002), there is general agreement that, in order to analyse effects of fiscal policy, at least three endogenous variables should be included in the VAR: government spending or consumption, government revenues or net-taxes and GDP.

Therefore, we will also start with these three variables in our PVAR. However, we also include prices and interest rates in our baseline specification, in line with most empirical studies (as surveyed in the previous chapter). As discussed above, the inclusion of these two variables also helps to mitigate the anticipation problem of VARs with annual data. Indeed, they are used as forward-looking variables, since they react quickly to fiscal policy announcements, so their lags can be used to capture anticipated policy. Further, the responses of prices and interest rates are also interesting in their own right, since they capture key macroeconomic variables, including the response of monetary policy to fiscal policy shocks. As Table 4.1 in the previous chapter shows, these five endogenous variables are the ones most commonly included in VAR studies, and could be considered as the minimal set of macroeconomic variables necessary to capture dynamic effects of fiscal policy shocks (Fatás and Mihov, 2001b). These five variables are also included in some of the studies using the panel VAR approach (Table 4.2). In addition, we are reluctant to extend our baseline specification with additional endogenous variables due to the well-known problem of over-parametrisation in the VAR, although additional variables will be included when analysing the transmission of fiscal policy in Section 5.4. Finally, in all specifications we include two exogenous variables: country fixed effects (in order to deal with unobserved heterogeneity, as discussed above) and a common linear time trend[95], which is important in our case where variables enter the PVAR in levels (as discussed below) and are therefore clearly trended. The inclusion of these two exogenous variables is in line with most empirical studies using fiscal PVAR (Table 4.2). On the other hand, we do not include year dummies, for several reasons. Although time dummies could help address possible cross-section error correlation, Table 4.2 shows that there is no consensus regarding their inclusion in the existing fiscal PVAR studies, with no particular explanation for their omission in studies that do so. What is equally important, results in studies that include time effects are robust to their exclusion (e.g. Almunia et al. (2010) or Beetsma and Giuliodori (2011), implying that cross-section error correlation does not yield substantially biased results. Related to this, while time dummies account for common shocks, they do not account for country-specific responses of endogenous variables to these shocks. We account for common shocks to some extent by the inclusion of a common time trend, which is a second-best solution to separate time dummies, since the linear time trend is a special (restricted) case of time dummies[96]. Moreover, our approach does go some way to accounting for possible country-specific responses by first including country-specific trends as a robustness check, finding results that are similar to the baseline with common trend (Appendix 5.3) and, secondly, by using cyclically-adjusted revenues that can partially account for the country-specific response of revenues to common shocks (discussed below). In this manner, we both check and minimise the possible bias related to cross-section error correlation. Further, we were facing software limitations, as the code that we use (discussed below) does not support the inclusion of period dummies. However, despite this drawback, we decided to proceed with this particular PVAR code due to its relative flexibility in other aspects, such as the possibility to include trends and country fixed effects, to modify the specification to various research questions and to easily modify the tables and graphs (thus greatly facilitating inference and reporting).

[95] As noted below, our results are robust to the introduction of country-specific linear trends instead of a common time trend (Appendix 5.3).

[96] Based on the comment by Wooldridge in http://www.statalist.org/forums/forum/general-stata-discussion/general/82335-time-dummies-and-time-trend-in-the-same-equation.

A closely related issue to the set of variables in the baseline VAR is their particular definition, and there is some divergence in the literature regarding some of the variables (see Table 4.1 and Table 4.2 in the previous chapter). In this part, we rely mostly in the numerous arguments provided in the extensive fiscal VAR literature. We use real GDP as an indicator of output, in line with the vast majority of the literature. Consequently, we use the GDP deflator as an indicator of price movements, although a few studies use the consumer price index or the private consumption deflator instead. Further, for interest rates we use average nominal three-month money market rates. As noted in Chapter 4, there is some divergence on this issue, since numerous studies use short-term rates, while others argue for the use of long-term interest rates, which are argued to be more relevant for private consumption and investment decisions (Perotti, 2005). However, we are reluctant to take such an approach for two reasons. First, short-term interest rates are better suited to quickly reflect anticipated fiscal policy, which is one of the reasons of the inclusion of interest rates in the VAR. Second, sufficiently long series of long-term interest rates are unavailable for some of the countries in our sample. Finally, we define interest rates in nominal and not in real terms, which is common practice in the literature and should not be problematic due to the inclusion of prices in the VAR as well.

The literature diverges somewhat more on the definition of fiscal variables. In our study, we follow arguments and definitions in Alesina et al. (2002), Caldara and Kamps (2008) and particularly Beetsma et al. (2006) and Beetsma and Giuliodori (2011). Fiscal variables are defined in real terms[97], thus facilitating direct inference on the fiscal multiplier since GDP is also defined in real terms. Further, in line with the dominant approach in the literature, we define government spending and revenues net of interest payments (which are largely pre-determined due to deficits incurred in the past) as well as net of social benefits and other transfers[98]. Consequently, government spending is defined as the sum of government consumption (approximately the sum of public wages and purchases of goods and services) and government investment. On the other hand, for revenues we use net-taxes, defined as

[97] Government consumption is deflated with the government consumption deflator, government investment is deflated with the gross fixed capital formation deflator and, in absence of a more suitable deflator, revenue items are deflated with the GDP deflator.

[98] Blanchard and Perotti (2002) justify this choice with the theoretical expectation that, in the short run, effects of fiscal policy are transmitted by the effects of spending and taxes on aggregate demand and further on output. Related to this, the empirical literature is focused on the effects of spending and net-taxes on output, whereas social benefits and other transfers represent redistribution of funds, but not a withdrawal from or a payment to the private sector as a whole and consequently should not have a first-order short-run impact on macroeconomic variables (Bénétrix and Lane, 2013).

revenues minus transfers[99]. In particular, we follow the detailed calculations in Beetsma and Giuliodori (2011) and define net-taxes as the sum of indirect taxes, direct taxes, social benefits received and transfers received by the government, minus subsidies, social benefits paid and transfers paid by the government.

Another important point regarding the definition of fiscal variables is their cyclical adjustment, which is important for the ordering of the variables in the VAR and for accounting for country heterogeneity. We follow the arguments and calculations in Beetsma et al. (2006) and Beetsma and Giuliodori (2011) and cyclically adjust net-taxes, while government spending is left unadjusted. The reason for this is that the only component of government spending that is sensitive to the cycle is unemployment benefits, which are relatively small and are in any case not included in our measure of government spending (defined as government consumption plus investment). On the other hand, we remove the cyclical component of net-taxes by using country elasticities of various components of net-taxes to output (EC, 2005) as well as the trend GDP based on Hodrick Prescott filtering (in line with the discussion in Chapters 2 and 3). This procedure removes the effect of cyclical output movements on taxes (automatic stabilizers), thus leaving only the part of net-taxes that is under discretionary control of governments[100]. Therefore, the use of cyclically-adjusted net-taxes addresses the issue of country heterogeneity, at least partially. Indeed, to the extent to which countries differ in the automatic response of net-taxes to output, this heterogeneity is removed by the cyclical adjustment procedure, thus making the imposition of homogenous slope coefficients less problematic. Further, it could be argued that the country-specific cyclical adjustment of revenues helps to partially address the problem of cross-section error correlation. In particular, if common business cycle shocks affect the countries in the sample (e.g. the recent global crisis), the cyclical adjustment removes the country-specific response of automatic stabilizers to these shocks, thus attenuating the possible consequences of omitting period effects from our specification. An additional important reason for the cyclical adjustment of net-taxes is related to the ordering of the variables in the VAR, which has considerable implications for the analysis of responses to spending shocks due to our use of recursive identification. Indeed, the use of cyclically- adjusted net-taxes also enables inference on the response of revenues to a spending shock, since it is cyclically-adjusted taxes that are under direct, i.e. discretionary control of the government (Beetsma and Giuliodori, 2011).

[99] Consequently, we use 'revenues' and 'net-taxes' interchangeably in the text.
[100] The cyclical adjustment procedure is described in detail and also used in Chapter 3, where we mostly used cyclically-adjusted fiscal data.

In line with this discussion, as well as with the dominant practice in the empirical literature, we use the following ordering of variables in our VAR: government spending, cyclically-adjusted net taxes, GDP, prices and interest rates. The main implication of this particular ordering and of the recursive identification is that shocks to government spending (which is ordered first) are allowed to have a contemporaneous effect on every variable, but spending is not contemporaneously affected by shocks to any other variable[101]. As discussed above, we will focus on spending shocks, so the ordering of the other variables does not matter when analysing their effects (Christiano et al., 1999). The drawback of this ordering is that it implies that cyclically-adjusted net-taxes can not affect spending within a year, but can only respond to spending shocks. While this might seem like a too strong restriction, we rely on this ordering of spending and revenues because it is standard in the literature, but we provide a robustness check on this issue in Section 5.3.2. Related to this, Beetsma and Giuliodori (2011) argue that spending is mostly predetermined in the budget, whereas changes to spending within the year tend to be less important, implying that it is reasonable to order spending first. Further, output is ordered third, implying that it does not contemporaneously affect government spending and cyclically-adjusted net taxes. This restriction is justified by the omission of cyclically-sensitive components from our definition of government spending, as well as by the cyclical adjustment of net-taxes. Finally, the ordering of prices and interest rates last is common in the literature, and it implies that these variables react contemporaneously to movements in fiscal variables and to output but do not affect them within the year.

The final issues regarding the specification of our baseline VAR are related to the definition of variables in levels or in differences, their definition in absolute terms or per capita terms and the lag length of the VAR. Regarding the first issue, we define variables in log-levels (except the interest rates in percents) and not in differences, thus being in line with almost the entire literature that uses fiscal VARs (as summarised in Table 4.1 in the previous chapter). The main reason for this choice is

[101] This differs somewhat from our approach in Chapter 3, where it was reasonable to expect simultaneity between output and fiscal balances, which gave rise to endogeneity, thus warranting the use of system GMM. However, these differences in the approach are explained by the particular definition of variables, and are also in line with the relevant literature (as discussed throughout the text). In Chapter 3, we were focusing on budget balances (defined as the difference between total revenues and total spending), while here we focus separately on spending and revenues, which are both cleared of transfers and social benefits. Therefore, the omission of cyclically-sensitive components from government spending, which is our primary focus in this chapter, allows us to assume that GDP shocks do not contemporaneously affect spending as it is defined here. In other words, if GDP contemporaneously affected spending, this effect would most likely appear through transfers and social benefits, which are however removed from the definition of spending used here (as the sum of government consumption and government investment).

that it enables a straightforward interpretation of results, including the size of the fiscal multiplier. In addition, while the question whether variables in a VAR should be stationary is not definitively settled (Enders, 1994), we follow recommendations by Sims (1980) and Doan (1992) not to difference variables in the VAR even if they have a unit root. This approach is justified by the aim of the VAR, which is not to recover precise coefficient estimates but to analyse relations among variables (typically via impulse response functions, as discussed below). Further, it is argued that differencing throws away information on co-movements in the data. We also do not carry out tests on unit roots and cointegration, which is seldom done in empirical studies on fiscal policy, not least as a reflection of the low power of these tests in short time series. Indeed, even the few studies that perform such checks and find cointegration (e.g. Heppke-Falk et al. (2010) or Giordano et al. (2007)), proceed with VAR estimation in levels, arguing that it is difficult to impose economically meaningful cointegrating restrictions within a relatively general set of variables. However, in order to account for trending variables, we also include a time trend in our specification, in line with the majority of empirical studies surveyed in the previous chapter. The second issue, which is related to the definition of variables in absolute or per capita terms, is also not settled in the literature. Therefore, we use absolute amounts, but confirm the robustness of results to the definition in per capita terms in Appendix 5.3. Finally, we use 2 lags of each endogenous variable in our VAR. Related to this issue, it must be noted that, unlike time-series VARs, testing for lag-length in PVARs is not straightforward (Babecký et al., 2012). Therefore, despite the risk of imprecise estimates due to low degrees of freedom, we take a relatively conservative approach by using 2 lags, which should be sufficient to remove any residual auto-correlation with annual data. In addition, the use of deeper lags would be unfeasible due to relatively small degrees of freedom, which is a common problem of VARs due to the proliferation of the number of coefficients with each additional lag. However, we also check for the robustness of our baseline results to the lag length in Section 5.3.2.

We can now define the structural form of our baseline panel VAR in Eq. 36 below. Years are denoted by t subscripts and countries are denoted by i subscripts. As noted above, our analysis covers the period starting in 1995 and ending in 2012 (t=1, …, 18) and we include 27 countries that were EU members in 2012 (i=1, …, 27). The endogenous variables included in the VAR and their ordering is as follows: the log of real government spending (g), the log of real cyclically-adjusted net-taxes (t), the log of real GDP (y), the log of the GDP deflator (p) and average annual three-month money market interest rates in percents (r). In addition, we also include country-specific fixed effects (c) and a common time trend (t) as exogenous variables. D, E, P and H capture corresponding coefficients. The vector of orthogonal structural shocks $e_{i,t}$ reflects the shocks to each equation in the VAR. Finally, the first matrix in Eq. 36 captures contemporaneous relations between endogenous variables (the A_0 matrix). In particular, α_{nm} elements of the A_0 matrix represent the estimated contemporaneous reaction of variable m to shocks in variable n. The zero elements in the matrix reflect the restrictions of the recursive identification on the contemporaneous relations between variables, i.e. the restriction that variables ordered later do not have a contemporaneous effect on variables ordered before them.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ -\alpha_{gt} & 1 & 0 & 0 & 0 \\ -\alpha_{gy} & -\alpha_{ty} & 1 & 0 & 0 \\ -\alpha_{gp} & -\alpha_{tp} & -\alpha_{yp} & 1 & 0 \\ -\alpha_{gr} & -\alpha_{tr} & -\alpha_{yr} & -\alpha_{pr} & 1 \end{pmatrix} \begin{bmatrix} g_{i,t} \\ t_{i,t} \\ y_{i,t} \\ p_{i,t} \\ r_{i,t} \end{bmatrix} = D \begin{bmatrix} g_{i,t-1} \\ t_{i,t-1} \\ y_{i,t-1} \\ p_{i,t-1} \\ r_{i,t-1} \end{bmatrix} + E \begin{bmatrix} g_{i,t-2} \\ t_{i,t-2} \\ y_{i,t-2} \\ p_{i,t-2} \\ r_{i,t-2} \end{bmatrix} + Pc_i + Ht_t + \begin{bmatrix} \varepsilon_{i,t}^{g} \\ \varepsilon_{i,t}^{t} \\ \varepsilon_{i,t}^{y} \\ \varepsilon_{i,t}^{p} \\ \varepsilon_{i,t}^{r} \end{bmatrix} \quad \text{Eq. 36}$$

5.3.2 Baseline results and robustness checks

Before proceeding with estimations, a note is in order on the manner of estimation and presentation and discussion of the results. Since PVAR estimation is not yet part of standard software packages, we estimate our PVARs using the MATLAB code that has been developed and made public by Georgios Georgiadis[102]. Further, in line with effectively the entire literature using VARs, we are not interested in VAR coefficients, but we focus on impulse response functions (IRFs), which reflect the dynamic responses of variables to structural shocks. IRFs are based on the moving average representation of the VAR, and they are calculated as complex nonlinear interactions of VAR coefficients at different time horizons[103]. For the baseline model we will also present the forecast error variance decomposition (FEVD), which

[102] We are grateful to Mr. Georgiadis for the code and additional advice provided in our correspondence. The code is explained in Georgiadis (2012) and can be downloaded from https://sites.google.com/site/georgiosgeorgiadis111/research. This code can also estimate Panel Conditional Homogenous VARs (PCHVAR). A similar approach, which they call interacted PVAR (IPVAR), has been independently developed and used in Towbin and Weber (2013). We are also grateful to Pascal Towbin and Sebastian Weber for providing us the codes on IPVAR, which we hope we will find useful in some future application. While both the PCHVAR and the IPVAR methods allow for a richer analysis of heterogeneity than our approach of using sub-samples, we are unable to use these additional features due to the unavailability of sufficiently long data series required by both methods.

[103] For a detailed exposition on the calculation of impulse responses, see for instance Enders (1994).

decomposes the forecast error variance of each equation into contributions by separate structural shocks. However, in order to keep the discussion and the results manageable, we refrain from presenting FEVDs for our analysis of sub-samples and extensions.

As noted above, we will focus on government spending shocks. In line with the dominant practice in the literature, we present impulse responses to the government spending shock in graphical form (as well as 95% confidence intervals), while corresponding detailed tables are relegated to Appendix 5.2 and Appendix 5.3. Since one of the main aims of the study is to analyse the effects of fiscal policy on output, we also calculate and discuss the size of the fiscal multiplier. The fiscal multiplier is defined as the ratio of the change in output (ΔY) to the change in government spending (ΔG) relative to their respective baselines[104] (Spilimbergo et al., 2009). We focus on the impact multiplier or the multiplier at some horizon as a response to a shock at time *t*, but we do not discuss cumulative multipliers, which is in line with the established practice in the literature, as noted in surveys by Spilimbergo et al. (2009) and Rusnak (2011). In particular, we focus both on the impact multiplier, i.e. the impact response at the year of impact *t* ($=\Delta Y_t/\Delta G_t$), and on the multiplier at some horizon *h*, i.e. one or more years after the shock at time *t* ($=\Delta Y_{t+h}/\Delta G_t$); the same holds for responses of other variables besides GDP. In graphs, the year of impact is always zero, while the horizon starts with year 1, i.e. the year after the shock occurred. Further, in order to facilitate discussion, we standardise the size of the shock to be equal to 1% of GDP[105]. Consequently, we can directly interpret the impulse responses of GDP as the fiscal multiplier, i.e. the unit increase in GDP that is due to an increase in government spending for one unit of GDP. As far as the other variables are concerned, we mostly discuss the direction and the significances of responses as a

[104] The baseline is defined as the absence of fiscal shocks.

[105] Technically, this is done by defining the shock as one unit of spending, not as a standard deviation shock. Since spending enters in logs, a unit shock is in fact a shock equal to 1% of spending. However, with the re-scaling transformation, the unit shock of government spending is multiplied by the inverse of the average share of spending in GDP in the corresponding sample in order to define the size of the spending shock to be equal to one unit of GDP (and then to be able to directly interpret impulse responses of GDP as fiscal multipliers). Illustratively, without this transformation, impulse responses would show how a shock of one unit, i.e. 1% of spending is reflected in responses of other variables, expressed in percents (for variables in logs) or in percentage points (for rates or ratios). In such a case, additional calculations would be needed for the multiplier, since the spending shock and the response of GDP would be expressed in different units: the shock as 1% of spending, and the GDP response as a percentage of GDP. With this transformation, we multiply the size of the spending shock with the inverse of the share of government spending in GDP (around 25%), i.e. we multiply the shock by around 4. Consequently, the size of the spending shock now appears as 4 units, i.e. 4% of spending (due to logs), which is equivalent to a spending shock equal to 1% of GDP (because of the re-scaling). Since responses of GDP are also expressed in percents of the variable itself (as it also enters in logs), there is now a direct interpretation - for how many units (percents) does GDP change in response to a shock in government spending that is equal to one unit (1%) of GDP. As discussed above, this is in fact the definition of the fiscal multplier: ΔY/ΔG.

result of a positive spending shock of 1% of GDP, while detailed results are also presented in graphs and tables in Appendix 5.2. Where variables enter in logs (e.g. spending, GDP, net-taxes or the GDP deflator), the interpretation of responses is in terms of percentage changes of the responding variable, while for interest rates and variables that enter as a ratio (e.g. debt/GDP, net-exports/GDP) the responses are interpreted in percentage points. Finally, it should be noted that graphs also contain the 95% confidence intervals, while other conventional significance levels are presented in the tables in Appendix 5.2. However, we will mostly focus the size of the responses, although sometimes these are insignificant due to the relatively low degrees of freedom in our system.

We can now present the results of our baseline specification from Eq. 36, which includes the entire sample of 27 EU countries over the 1995-2012, with time trend and country fixed effects and with 2 lags of endogenous variables in the VAR. The results in Figure 5.1 below show that the government spending shock is relatively persistent, as it takes around five years for its effects on spending to die out. At the year of the shock, governments also increase net-taxes, but this response becomes negative from the following year, presumably as governments try to reinforce the effects of spending rises by also lowering taxes. The response of real GDP to the spending shock is positive and the fiscal multiplier is around one at the year of the shock and in the following year. While this implies that fiscal policy does stimulate output, its effectiveness is relatively limited, since there are no stronger multiplicative effects beyond the approximately one-for-one response of GDP[106]. In addition, the fiscal multiplier is halved three years after the shock, when it also becomes insignificant[107]. Although we do not discuss cumulative multipliers (as noted above), these results indicate that, in the entire sample, the cumulative fiscal multiplier is one within five years and around 0.8 within ten years.

The positive spending shock and the consequent increase in GDP also result in higher inflation, and the rise is significant for three years after the initial shock. Finally, interest rates fall on impact, while their direction changes the following year, although the responses become insignificant. While the initial negative response of

[106] The one-for-one response means that a one unit increase of government spending corresponds to one unit increase of GDP, which is true by definition if there are no stronger multiplicative effects. This is related to the fact that government spending is also included in the definition of GDP, i.e. government consumption is a separate component of GDP, whereas government investment is part of the total gross fixed capital formation.

[107] The positive response of GDP is insufficient to relate results to Real Business Cycle or New Keynesian theoretical predictions, since it is in line with predictions of both theories. We return to this issue when analysing the transmission mechanism of fiscal policy below.

interest rates is puzzling, we return to it in the following subsection when we analyse different sub-samples.

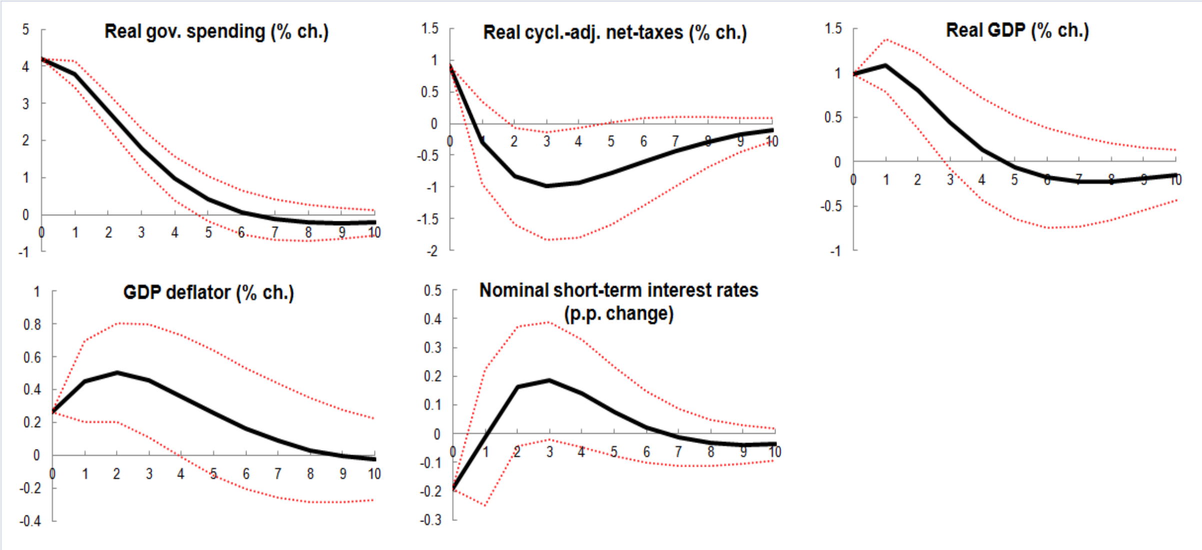


Figure 5.1. Impulse responses to a government spending shock of 1% of real GDP - baseline specification

Note: The size of the spending shock in the entire sample and in all sub-samples discussed below equals 1% of GDP, which is equivalent to around 4% of government spending (i.e. the inverse of the share of government spending in GDP. This share is around a quarter of GDP in the entire sample and in sub-samples).

Next we present results of the forecast error variance decomposition (FEVD), which is complementary to impulse responses. As noted above, the FEVD decomposes the forecast error variance of each equation into contributions by separate structural shocks. In line with our points of interest, in Table 5.1 we focus on the contribution of various shocks to the forecast error variance of GDP and the contribution of the government spending shock to the forecast error variance of various equations. The table on the left indicates that the forecast error variance of GDP is mostly attributable to GDP shocks. In addition, government spending shocks explain 8.4% of the forecast error variance on impact, and this effect fades out slowly in the future. On the other hand, the caveats regarding the proper identification of shocks to net-taxes notwithstanding, they initially explain only 4.6% of the forecast error variance of GDP, but their importance rises to explaining up to around a quarter of the GDP error variance 5 years after the shock. Further, the table on the right of Table 5.1

shows that a relatively low share of fluctuations of other variables is attributable to spending shocks. Indeed, spending shocks explain the majority of fluctuations of spending itself, as well as some of the forecast error variance of GDP, but do not explain more than around 3% of the forecast error variance of the other three variables.

Forecast error variance decomposition of GDP				
	At impact	After 1 year	After 3 years	After 5 years
Contributions of shocks to:				
Real gov. spending	8.4	7.8	5.7	4.7
Real cycl.-adj. net-taxes	4.6	10.8	20.6	25.7
Real GDP	87.0	78.9	66.1	59.9
GDP deflator	0.0	0.7	1.9	2.1
Nom. short-term int. rates	0.0	1.7	5.7	7.6
	100.0	100.0	100.0	100.0

Contributions of the gov. spending shock				
	At impact	After 1 year	After 3 years	After 5 years
To the FEVD of:				
Real gov. spending	100.0	94.5	72.7	58.6
Real cycl.-adj. net-taxes	1.5	0.9	1.9	2.8
Real GDP	8.4	7.8	5.7	4.7
GDP deflator	0.8	1.9	3.1	3.1
Nom. short-term int. rates	0.5	0.4	1.0	1.1

Table 5.1. Forecast error variance decomposition (FEVD) - baseline specification (Note: The table on the left shows the contribution in % of each shock to the forecast error variance of GDP at various horizons. The table on the right shows the contribution in % of the spending shock to the FEVD of each variable at various horizons.)

Bearing on mind the discussion above about the model specification, we present several robustness checks to impulse responses of the baseline specification. In order to facilitate the presentation and avoid cluttering, we present only the comparisons of alternative impulse responses without the confidence bands, which are presented in detailed graphs on separate alternatives in Appendix 5.2[108].

We start the robustness checks with the deterministic terms by comparing the baseline specification, which includes country fixed effects and a common linear time trend, with two alternatives[109]: country fixed effects without time trend, and pooled OLS with time trend. Figure 5.2 shows that results are fairly similar when the baseline is compared to the omission of the time trend. However, as discussed above, we keep the time trend in our specification due to the definition of variables in levels. On the other hand, results between the baseline and from the omission of country

[108] As noted previously, the comparison of impulse responses obtained when variables are defined in absolute terms and in per capita terms is relegated to Appendix 5.3. It shows that baseline results are robust to the alternative definition in per capita terms.

[109] An additional check is provided in Appendix 5.3, which shows that the baseline results are robust to the introduction of country-specific linear time trends instead of the common trend. Therefore, we proceed with the common time trend in all our specifications.

fixed effects are considerably different, with the responses in pooled VAR indicating a permanent level shift of GDP due to a spending shock, which is hardly feasible. This difference to the baseline is an indication that there is heterogeneity in our sample, so the maintenance of fixed effects is warranted in order to account for unobserved country heterogeneity.

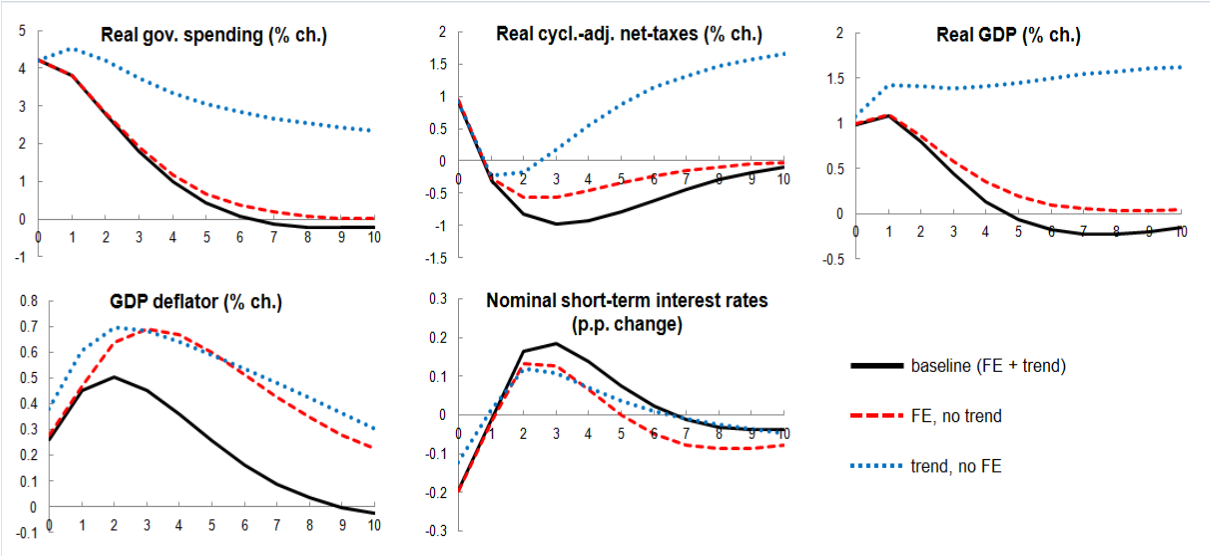


Figure 5.2. Impulse responses to a government spending shock of 1% of real GDP - robustness checks of deterministic terms

Next we check the robustness of our results to alternative lag-length of endogenous variables in the PVAR. Figure 5.3 shows that baseline results from a second order PVAR are robust to both a shorter and a longer lag-length by one year. Indeed, the size and dynamics of responses are fairly similar in all cases, although the option with 3 lags displays a somewhat higher volatility of responses. This robustness indicates that there are no severe problems with residual auto-correlation. Therefore, we maintain our baseline PVAR with 2 lags, since adding an additional lag would consume considerable degrees of freedom without any obvious benefits.

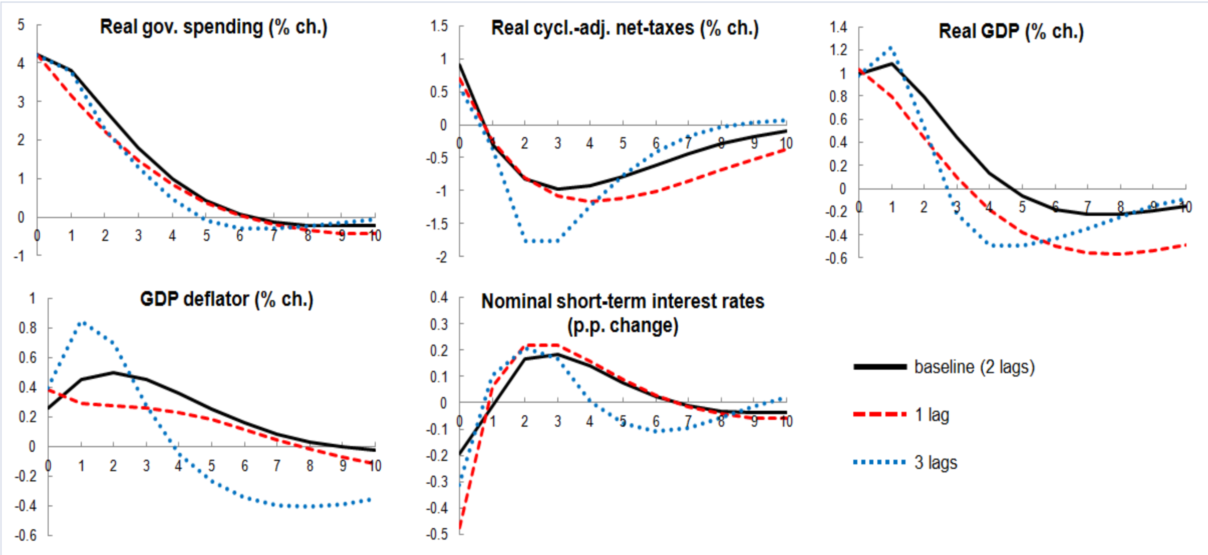


Figure 5.3. Impulse responses to a government spending shock of 1% of real GDP - robustness checks of the lag-length of endogenous variables

Finally, we also check the robustness of our results to an alternative ordering of variables. As discussed above, the main implication of the ordering of variables in our baseline PVAR (spending first, net-taxes second) is that spending shocks can affect net-taxes within the year, but not-vice versa. Although this is a standard assumption in the literature, we check the robustness of the results to ordering net-taxes first and spending second. In this case, spending shocks do not contemporaneously affect net-taxes, but can still have a contemporaneous effect on other variables. In addition, spending can now also be affected contemporaneously by shocks to net-taxes. Results of the alternative ordering in Figure 5.4 below indicate that responses of other variables to spending shocks (which again appear at t=0) are similar to the ones in the baseline ordering. In particular, the response of spending to its own shocks is almost the same in the two cases. By design, the response of net-taxes in the alternative ordering is different at impact (within the year, i.e. t=0), since the contemporaneous response of net-taxes to spending shocks is now restricted to zero. However, after a spending shock, net-taxes have a similar dynamics in the following years. Further, the response of GDP to a spending shock is fairly similar in both cases, implying that the results on the fiscal multiplier are quite robust. The responses of prices and particularly interest rates are also robust to the alternative ordering.

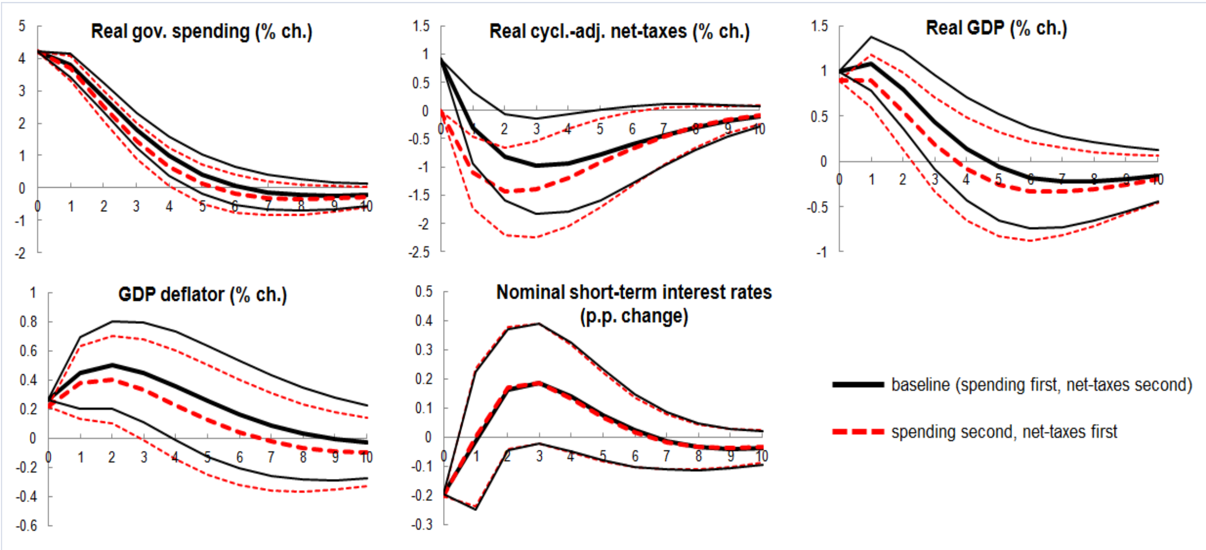


Figure 5.4. Impulse responses to a government spending shock of 1% of real GDP - robustness checks of the different ordering of spending and net-taxes

5.3.3 Sub-sample analysis (effects of structural characteristics)

In this section we analyse the effects of government spending shocks in various sub-samples, which are defined by various country features. By doing so, we address one of the main aims of the thesis, i.e. to analyse whether country structural characteristics influence the effects of fiscal policy on macroeconomic variables. In addition, splitting the sample in various ways also enables us to deal with country heterogeneity in a more careful manner, since sub-samples analysed here consist of more homogenous groups than the entire sample of 27 EU member states.

The analysis in this section applies the baseline specification of the panel VAR on various sub-samples. This means that we have five endogenous variables in the VAR: the log of real government spending, the log of real cyclically-adjusted net-taxes, the log of real GDP, the log of the GDP deflator and average annual three-month money market interest rates in percents. We also include country fixed effects and a common time trend as exogenous variables. On a technical note, in order to facilitate the discussion of results, we only present comparison graphs of impulse responses (and the corresponding 95% confidence intervals) for the sub-samples being analysed, whereas complete graphs and tables for each separate alternative are relegated to Appendix 5.2. It should also be noted that the 95% confidence intervals in the graphs below are somewhat wider than in the baseline results in Figure 5.1 due to the smaller sample sizes resulting from splitting the sample.

We first analyse possible differences in fiscal policy effects between the 17 old and 10 new EU member states (EU17 and NMS10 respectively[110]). This comparison is directly related to one of the aims of the thesis, which is concerned with the effects of fiscal policy in transition countries and possible differences with old EU member states. The comparison in Figure 5.5 shows that the response of spending to its own shock is fairly similar, and it becomes insignificant within 4 to 5 years. On the other hand, there is a complete opposite reaction of net-taxes. In old EU member states, positive spending shocks are accompanied by lower net-taxes as governments try to reinforce higher spending by also lowering revenues. In addition, this fall in net-taxes is significant for a considerable period into the future. On the other hand, spending shocks in transition countries are accompanied by an increase of net-taxes on impact, and the positive reaction of net-taxes is significant up to 3 years after the shock, indicating that governments in these countries try to pursue a more disciplined fiscal policy than in old EU member states. Further, the effects of spending shocks on GDP are positive in both old and new EU member states, and in both cases responses become insignificant around 3 years after the shock. However, the fiscal multiplier is higher in transition countries both at impact (1.3 in new and 0.6 in old EU member states) and into the future (e.g. 1 in new and 0.6 in old EU member states 3 years after the shock). Finally, although there are some differences in the dynamics, the reaction of prices and interest rates is fairly similar in the two groups of countries.

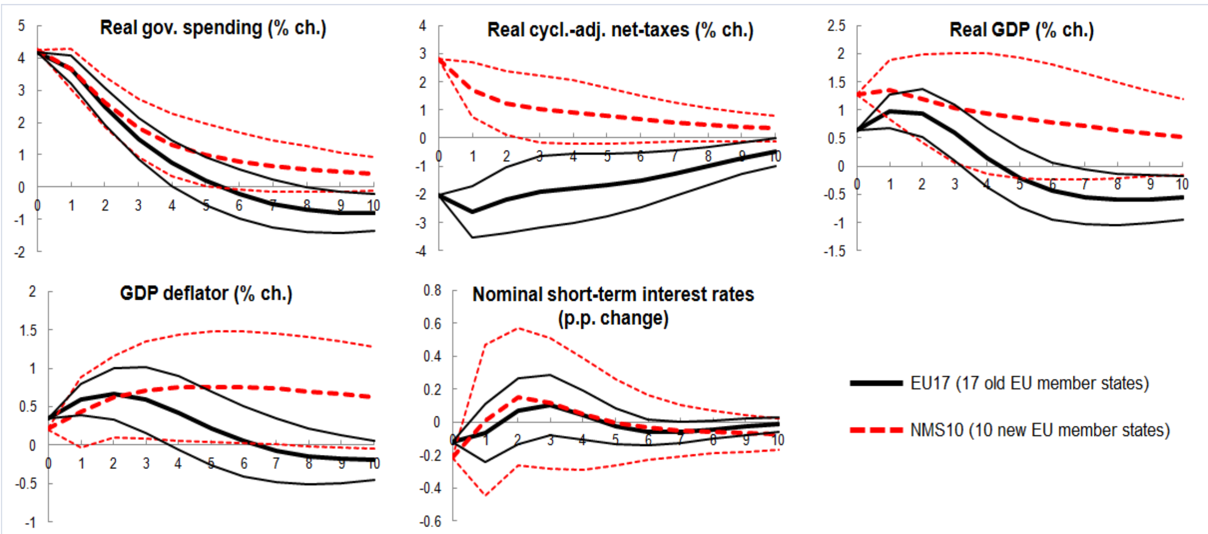


Figure 5.5. Comparison of impulse responses to a government spending shock of 1% of real GDP - old and new EU member states

[110] Similar to Chapter 3, EU17 consists of 15 old EU member states plus Malta and Cyprus, while NMS10 consists of the 10 new EU member states from Central and Eastern Europe (the 2004 and 2007 enlargement cohorts).

After analysing differences in effects of fiscal policy in old and new EU member states, we turn to the importance of country structural characteristics for the effects of fiscal policy. First we analyse the effects of the level of public debt by using the threshold of the average share of public debt to GDP of 60% between 1995 and 2012 to split the sample into countries with high and low debt[111] (Figure 5.6). Results indicate that there is indeed a different response to spending shocks in the two groups of countries. First, in countries with lower debt levels positive spending shocks are followed by higher net-taxes, unlike high-debt countries where higher spending is accommodated by lower taxes, thus potentially further increasing deficits and debt levels. What is more important, the fiscal multiplier is higher in less indebted countries, and this holds both at impact (1 in low-debt and 0.6 in high-debt countries) and into the future (e.g. 0.5 in low-debt and 0.3 in high-debt countries 3 years after the shock). This result indicates that the effectiveness of fiscal policy is considerably stronger in low-debt than in high-debt countries, which is in line with *a priori* expectations and findings in the literature (Rusnak, 2011). Further, spending shocks tend to be followed by higher inflation in low-debt countries, possibly reflecting higher demand. On the other hand, the dynamics of the response of interest rates are similar, although there are some differences in magnitude.

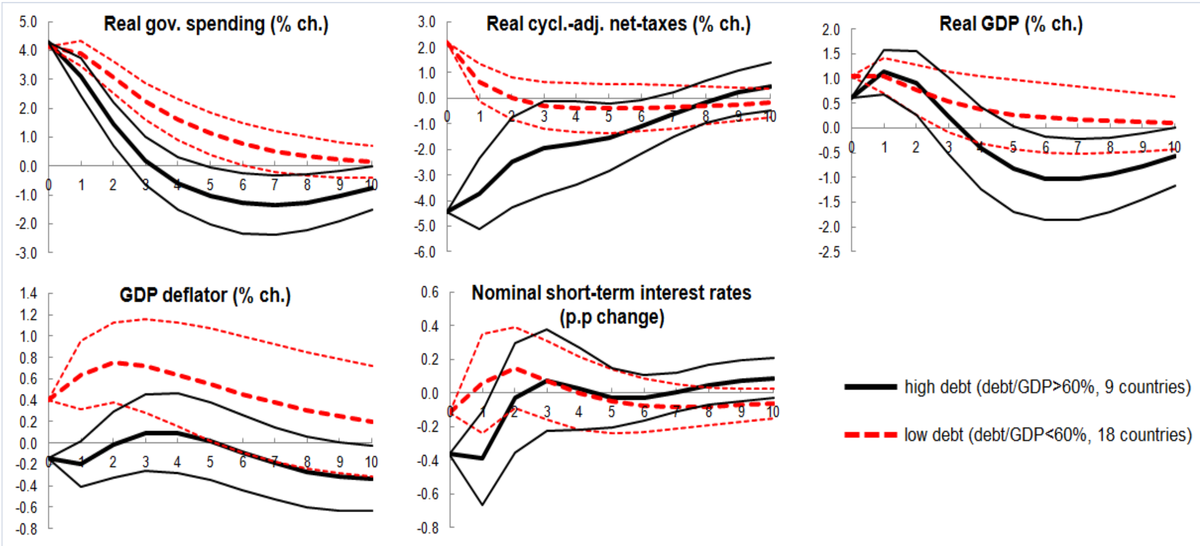


Figure 5.6. Comparison of impulse responses to a government spending shock of 1% of real GDP - high debt and low debt countries

(Note: High debt countries: Austria, Belgium, Cyprus, France, Germany, Greece, Hungary, Italy, Portugal. Low debt countries: Bulgaria, Czech Republic, Denmark, Estonia, Finland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.)

[111] The threshold of 60% is in line with the Maastricht criteria for public debt. However, results are similar if the threshold is defined as 50% instead.

Another factor which could affect the effects of fiscal policy is the level of trade openness, since it is expected that, in more open countries, there would be partial 'leakages' of the positive fiscal shock, i.e. the higher demand could be met with higher imports, thus decreasing the effects on GDP and the size of the multiplier. In order to analyse this issue, we split our sample into more open and less open countries by using the level of average trade openness to GDP of 50% between 1995 and 2012 as a threshold[112]. Results in Figure 5.7 below support the *a priori* expectation that the effects of fiscal policy differ according to the level of openness. Somewhat surprisingly, on impact the size of the fiscal multiplier is slightly higher in more open than in less open economies (1.1 and 0.7 respectively). However, starting from one year after the shock, the fiscal multiplier is considerably higher in less open economies. In addition, it is also significant for three years after the shock in less open economies, while it becomes insignificant one year after the shock in more open economies. These results indicate that there are considerably more 'leakages' in more open economies via the import channel, thus making fiscal policy in these countries less effective. On the other hand, the openness level does not affect the responses of other variables to the spending shock, except for the impact responses.

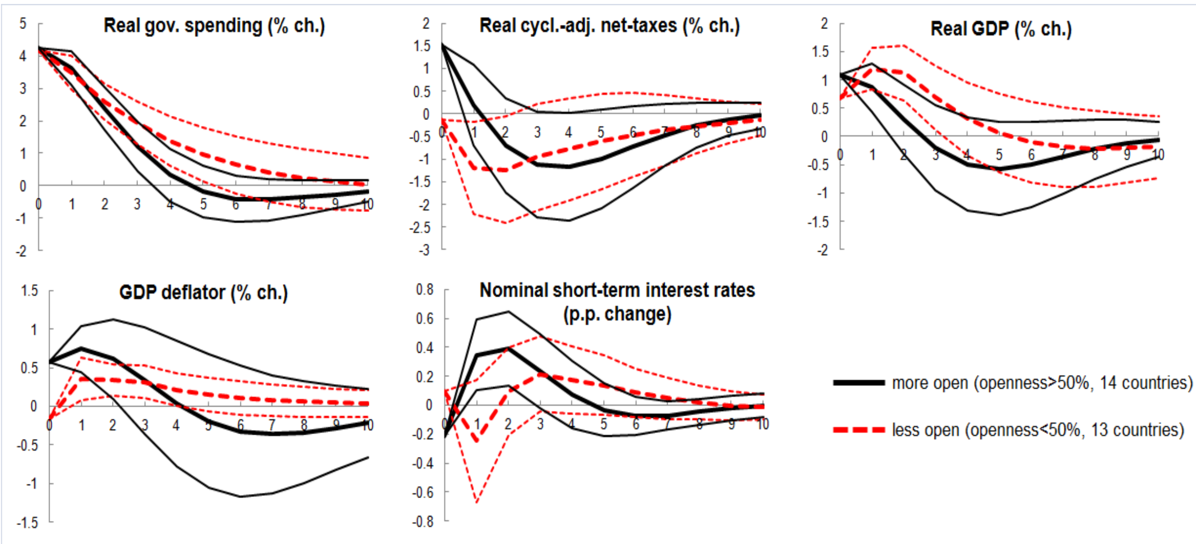


Figure 5.7. Comparison of impulse responses to a government spending shock of 1% of real GDP - more and less open countries
(Note: More open countries: Belgium, Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Slovakia, Slovenia. Less open countries: Austria, Denmark, Finland, France, Germany, Greece, Italy, Poland, Portugal, Romania, Spain, Sweden, United Kingdom.)

[112] Openness is calculated as the share of foreign trade in nominal GDP. Foreign trade is calculated as the sum of nominal exports and imports of goods and services divided by 2.

As discussed in the previous chapter, in circumstances of low demand and zero lower bound of nominal policy rates, it is generally expected that the size of the fiscal multiplier would be higher than in normal circumstances. Therefore, in the last part of this section we analyse whether our baseline results on effects of fiscal policy shocks in European countries are partially a reflection of the Great Recession. In order to do so, we compare baseline results (1995-2012) to the ones that obtain when shortening the sample for the crisis years, i.e. using only the pre-crisis period between 1995 and 2008. While the shorter sample of 14 years magnifies potential small sample problems discussed in the previous section, results of this comparison in Figure 5.8 still yield some interesting insights. In the pre-crisis period, the size of fiscal multiplier is about half the size of the multiplier in the entire period, both on impact (0.4 compared to 1) and into the future. In addition, the response of GDP in the pre-crisis period becomes insignificant only one year after the shock, whereas in the entire period it is significant up to three years after the shock. Overall, these results suggest that fiscal policy is less effective in normal circumstances, while the results for the entire period are driven by the higher effectiveness in the recent crisis years, which is in line with expectations. Further, while the responses of other variables are similar, there are some differences in the response of interest rates. In particular, when using the entire period, interest rates fall on impact, and become insignificant thereinafter, which is somewhat puzzling. However, in the pre-crisis period, the response of interest rates to spending shocks is significantly positive on impact and up to three years after the shock. This difference is an indication that the response of monetary policy in the entire sample might be driven by the crisis years. Indeed, it appears that central banks respond to positive spending shocks with more restrictive policy in normal times, but accommodate fiscal policy shocks during the crisis years.

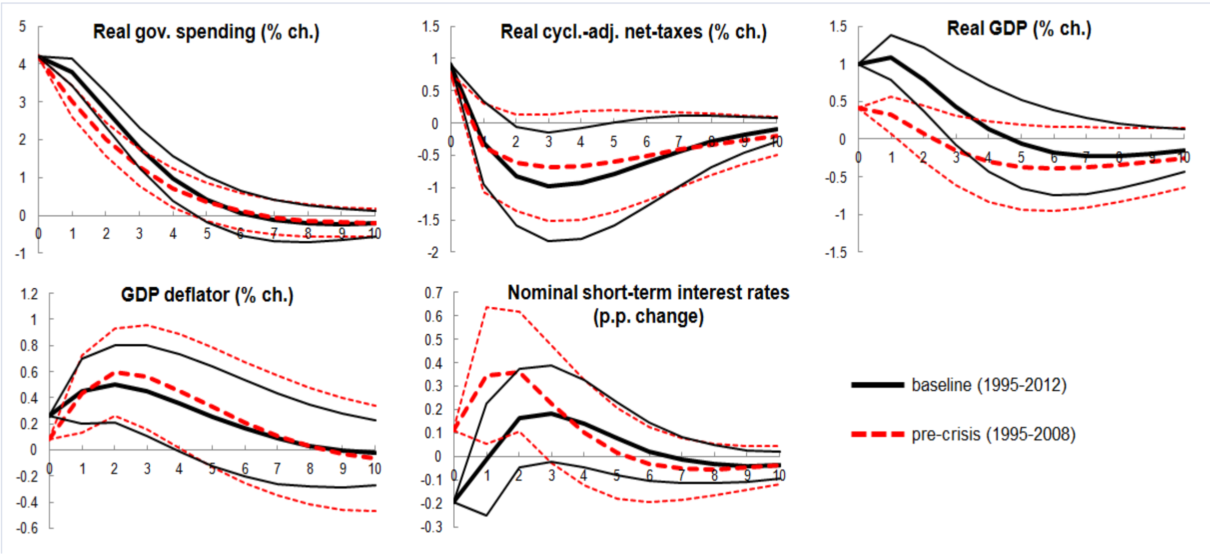


Figure 5.8. Comparison of impulse responses to a government spending shock of 1% of real GDP - baseline and pre-crisis period

Before moving to the analysis of the transmission mechanism of fiscal policy and other extensions of our baseline specification, it is useful to summarise the main findings so far related to main differences between results across various sub-samples. Therefore, Table 5.2 below presents the main results on the size of the fiscal multiplier in the baseline specification and in various sub-samples. As discussed previously, the fiscal multiplier in the entire sample is around one on impact and after one year, and declines thereinafter. However, the fiscal multiplier is higher than one in new EU member states, whereas fiscal policy is less effective in old EU member states. Further, in line with theoretical predictions and findings in most empirical studies (Chapter 4), fiscal policy is considerably more effective in countries with low public debt levels and low trade openness. Last but not least, fiscal multipliers were much lower in 'normal', pre-crisis years. This implies that the results on the entire sample are driven by the much higher effectiveness of fiscal policy during crisis years, which is in line with traditional Keynesian predictions of effective fiscal policy in recessions. Overall, the results from this section and particularly the summary in Table 5.2 confirm the suggestion by Spilimbergo et al. (2009) that fiscal multipliers are country-, time- and circumstance-specific.

	Size of the fiscal multiplier			
	On impact	After one year	After 3 years	After 5 years
Baseline (EU27, 1995-2012)	1.0***	1.1***	0.4*	-0.1
Old EU member states (EU17)	0.6***	1.0***	0.6**	-0.2
New EU member states (NMS10)	1.3***	1.4***	1.0**	0.9
High debt (debt/GDP>60%)	0.6***	1.1***	0.3	-0.8*
Low debt (debt/GDP<60%)	1.0***	1.1***	0.5*	0.3
High openness (>50% of GDP)	1.1***	0.9***	-0.2	-0.6
Low openness (<50% of GDP)	0.7***	1.2***	0.7**	0.1
Pre-crisis (EU27, 1995-2008)	0.4***	0.3**	-0.1	-0.4

Table 5.2. Fiscal multipliers in the entire sample and in various sub-samples
(Note: The table shows the size of the fiscal multiplier, i.e. the response of real GDP (in %) to a government spending shock of 1% of real GDP. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.)

5.4 Results on the transmission mechanism of fiscal policy and other extensions

This section provides various extensions of the baseline specification in order to shed some light on the transmission mechanism of fiscal policy, which is one of the main aims of this chapter. In order to do so, we use various components of GDP and fiscal policy, as well as some additional variables. This enables us to also analyse the channels through which fiscal policy affects the economy, which are interesting in their own right. In addition, some of the extensions enable us to analyse relations between our empirical results and theoretical predictions. Last but not least, some of the extensions provide additional robustness checks on the baseline results. In all cases, we start from the baseline specification of our PVAR with five endogenous variables (Eq. 36 and Subsection 5.3.2) and modify it in accordance with the issues we are analysing[113]. Similar to the previous section, here we only present comparison graphs of impulse responses (with corresponding 95% confidence intervals) for the specifications being analysed, whereas complete graphs and tables for each separate alternative are provided in Appendix 5.2.

[113] Our baseline specification has five endogenous variables in the VAR: the log of real government spending, the log of real cyclically-adjusted net-taxes, the log of real GDP, the log of the GDP deflator and average annual three-month money market interest rates in percents. We also include country-specific fixed effects and a common time trend as exogenous variables.

5.4.1 Effects of fiscal policy on private consumption and investment

We start this part of the analysis by augmenting the baseline specification with four additional variables: private consumption, private investment, real wages per employee and total employment[114]. In line with the practice in the literature (e.g. Caldara and Kamps (2008) and Perotti (2005)), we add one variable at a time to our baseline of 5 variables, which yields four additional specifications with 6 variables[115]. In order to facilitate the discussion and bearing on mind the robustness of the responses of the other variables, we only present the responses of each additional variable to a spending shock of 1% of GDP, whereas the complete responses for each of the four specifications are relegated to Appendix 5.2.

Figure 5.9 below presents the responses of the additional variables in respective extended 6-variable PVARs when the entire sample is used. According to the results, government spending shocks of 1% of GDP are followed by increases both of private consumption and private investment. While the response of investment is about double the one of consumption both at impact and in the future, they both have a similar dynamic and both are significant up to 2 years after the shock. In addition, the results indicate that the rise of private consumption is a reflection of the rise of both real wages and employment following a government spending shock.

The extension of the baseline specification with these variables also makes it possible to analyse whether effects of fiscal policy are in line with Real Business Cycle (RBC) or New Keynesian predictions. Indeed, as discussed in detail in the previous chapter, both groups of theories predict that government spending shocks cause higher output. Related to this, our previous finding of rising output in response to spending shocks in the baseline specification is in line with the vast majority of other empirical studies as well as predictions of the two main theories. However, theories diverge on the predicted response of other variables, particularly private consumption, real wages and employment, while predictions on the response of private investment are less clear (Perotti, 2008). Our finding of a positive response of private consumption to spending shocks is in line with almost the entire empirical literature, but opposite to predictions of both baseline RBC and baseline New Keynesian theoretical models, which predict that private consumption would fall due

[114] Most studies on US data use private sector wages and private sector employment. While such an approach would be more consistent with the use of private consumption and private investment, data on private sector wages and employment for EU countries are not available from the European Commission AMECO database.

[115] Each new variable is added before GDP. However, as discussed above, the ordering does not matter since we are interested only in the effects of spending shocks, which are ordered first.

to dominant negative wealth effects. Indeed, as surveyed in Chapter 4, the extension of baseline theoretical models was partially motivated by their inability to explain overwhelming empirical evidence of rising private consumption. Related to this, our empirical results are in line with predicted responses in some of these extended theoretical models. In particular, our finding of rising private consumption, real wages and employment is in line with predictions both from extended RBC models with monopolistic competition and 'deep habits' in the consumption of individual goods (Ravn et al., 2006) and extended New Keynesian models with rule-of-thumb consumers (Galí et al., 2007).

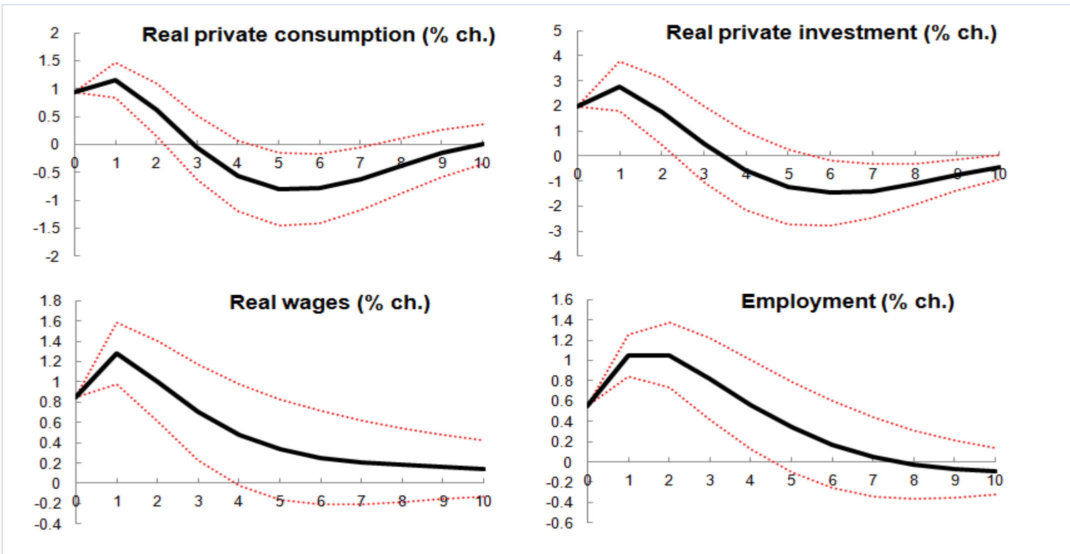


Figure 5.9. Impulse responses of additional variables to a government spending shock of 1% of real GDP - extended PVARs with 6 variables
(Note: Only responses of the additional variable in each of the four 6-variable PVARs are shown. For complete results of each specification, see Appendix 5.2)

Next we carry out the same exercise with an additional variable in the baseline specification, but now split the sample to old and new EU member states in order to analyse whether there are differences in the transmission mechanism between the two groups. Figure 5.10 broadly confirms results from the entire sample, with dynamics and signs of the responses similar in the two groups, although there are differences in the strength of the responses. More precisely, in both groups private consumption rises in response to government spending shocks, as do wages and employment as two key factors supporting consumption. However, the rise of consumption, wages and employment is stronger in new member states, and this holds both at impact and into the future. In addition, the response of consumption and wages becomes insignificant in both country groups two years after the shock, whereas the rise of employment is significant for longer in new than in old member states (five as opposed to two years). Finally, the positive response of private investment is stronger in new member states on impact, but afterwards the response is both stronger and significant for a longer period in old member states.

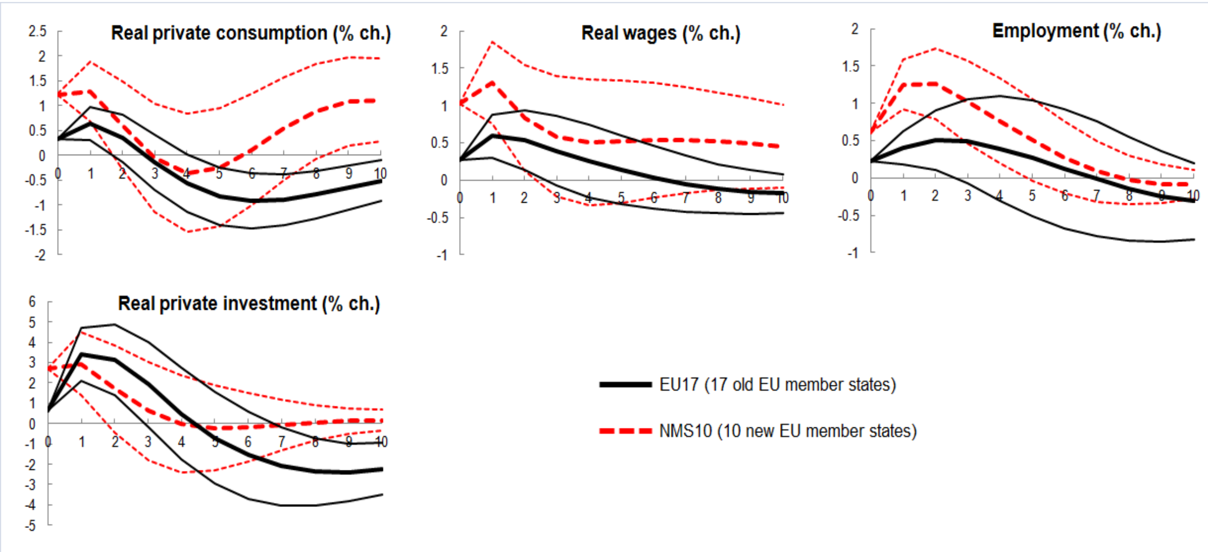


Figure 5.10. Comparison of impulse responses to a government spending shock of 1% of real GDP in extended PVARs with 6 variables - old and new EU member states

5.4.2 Effects of various components of government spending

Although we are focused in the effects of government spending shocks, in line with the vast majority of the literature, we are also interested in whether components of government spending have different effects on output and other macroeconomic variables. This is not directly related to any theoretical model, but still provides some interesting insights on the transmission mechanism of fiscal policy. Therefore, we proceed by separately analysing the effects of the two components of government spending: consumption and investment. In addition, we also consider the effects of the two components of government consumption: the government wage bill and the government non-wage consumption. In order to do so, in the baseline specification[116],

[116] Our baseline specification has five endogenous variables in the VAR: the log of real government spending, the log of real cyclically-adjusted net-taxes, the log of real GDP, the log of the GDP deflator and average annual three-month money market interest rates in percents. We also include country-specific fixed effects and a common time trend as exogenous variables.

we replace real government spending with its components, one at a time, and present the responses of GDP to shocks of 1% of GDP of various components in Figure 5.11, whereas complete responses of all variables are relegated to Appendix 5.2. According to the results, there are some differences in the effect of spending components on output. In particular, government investment is the more effective tool in stimulating output compared to government consumption. Indeed, the response of GDP to government investment shocks is stronger than the response to government consumption shocks at impact and up to three years after the shock, while in both cases the response of GDP becomes insignificant about two years after the shock. Further, among the components of government consumption, government wage bill shocks are more effective than government non-wage consumption shocks up to two years after the shock, although in both cases the response becomes insignificant rather quickly. Overall, these results indicate that, if the aim is to stimulate output, the most effective way to do so is by increasing government investment. If government consumption is used, the effects of government employees' wages are somewhat larger than those of non-wage consumption (i.e. government purchases of goods and services).

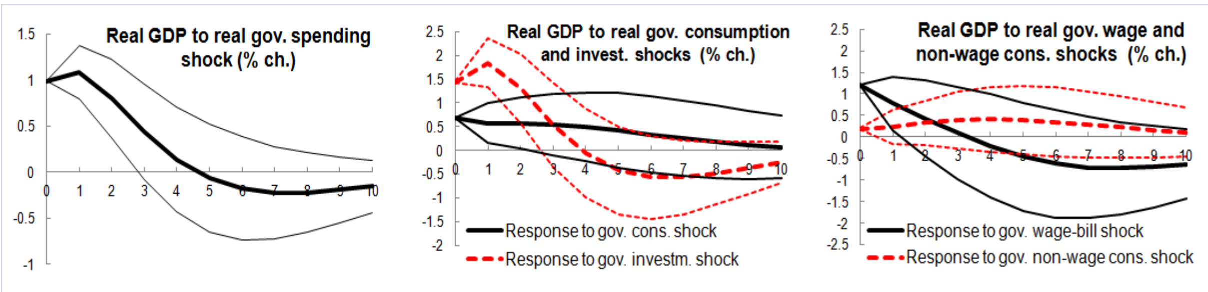


Figure 5.11. Impulse responses of GDP to a shock of 1% of real GDP in various spending components

We further enrich the analysis of the transmission mechanism by considering the effects of various government spending components on private consumption and investment as key components of GDP. In order to do so, in our baseline VAR we replace GDP with private consumption and private investment, and then replace government spending with its components one at a time. Similar to previously, in Figure 5.12 below we only present the responses of private consumption and investment to shocks of 1% of GDP to various components, whereas complete responses of all variables are provided in Appendix 5.2. Results indicate that total government spending shocks have stronger positive effects on private investment than on consumption, although in both cases the effect becomes insignificant after two years. As far as the components of spending are concerned, somewhat surprisingly government consumption is more effective in stimulating private investment than private consumption on impact, but in both cases responses quickly become insignificant. On the other hand, in line with expectations, government investment is more effective in stimulating private investment than private consumption. Further, shocks to the government wage-bill have positive effects on both private consumption and investment on impact but this effect quickly becomes insignificant. Finally, government non-wage consumption shocks are more effective in stimulating private investment on impact, whereas their effects on both private consumption and investment become insignificant in the first year after the shock. Overall, these results indicate that the fiscal policy works mostly via its effects on private investment, which normally appears to be more responsive, whereas responses of private consumption are lower, in line with the expected relatively higher inertia in household consumption.

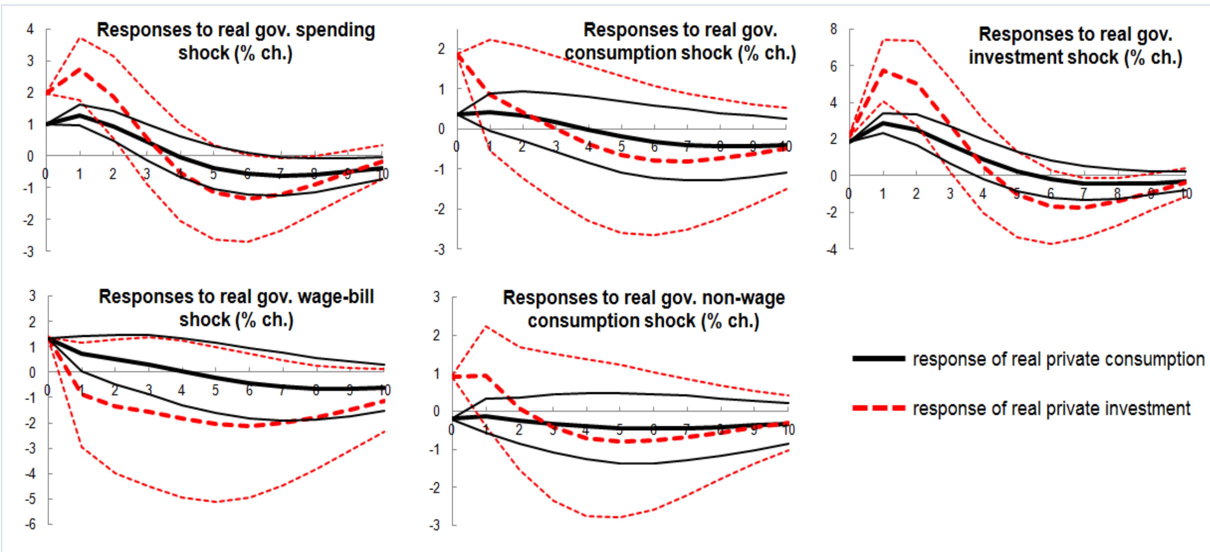


Figure 5.12. Impulse responses of private consumption and private investment to a shock of 1% of real GDP in various spending components

5.4.3 Effects of debt on the transmission of fiscal policy shocks

We proceed by analysing the robustness of our baseline results for the entire sample to the inclusion of the public debt ratio in the specification. As discussed in the previous chapter, public debt is not usually included in the VAR, which has been criticised by Favero and Giavazzi (2007) since a fiscal shock is expected to constrain future revenues and spending due to the intertemporal budget constraint. Consequently, they argue that results of standard fiscal VARs may be biased due to the omission of debt, and recommend that the analysis of fiscal shocks should take into account the debt dynamics and allow for possible feedback from debt to fiscal and other variables. Therefore, we augment our baseline specification for the entire sample with the share of public debt to GDP as an endogenous variable. Results in Figure 5.13 below indicate that baseline responses of other variables to a government spending shock are robust to the inclusion of the debt level. This also holds for the response of interest rates, which is opposite to findings by Favero and Giavazzi (2007) that in the US interest rates respond differently to spending shocks when debt is included in the VAR. In addition, the debt/GDP ratio itself slightly falls on impact in response to a spending shock, probably reflecting the rise of net-taxes and of GDP on impact. However, there is a significant increase in the debt/GDP ratio of up to 2 percentage points in the future and this response dies out rather slowly. Overall, these results on the response of public debt suggest that spending shocks have a considerable deteriorating effect on fiscal sustainability. Indeed, in the wake of spending shocks, the rise of spending is quite persistent, unlike the positive response of net-taxes, which dies out considerably faster, thus giving rise to higher budget deficits and consequently higher debt levels.

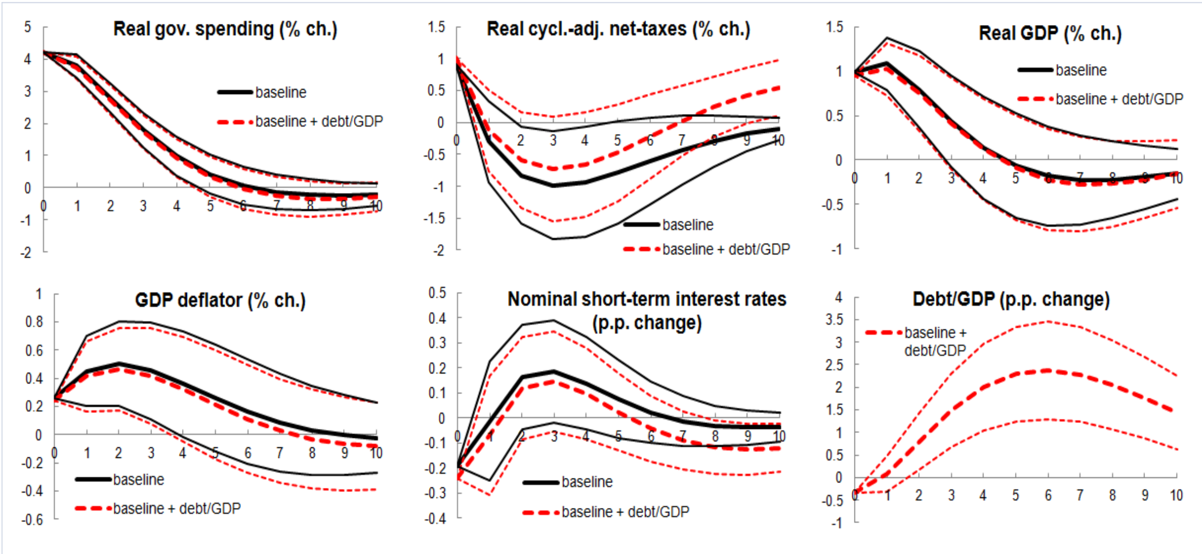


Figure 5.13. Comparison of impulse responses to a government spending shock of 1% of real GDP - baseline and baseline extended with debt/GDP as endogenous variable

We carry out the same exercise with the inclusion of debt, but now we split the sample to old and new EU member states. Since baseline responses of all variables in both country groups are robust to the inclusion of debt, we relegate them to Appendix 5.2, while here we focus on the response of GDP and fiscal variables in the two groups. Results in Figure 5.14 below indicate that baseline responses of GDP to spending shocks are robust to the inclusion of debt in both country groups. In addition, the conclusion from the baseline that fiscal multipliers are higher in new than in old member states holds when debt is added. Finally, it appears that fiscal sustainability is stronger in new than in old member states, since government spending shocks result in a low and insignificant response of debt in new member states, unlike old member states where spending shocks are followed by considerably higher debt levels. Additional results indicate that this difference in the response of debt levels is related to the response of net-taxes in old and new EU member states, which was also discussed above. Indeed, in new EU member states, government spending shocks are followed by higher net-taxes. On the other hand, higher spending in old EU member states is accommodated by lower taxes, and consequently debt levels are higher, thus giving rise to concerns about debt sustainability.

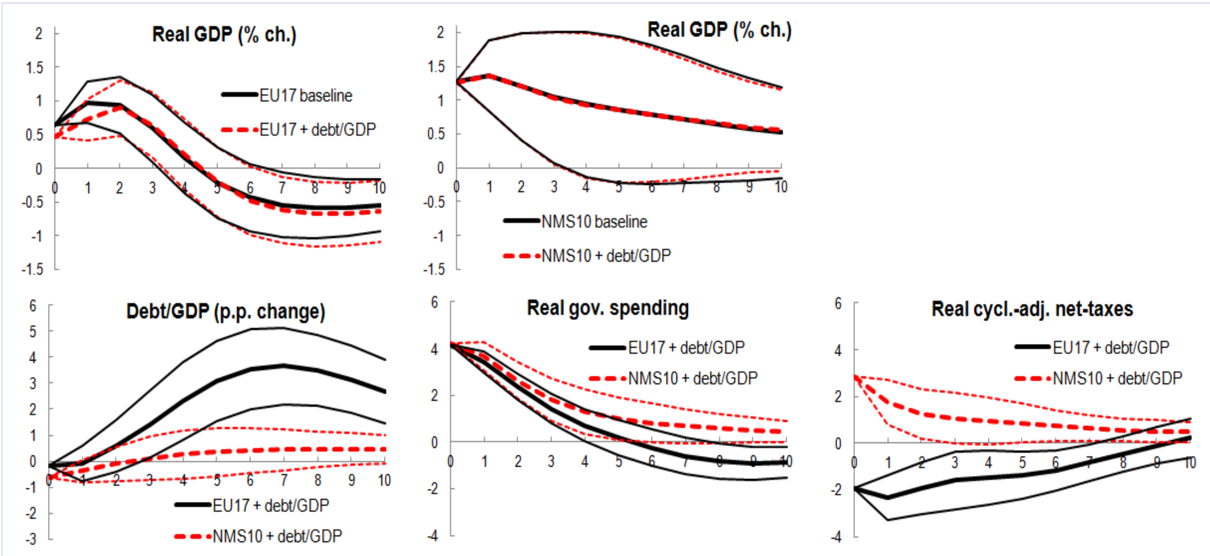


Figure 5.14. Comparison of impulse responses of GDP to a government spending shock of 1% of real GDP with and without debt/GDP - old and new EU member states

5.4.4 Transmission of fiscal policy shocks in the open economy context

In order to check the robustness of baseline results and to provide further insights into the workings of fiscal policy, we extend our analysis by introducing some open economy elements. This point is particularly relevant, since our sample consists of small open economies. We first provide two modifications of the baseline PVAR with five variables[117]. First, in the baseline specification we replace GDP with private consumption and private investment (6-variable PVAR in Figure 5.15). Second, to this specification we also add real exports and real imports of goods and services, which yields an 8-variable PVAR. The comparison of responses to government spending shocks in the two specifications is presented in Figure 5.15. The 6-variable PVAR confirms previous findings that private consumption and investment react positively to government spending shocks, with the response of private investment around double that of private consumption. In addition, the responses of net-taxes, the GDP deflator and interest rates are similar to those of the baseline specification with GDP (commented above). The results of the 6-variable PVAR are robust to the

[117] Our baseline specification has five endogenous variables in the VAR: the log of real government spending, the log of real cyclically-adjusted net-taxes, the log of real GDP, the log of the GDP deflator and average annual three-month money market interest rates in percents. We also include country-specific fixed effects and a common time trend as exogenous variables.

inclusion of real exports and imports in the specification in the 8-variable PVAR. In this case, responses of exports and imports themselves are in line with expectations. Government spending shocks only marginally increase exports on impact, but the response becomes insignificant thereinafter. On the other hand, spending shocks result in higher imports of goods and services, and the increase is significant up to two years after the shock. The positive response of imports can be explained by the considerable import share of government spending, private consumption and private investment, which all rise in response to a positive spending shock.

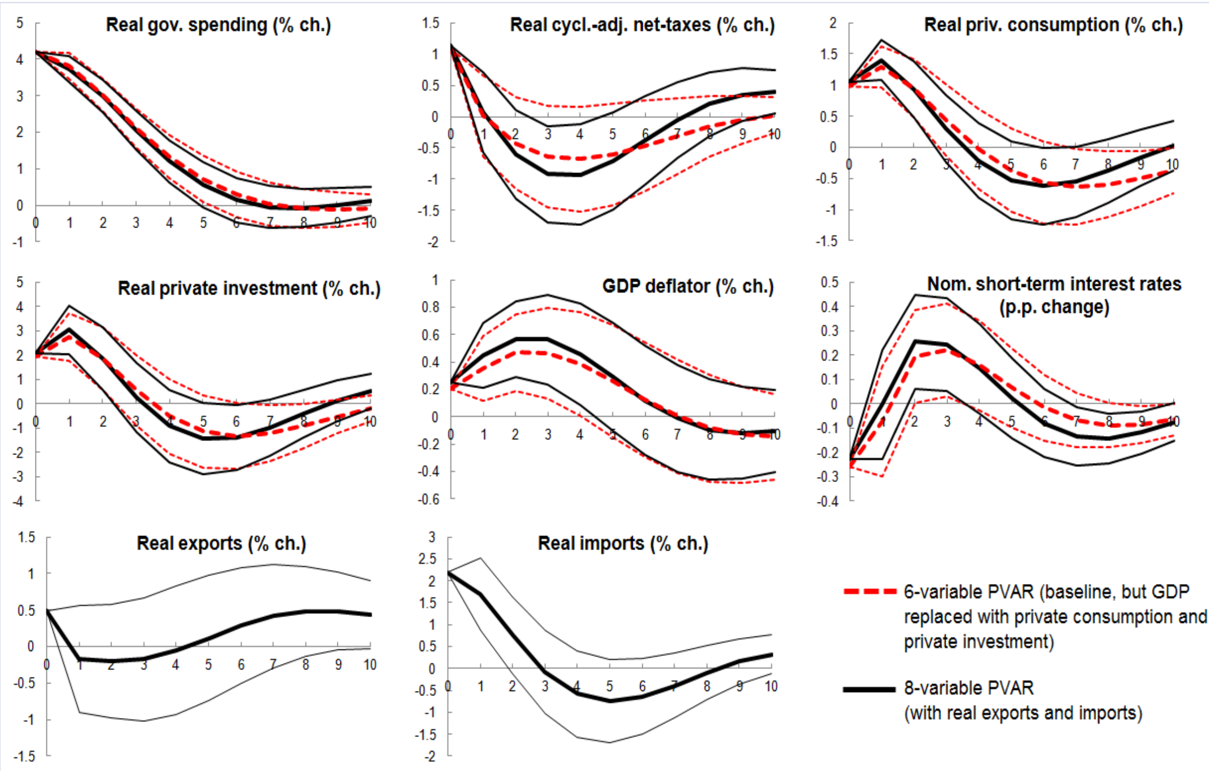


Figure 5.15. Comparison of impulse responses to a government spending shock of 1% of real GDP - specifications with GDP components

Besides extending the baseline specification with separate GDP components, we provide an alternative open economy specification by introducing variables that are more common in the relevant literature. More precisely, we bring back GDP instead of using separate GDP components, since the extended 8-variable VAR consumes considerable degrees of freedom. Further, we also remove prices, and use the CPI-based real exchange rate and real interest rates instead, which is a common approach in the open economy context. This specification is completed by the introduction of the ratio of real net-exports to GDP, thus partially resembling the analysis for the US by Kim and Roubini (2008). Results in Figure 5.16 below confirm the previous finding that GDP rises in response to spending shocks, even when this alternative specification is used. Further, spending shocks result in a small real exchange rate depreciation on impact, but the effect soon becomes insignificant. Real interest rates tend to fall in response to spending shocks, thus mimicking the fall in nominal interest rates and the increase in prices from the baseline specification. Finally, spending shocks result in a considerable deterioration of the trade deficit of around 1.1 percentage points of GDP on impact, and the fall is significant up to two years after the shock. The worse trade deficit in the wake of spending shocks could be explained mostly by the previous finding of rising imports, which are also related to the stronger economic activity and accommodative real interest rates. However, net-exports start rising around three years after the shock, which could reflect higher private investment (found earlier) and higher productivity of the domestic economy.

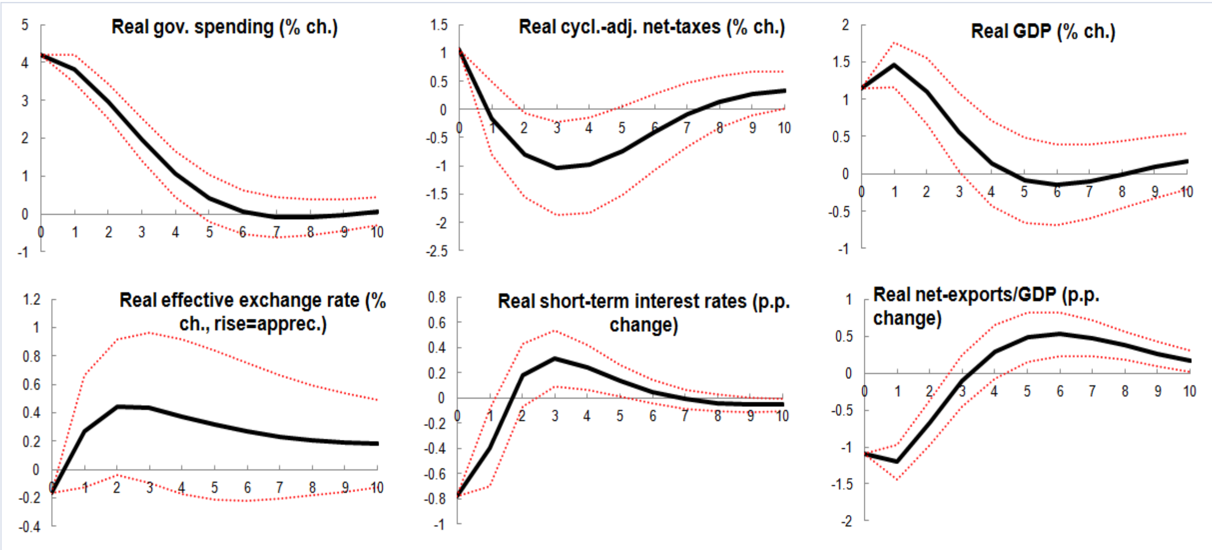


Figure 5.16. Impulse responses to a government spending shock of 1% of real GDP - open economy specification

In Figure 5.17 we repeat the open economy analysis, but now for the sub-samples of old and new EU member states. Responses of net-taxes and GDP are similar to the ones in respective baseline specifications for the two country groups commented previously, with the fiscal multiplier higher in new member states, and rising net-taxes in new member states as opposed to falling net-taxes in old member states. Further, results indicate that government spending shocks are followed by real appreciation in old EU member states, unlike the minimal real depreciation in new member states, although in both cases responses are mostly insignificant. The dynamics of real interest rates and net-exports are similar in both country groups, as they both fall on impact and then soon become insignificant. The only difference is that both real interest rates and net-exports initially fall more in new than in old member states.

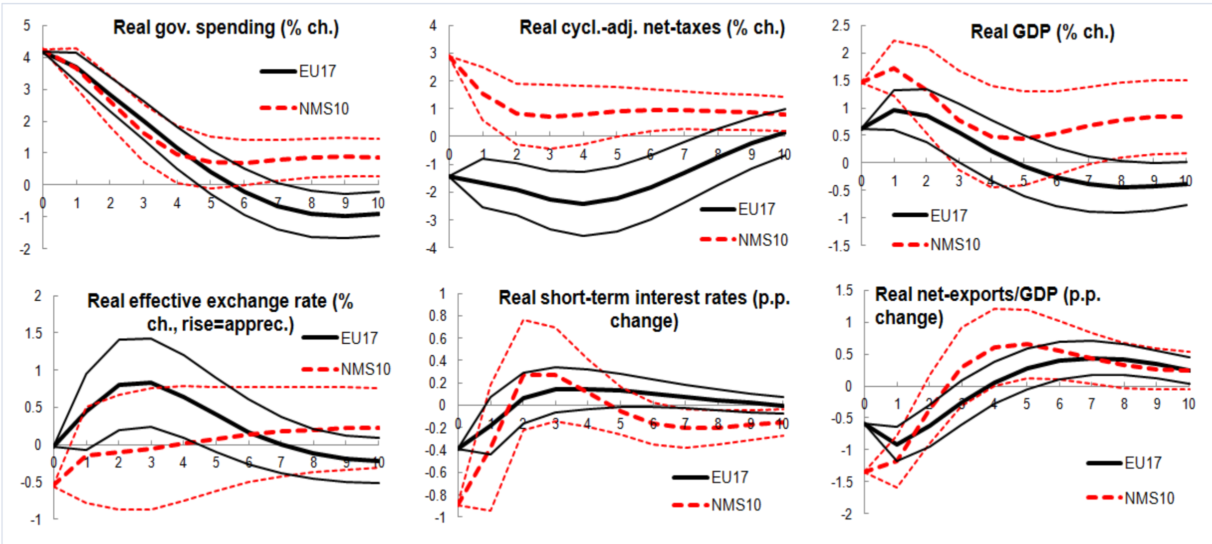


Figure 5.17. Comparison of impulse responses to a government spending shock of 1% of real GDP in the open economy specification - old and new EU member states

5.4.5 Jack-knifing the results of the baseline specification

The final analysis in this part provides an additional robustness test by using the jack-knifing procedure[118], which enables to check whether baseline results for the entire sample are driven by any particular country. Jack-knifing is used to calculate pseudo-coefficients when omitting one country at a time, in effect yielding 27 sets of pseudo-coefficients (i.e. one set for each country omitted), as well as accompanying standard errors and impulse responses. This set of results, presented in Figure 5.18, can be useful in distinguishing whether a particular country is driving the results. Figure 5.18 contains the impulse responses and the 95% confidence interval from the

[118] A similar approach was used in the empirical analysis in Chapter 3, which also provides details about the procedure.

baseline specification with 27 countries, as well as impulse responses if one country is dropped from the sample, but we do not report jack-knifed confidence bands in order to avoid cluttering. Baseline responses appear very robust to the exclusion of any country from the sample, since jack-knifed responses are mostly close to the baseline ones. In addition, jack-knifed responses are within the 95% confidence bands of the baseline, except for minor differences in some of the jack-knifed responses on impact.

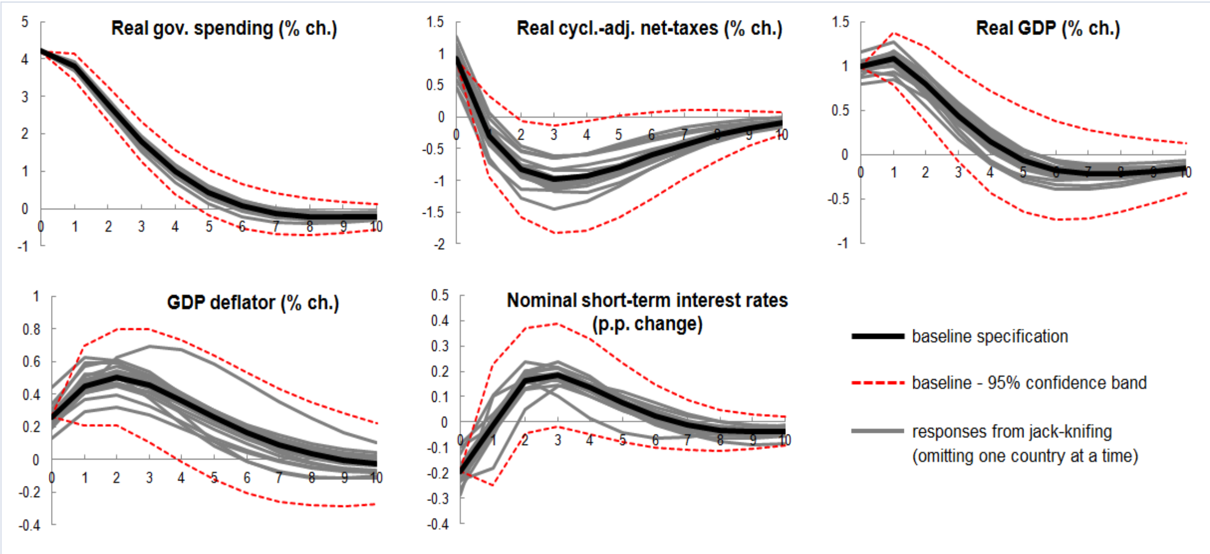


Figure 5.18. Impulse responses to a government spending shock of 1% of real GDP - jack-knifing the baseline specification (removing one country at a time)

5.5 Conclusions

This chapter provides an empirical analysis of the effects of fiscal policy on output and other macroeconomic variables in European countries. It begins with an extensive discussion of the methodological design of our empirical analysis. In this part, it also relates to the literature survey in the previous chapter, particularly when considering various approaches used in the empirical literature and their advantages and drawbacks. At the same time, the discussion also relates the choice of the methodology to the main aims of the study and the sample at hand (annual data on 27 European countries between 1995 and 2012). On the basis of this discussion, the panel VAR with fixed effects is chosen as the most appropriate empirical method, mostly due to its ability to treat all variables as endogenous and to allow for unobserved country heterogeneity. In addition, PVAR with fixed effects enables inference on the common aspects in macroeconomic data (Gavin and Theodorou, 2005), which is precisely the main aim of our study. In line with the dominant approach in the fiscal VAR literature and particularly in studies using PVAR, our analysis uses recursive identification of fiscal policy shocks, and we focus on responses of GDP and other macroeconomic variables to government spending shocks. An extensive discussion of numerous specification issues, on which there is no consensus in the main literature, is also provided in this chapter.

By using PVAR, we extend the relatively limited and fairly recent body of literature that uses this method. Indeed, PVAR is still a relative novelty in terms of empirical application, as it relies mostly on user-written software codes. Compared to the design of the relevant studies on fiscal policy (summarised in Table 4.2 of the previous chapter), we extend the existing literature using PVAR in several important aspects. First, we analyse a wider sample of countries for a similar period of time (old and new EU member states, starting in the mid-1990s and ending after the recent global economic crisis). Both aspects of our sample give rise to contributions: in contrast to all other PVAR studies of fiscal policy, we extend this method to transition countries; and, by including the period up to 2012, we are able to take account of the recent crisis in our analysis, which enables indirect inference on the size of the fiscal multiplier in 'normal' times compared to the post-crisis period. Second, unlike several other PVAR studies of fiscal policy, we apply this method in an extensive manner to deal with country heterogeneity. Third, a similarly extensive application of the method is also used during the detailed investigation of the transmission mechanism of fiscal policy. Last but not least, our model specifications and variable definitions to a considerable extent rely on the arguments put forward in the extensive fiscal VAR literature (summarised in Table 4.1 of the previous chapter), which is not always the case in the relatively small body of PVAR studies of fiscal policy.

When the baseline specification for the entire sample is used, results indicate that fiscal policy has a statistically significant, but relatively small effects on other macroeconomic variables. The most important result in this part is that the fiscal multiplier is around one on impact and a year after the fiscal shock, and declines thereinafter. This implies that fiscal policy is effective in stimulating output, but stronger multiplicative effects on GDP are absent, since the effect is approximately one-for-one. In addition, government spending shocks are followed by higher net-taxes on impact, but their response soon dies out as governments try to accommodate spending shocks by lower taxes. Prices also rise following a spending shock, in line with higher demand, whereas the response of interest rates is negative on impact but soon becomes insignificant. The baseline analysis is followed by numerous robustness checks using various modifications, which generally confirm the baseline results.

The chapter proceeds to analyse effects of fiscal policy shocks in various sub-samples, which are defined by various country characteristics or different time periods. The results, summarised previously in Table 5.2, confirm the importance of structural characteristics when analysing the fiscal multiplier. In particular, fiscal multipliers are higher in new than in old EU member states. In addition, new EU member states appear to implement more disciplined fiscal policies, since net-taxes are increased in the wake of higher government spending, unlike old EU member states where net-taxes fall. Further, in line with expectations, the fiscal multiplier is higher in countries with lower debt levels and lower openness. Finally, omitting the crisis years from the sample indicates that the results for the entire period are driven by the higher effectiveness of fiscal policy during the recent crisis, which is entirely in line with traditional Keynesian predictions on the effectiveness of fiscal policy in recessions. On the other hand, during 'normal' pre-crisis years, the fiscal multiplier is considerably lower than one, whereas monetary policy becomes more restrictive in the wake of spending shocks. Overall, the results from the sub-sample analysis thus confirm the suggestion by Spilimbergo et al. (2009) that fiscal multipliers are country-, time- and circumstance-specific.

The last part of the chapter deals provides numerous extensions to the baseline specification in order to analyse the transmission mechanism of fiscal policy and its relations to main theoretical predictions. The findings in this part suggest that government spending shocks cause rises in both private investment and consumption, with the latter being supported by higher real wages and higher employment. This is in line with findings in most other empirical studies, but opposes both baseline Real Business Cycle and baseline New Keynesian models. However, the rise of private consumption, wages and employment is consistent with extensions of both types of baseline theoretical models. Findings in this part also suggest that fiscal policy is more effective when implemented via government investment than via government consumption. Further, the introduction of the share of debt in GDP in the model in order to account for intertemporal budget constraints and debt feedbacks to fiscal policy does not affect baseline results. However, it does yield some worrying implications for fiscal sustainability, since spending shocks are followed by rising debt levels in old EU member states, which could be related well to the recent European debt crisis. Further, the specification is modified to also incorporate some open economy elements. This extension again confirms baseline results, and also suggests that trade deficits worsen in the wake of spending shocks, which is driven by rising imports. This part of the analysis concludes with jack-knifing of baseline results, which appear to be robust to the omission of any single country from the sample.

Chapter 6 – Conclusions and policy implications

6.1 Introduction

The work on this thesis began in early 2011, as the world economy was undergoing the deepest and the longest crisis since the Great Depression and policymakers were trying to find a way to support a sustainable economic recovery. This period, which came to be known as the Great Recession, raised some important questions about the role of fiscal policy in stimulating output and in the stabilization of macroeconomic fluctuations. The attention paid to these issues by policy-makers was thus related to and further stimulated the work on these issues in academia, both regarding theoretical models and empirical research. Accordingly, the original aim of the thesis was to investigate the stabilization properties of fiscal policy, its role and its effectiveness. Since this is a very wide area of research, in the early stages of the work on the thesis the focus was narrowed down to a few key issues related to fiscal policy in European countries. Related to this, the thesis focuses on issues that are at the heart of the academic and policy debates in the context of the European debt crisis. In particular, the aim of the thesis is to analyse the cyclical character and determinants of fiscal policy, as well as the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European countries, with particular reference to transition countries.

In order to meet this aim, the thesis focuses on the following research objectives:

- To briefly review the main macroeconomic and fiscal policy developments in European countries;
- To review and critically assess the theoretical and empirical literature on the cyclical character and determinants of fiscal policy, as well as on the effects of fiscal policy on output and other macroeconomic variables;
- To analyse empirically the cyclical character and determinants of fiscal policy in European countries, with a particular focus on transition countries;
- To analyse empirically the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European countries, with a particular focus on transition countries;
- To draw policy recommendations relevant for transition countries and Macedonia in particular.

This chapter presents the conclusions of our investigation. In particular, the next section summarises the main findings of the thesis and relates them to the research objectives, while Section 6.3 uses our findings to draw some policy recommendations. Section 6.4 presents our contributions to knowledge. Section 6.5 discusses some limitations of our research and the final section provides ideas for future research.

6.2 Main findings of the thesis

The first research objective is addressed in the introductory chapter (Chapter 1), which provides stylised facts on the main fiscal policy and macroeconomic developments in European countries for the period that is the subject of the empirical analysis in the thesis. Stylised facts show that average GDP growth between 1995 and 2012 was higher and more volatile in the two groups of transition countries than in old EU member states, and this was the case particularly in new EU member states, i.e. the more advanced transition countries. These countries also had larger cyclically-adjusted budget deficits than old EU member states during the period, while public debt in the vast majority of transition countries was considerably lower than in their Western European peers.

The thesis proceeds with the investigation of the stabilisation properties of fiscal policy, i.e. its cyclical character, as well as the determinants of fiscal policy.

Chapter 2 surveys the relevant theoretical and empirical literature, which is related to the second research objective. It starts by reviewing the traditional theories, as well as more recent theoretical explanations offered in response to findings in several empirical studies. Considerable attention is then paid to the specific environment for the design and implementation of fiscal policy in European countries, including the Maastricht Treaty, the Stability and Growth Pact and the specifics of the transition process. Further, it discusses key measurement and conceptual issues that affect our empirical work, such as the indicators for cyclical movements and the decomposition of fiscal policy into automatic stabilizers, endogenous and exogenous discretionary policy. The chapter then moves to the review and critical assessment of the empirical studies of cyclicality. They are roughly divided into two groups: earlier studies, which mostly use a two-stage approach, and more recent studies, which tend to use a single stage approach and provide various extensions. Particular attention is paid to the manner in which the more recent literature addresses the drawbacks of the earlier studies related to specification and estimation method.

Chapter 3 provides a comprehensive empirical analysis of the cyclical character and determinants of fiscal policy in European countries, which is the third research objective of the thesis. The absence of an overall theory on the cyclical character and determinants of fiscal policy and the relatively small sample greatly affect our estimation strategy. Consequently, we start from a relatively simple model, and then extend it with numerous variables (one at a time). This makes it possible to both investigate the robustness of the result on cyclicality from the baseline specification to the introduction of additional variables as well as to analyse their direct effect on budget balances. After a discussion of possible estimation methods and their advantages and disadvantages, we decided to use system GMM as the most appropriate method for our sample and our aim of study. Results from the initial model specification show that discretionary fiscal policy is pro-cyclical in the entire sample between 1995 and 2010 (i.e. it has aggravated economic fluctuations), whereas overall policy has been a-cyclical, reflecting the effect of automatic stabilizers. In addition, it appears that policy-makers pay little attention to public debt movements, since the effect of public debt on budget balances is relatively small, which relates well to the recent European debt crisis. Further, we find considerable differences in the cyclical character of fiscal policy among country groups. Indeed, pro-cyclicality in the entire sample is driven by transition countries, since discretionary policy is a-cyclical in old EU member states, but pro-cyclical in new EU member states and even more so in South-eastern European countries. Results from this initial specification (both for the entire sample and the country groups) are robust to the inclusion of two additional variables which complete our baseline specification: the dummy for the run-up to the introduction of the euro and the dummy for parliamentary elections. Related to this, we find that fiscal policy was tighter as countries were preparing to adopt the common currency. On the other hand, elections worsen budget balances, thus indicating that policymakers tend to relax fiscal policy in order to affect election outcomes, which amounts to political business cycle effects.

The baseline specification is then extended with numerous variables and modified to investigate additional issues related to fiscal policy. We find relatively weak evidence for the presence of voracity effects, i.e. the argument in some studies that pro-cyclicality rises with the higher dispersion of power or the number of power groups. We also find that strong government majorities result in more disciplined fiscal policy, presumably because they are in a better position to push through fiscal adjustment programmes. Further, plurality electoral systems worsen fiscal discipline in old EU member states and South-eastern European countries. In addition, we find that the level of democratisation and of control of corruption both result in more disciplined fiscal policies. However, our results do not support the finding of more pro-cyclical policies in "corrupt democracies" in some studies. Further, both the strength of the leftist orientation of the government and changes of government ideology towards the left result in higher budget deficits in old EU member states. There is no evidence of such effects in new EU member states, presumably because ideological definitions are less clear-cut in these countries, but also because fiscal policy was affected comparatively more by some constraints related to the transition process. In particular, we find that *de facto* IMF arrangements had a strong disciplining effect on fiscal policy in both groups of transition countries. Further, fiscal policy in our sample is also affected by certain aspects of fiscal governance. In particular, the implementation of fiscal rules has a disciplining effect on budget balances in both old and new EU member states.

The additional extensions provide further evidence on differences among the country groups. When analysing sources of cyclicality, we find that the a-cyclical discretionary policy in old EU member states is a result of the compensating influence of pro-cyclical revenues and counter-cyclical expenditures[119]. On the other hand, we find that pro-cyclicality in new EU member states comes from pro-cyclical revenues, while there is some evidence that in South-eastern European countries it is driven by

[119] Revenues are pro-cyclical because they fall in expansions and rise in recessions, thus exacerbating the effects of the business cycle. Expenditures also fall in expansions and rise in recessions, which makes them counter-cyclical.

pro-cyclical expenditures. Further, splitting the sample at various years also yields some interesting insights. When splitting the sample in 2004 for the first wave of EU enlargement, we find that fiscal policy has shifted from a-cyclicality to pro-cyclicality in new member states after entering the EU. Finally, omitting the last two crisis years confirms the results of the baseline specification for transition countries, i.e. pro-cyclical discretionary policies but a-cyclical overall policies due to automatic stabilizers. We also find that, in more 'normal' times, discretionary policy in old EU member states is again a-cyclical (as in the entire period), but automatic stabilizers are effective and they shift overall fiscal policy towards a counter-cyclical stance. Indirectly, this result indicates that the ineffectiveness of automatic stabilizers in the old EU member states for the entire period in fact arises from the specific environment in the recent crisis years.

Finally, the chapter also provides an additional robustness check by jack-knifing the baseline specification i.e. removing one country from the sample at a time and re-estimating in order to analyse whether results are driven by any single country. The detailed results show that pro-cyclicality in the entire sample in the baseline specification is robust to the omission of any single country. On the other hand, when analysing country groups, it appears that the a-cyclicality of discretionary policy in old EU-member states is robust to dropping any other country except Greece, whose omission yields counter-cyclical discretionary policy in this group. Finally, pro-cyclical discretionary policy in the two groups of transition countries is robust to dropping any single country from the respective groups.

The extensive analysis of the stabilisation properties of fiscal policy naturally leads to the question as to whether policy-makers are in fact able to affect output movements. Indeed, if effects of fiscal policy on output are limited (fiscal multipliers are low), this greatly reduces the scope and the need for stabilising policies. Therefore, in the second half of the thesis we analyse the opposite question: what are the effects of fiscal policy on output and other macroeconomic variables. In this part, we only include old and new EU member states between 1995 and 2012, but omit South-eastern European countries due to lack of sufficiently disaggregated fiscal data.

We start our investigation of the short- to medium-term effects of fiscal policy by surveying the relevant theoretical and empirical literature in Chapter 4, which relates to the second research objective of the thesis. Due to the sheer size of this literature, we only focus on the key contributions by first describing important theoretical and empirical studies and then critically assessing advantages and drawbacks of particular empirical approaches. In this part, we note that both neoclassical and New Keynesian theoretical models predict negative effects of fiscal expansion on private consumption due to dominant wealth effects, while they differ on the expected size of the response of output. We also survey the extensions to baseline models aimed at matching the common finding in the empirical literature of positive responses of private consumption to expansionary fiscal policy shocks. Related to this, we find that the theoretical literature predicts fiscal multipliers higher than one only if models incorporate considerable Keynesian features or in cases of a zero lower bound of monetary policy. We also survey the extensive empirical literature, which typically studies effects of fiscal policy using some type of Vector Auto Regressions (VARs). Particular attention is paid to the manner in which various types of VARs impose restrictions in order to identify exogenous fiscal policy shocks, which is the most important issue in the empirical literature. We also discuss how VARs deal with the anticipation problem, which is also important in the context of fiscal policy. Our survey shows that studies using the recursive and the Blanchard-Perotti SVAR tend to find results in line with New Keynesian predictions, i.e. that the government spending multiplier is positive and its size is usually around one, as well as positive responses of private consumption to spending shocks. On the other hand, studies using the event-study approach are mostly in line with neoclassical predictions, since the fiscal multiplier is around one, but spending shocks have a negative effect on consumption. In addition, studies using sign restrictions or the narrative approach tend to find relatively high tax multipliers, resembling traditional Keynesian predictions. However, this summary is only tentative, since it is difficult to precisely identify the source of the wide range of results in the empirical literature. Indeed, the variation of results could reflect not only the different identification restrictions (types of VARs), but also a wide variety of other factors, such as different countries and time periods analysed, possible consequences of anticipation effects, different specifications or structural country differences. Related to the last point, some of the studies indicate that the effectiveness of fiscal multipliers also considerably depends on country features such as the level of public debt, the level of trade openness or the monetary policy stance. Overall, our survey is in line with most of the other findings in the literature that there is no such thing as "*the* fiscal multiplier", but that fiscal multipliers are country-, time- and circumstance-specific (Spilimbergo et al., 2009).

The critical assessment of the relevant literature, particularly regarding features, advantages and disadvantages of various empirical methods, informs our analysis in Chapter 5. Here we provide an empirical investigation of the short- to medium-term effects of fiscal policy on output and other macroeconomic variables in European Union countries between 1995 and 2012, which is related to the fourth research objective of the thesis. In order to do so, we use fixed effects panel VAR with annual data and recursive identification of government spending shocks. We focus on government spending shocks because their identification based on recursive VAR is relatively straightforward, which is in line with the dominant approach in the literature. Further, the choice of panel VAR as our empirical method reflects the empirical survey in the previous chapter, the aim of our study and the available frequency and length of data. In addition, panel VAR has the advantages of panel methods, since it allows for unobserved heterogeneity, as well as of VAR, since it treats all variables as endogenous.

Our baseline results indicate that expansionary government spending shocks have a positive effect on output, with the fiscal multiplier around one in the year of the shock and the following year, and lower thereinafter. This implies that the effectiveness of fiscal policy is relatively limited, since there are no stronger multiplicative effects beyond the approximately one-for-one response of GDP. Further, effects of spending shocks on spending itself are positive and relatively persistent, whereas revenues initially rise but fall thereinafter, presumably as governments try to reinforce the effects of spending rises by also lowering taxes. These results are quite robust to alternative specifications of deterministic trends, different lag-lengths of the panel VAR and the different ordering of spending and revenues. We also investigate whether country structural characteristics influence the effectiveness of fiscal policy by splitting the sample in various ways, which also enables us to deal with country heterogeneity in a more careful manner. One of the most important findings in this part is that fiscal multipliers are positive in both old and new EU member states. However, they are considerably higher in the latter group (i.e. transition countries) both at impact and into the future. In addition, governments in transition countries increase taxes in the wake of expansionary spending shocks, while fiscal policy in old EU member states is less disciplined, since positive spending shocks are accommodated by lower taxes. Further, when splitting the sample according to debt levels, we find that fiscal policy is more effective in low debt than in high debt countries, in line with expectations. In addition, low debt countries tend to pursue more disciplined policies as spending shocks are accompanied by higher taxes, unlike high debt countries where revenues fall. Results regarding trade openness are also in line with expectations, since fiscal multipliers are higher in less open economies, while in more open economies there are considerably more 'leakages' via the import channel. Finally, cutting the sample in 2008 in order to abstract from the crisis period also yields some important results regarding the effects of fiscal policy in more 'normal' years. Here we find that the fiscal multiplier in the pre-crisis period is about half the size of the multiplier in the entire sample. This suggests that fiscal policy is less effective in normal circumstances, while the results for the entire period are driven by the recent crisis years, which is in line with expectations for higher effectiveness of fiscal policy in circumstances of zero lower bound of nominal interest rates. We also find that in the pre-crisis period monetary policy becomes more restrictive in the wake of spending shocks. This indicates that the results for the entire period of interest rates initially falling and then becoming insignificant are actually driven by the accommodating monetary policy during the crisis.

We also carry out various extensions of the baseline specification in order to shed some light on the transmission mechanism of fiscal policy and to provide robustness checks on baseline results. In this part we find that government spending shocks cause higher private investment and private consumption, with the latter being supported by higher real wages and higher employment. This is in line with most other empirical studies, as well as with extended Real Business Cycle and new-Keynesian models. In addition, fiscal policy is more effective when implemented via higher government investment than via higher government consumption. Further, the introduction of the share of debt in GDP also yields some important insights. The extension of the baseline model with public debt confirms baseline results, but it also yields some worrying implications for fiscal sustainability, since spending shocks are followed by rising debt levels in old EU member states, which could be related well to the recent European debt crisis. On the other hand, spending shocks do not have such an effect on debt in new EU member states, probably since higher spending in these countries is also accompanied by higher taxes. Further, the introduction of open economy elements also confirms baseline results, and suggests that trade deficits worsen in the wake of spending shocks, which is explained by rising imports. Finally, we also provide an additional robustness check by jack-knifing the baseline specification. In this part we find that baseline results are robust to the exclusion of any single country, and this holds both when analysing the entire sample and when analysing old and new EU member states separately.

6.3 Policy implications

This section provides several recommendations for policy-makers arising from our study, thus meeting the final research objective of the thesis. It is expected that these recommendations would be useful for South-eastern European countries in general and Macedonia in particular, since they are yet to undergo the transition and reform processes completed by more advanced transition countries that are now EU members.

Our analysis of the cyclical character and determinants of fiscal policy indicates that there are considerable differences among old EU member states and the two groups of transition countries. In particular, discretionary policy is a-cyclical in old EU member states, but it is pro-cyclical in new EU member states and even more so in South-eastern Europe, which means that in these countries discretionary measures by policy-makers are in fact exacerbating economic fluctuations. Therefore, considerable efforts are needed in order to eliminate the amplifying effect of discretionary measures on economic fluctuations, and to move discretionary policy in a counter-cyclical direction. This could be achieved by better and timelier estimates of cyclical output movements, as well as better macroeconomic forecasts. In turn, this could then help a better design and implementation of discretionary measures in order to react to forecasts of economic fluctuations, bearing on mind implementation lags of fiscal policy. The removal of the pro-cyclical character of discretionary policy would also contribute in overall policy becoming counter-cyclical, bearing on mind that automatic stabilizers are found to be effective in transition countries. Further, policymakers in all three country groups need to pay much more attention to debt sustainability. The results of our analysis indicate that insufficient attention was paid to this issue in the past, which relates well to the ongoing European debt crisis. At the same time, our results also point that, despite the generally low debt levels compared to their Western European peers, there should be no complacency in transition countries regarding this issue.

The analysis of various political, institutional and other determinants of fiscal policy also yields some important recommendations. Most notably, fiscal policy is less disciplined in election years, indicating that policy-makers employ fiscal policy in order to improve their re-election chances. Therefore, considerable efforts are needed to remove this feature, which is found mostly in old EU member states, although transition countries are not expected to be immune to it as well. One way to do so would be the use of fiscal rules, which are already employed in several countries.

Although we do not investigate this issue in detail, our analysis does suggest that the strength of fiscal rules has a disciplining effect on budget balances. In addition, efforts to increase levels of democratisation and to control corruption are also expected to lead to better fiscal outcomes. This is particularly important for South-eastern European countries, which still lag behind EU member states regarding these indicators. Finally, upon eventual membership in the EU, which is their long-term goal, South-eastern European countries should try to avoid the experience of new EU member states, which appeared to have shifted towards pro-cyclical discretionary policy once they had achieved this goal.

The comprehensive analysis of the effects of fiscal policy on output and other macroeconomic variables advises us against drawing generalised recommendations for all countries and all times, in line with other recommendations in the literature. While we find that in the entire sample higher spending does result in higher GDP, the size of the fiscal multiplier does not exceed one, implying that the effects of fiscal policy are relatively limited. In addition, the effectiveness of fiscal policy in the entire sample appears to be reflecting the crisis period, when it was in fact the only policy tool available due to the zero lower bound of nominal interest rates in most countries. This implies that, once the economic recovery becomes sustained, it is likely that fiscal multipliers will fall back to their common levels in more 'normal' circumstances, i.e. positive but below one. Consequently, in such a case, preference should be given to monetary policy in attempts to affect short-term output movements, as well as to structural reforms when trying to affect long-term output.

Our analysis also indicates that policy-makers should pay particular attention to structural characteristics of their countries when trying to affect output via government spending. For instance, expansionary spending in transition countries is more effective in stimulating output than in old EU-member states. In addition, higher spending in transition countries is also accompanied by higher taxes, which consequently leads to a relatively stable path of public debt. Our results imply that this practice of expansionary spending and higher taxes should also be used in old EU-member states in order to prevent the worrying trend of rising debt levels in the wake of higher spending, without at the same time jeopardising the positive effects of higher spending on output. In addition, such a practice should also be applicable to South-eastern European countries, since it would ensure that they could stimulate output without worsening debt levels. Further, policy-makers in countries with high public debt and high trade openness should refrain from using government spending to stimulate output, since such a policy is largely ineffective. Related to the open economy context, which applies to virtually all countries in our sample, it should be expected that higher government spending would lead to higher trade deficits as well, due to the importance of the import channel. All of these findings are particularly important for South-eastern European countries, since they generally have high trade openness and relatively deep trade deficits, while some of them are also on a clear upward public debt trajectory. Nevertheless, in cases when higher government spending is employed, it is better to use government investment than consumption, since the former is more effective in stimulating output.

6.4 Contributions to knowledge

Bearing on mind the aim of our thesis, its contributions to knowledge are mostly empirical in nature. In addition, some of the contributions are also related to the application of particular investigation methods. Last but not least, while it does not directly extend the theoretical literature, the thesis systematises key contributions from the extensive body of literature, which could be useful in the design of future theoretical models and empirical studies.

The main contribution to knowledge from the thesis is that it provides a comprehensive empirical analysis of the cyclical character, determinants and effects of fiscal policy in European countries. This is an important academic and policy issue, particularly in the current economic circumstances. While there are certainly numerous studies analysing fiscal policy in Europe, they are mostly focused on a single country or on a group of old EU member states. On the other hand, our study focuses explicitly on old, new and prospective EU member states. Therefore, to the best of our knowledge, it is the first study to provide a systematic empirical analysis of fiscal policy in the two groups of transition countries covering a relatively long time period. Related to this, the study also draws the attention to numerous differences in the determinants and effects of fiscal policy between old EU member states and transition countries. Consequently, our study is able to provide well-founded recommendations for policy-makers.

The second main contribution to knowledge is that we enrich our analysis of the two key issues (i.e. the cyclical character and the effects of fiscal policy) with numerous additional factors, which both check the robustness of key results and shed some more light on fiscal policy in European countries. For instance, when analysing the cyclical character of fiscal policy, we introduce numerous additional political, institutional and other factors in the analysis. Treating this group of factors in a comprehensive manner addresses an important gap in the existing literature, which mostly ignores these issues or treats only some of the factors. Related to this, the introduction of these factors enables us to check the robustness of our finding on the cyclical character of fiscal policy, but also to investigate the direct effect of these factors on fiscal outcomes. Further, when analysing the effects of fiscal policy on output and other macroeconomic variables, we extend our analysis with various country structural characteristics, thus relating to the recommendation in the literature that there is no single fiscal multiplier. In addition, the thesis provides an extensive investigation of the transmission mechanism of fiscal policy. Finally, in both parts of the investigation we provide numerous robustness checks on our baseline results. This is done first by various modifications of our baseline specifications, and then also by jack-knifing in order to check the possibility that baseline results might be driven by a single country in the sample.

As far as the application of method is concerned, the study carries out extensive searches for the most appropriate model specification and empirical approach to analyse the issues at hand. By doing so, it avoids some of the drawbacks which are related to variable definitions, model specifications and estimation methods in the existing studies. For instance, in our analysis of the cyclical character and determinants of fiscal policy, we decide to use system GMM. This method is expected to offer an appropriate treatment of endogeneity and dynamics, which are key aspects of the analysis, but are often not treated properly in parts of the literature that use other methods. In addition, when analysing effects of fiscal policy, we use fixed effects panel VAR, which addresses two key issues in the analysis of the effects of fiscal policy, i.e. it allows for unobserved country heterogeneity and treats all variables in the VAR as endogenous. In addition, crucially for our aim, it enables us to study the effects of fiscal policy in a comprehensive manner in a group of countries, unlike the vast majority of fiscal policy studies that use single-country VARs. By applying panel VAR, we use a method that is a relative novelty in terms of empirical application to investigate important policy and research issues. More precisely, PVAR as a method is still not widely available in standard software packages but relies on user-written codes that are often generously made available to fellow researchers and are thus open to scrutiny and critique, which helps their continuous improvement. As our survey of the relevant literature shows, there are only a relatively few, mostly recent studies that use panel VAR to investigate the effects of fiscal policy. By applying this method to investigate fiscal policy in all EU member states, our main contribution consists in extending this body of knowledge to a wider sample of countries for a similar period of time (starting in the mid-1990s and ending after the recent global economic crisis). Both aspects of our sample give rise to contributions: in contrast to all other PVAR studies of fiscal policy, we extend this method to transition countries; and, by including the period up to 2012, we are able to take account of the recent crisis in our analysis, which enables indirect inference on the size of the fiscal multiplier in 'normal' times compared to the post-crisis period. In addition, unlike several other PVAR studies of fiscal policy, we apply this method in an extensive manner to deal with country heterogeneity, i.e. to study the possible dependence of the effects of fiscal policy on various country structural characteristics. A similarly extensive application of the method is also used during the detailed investigation of the transmission mechanism of fiscal policy. It should also be noted that our model specifications and variable definitions to a considerable extent rely on the arguments put forward in the extensive fiscal VAR literature, which is not always the case in the relatively few existing PVAR studies of fiscal policy.

6.5 Limitations of the research

The limitations of our research are primarily related to the length, the frequency and the quality of data available, which may all magnify the weaknesses of the estimation methods employed in our thesis. For instance, we use system GMM when analysing the cyclical character and determinants of fiscal policy. Although system GMM does have numerous advantages over other methods, GMM methods were originally designed and are mostly used for typical microeconomic panels with a large cross-section and short-time dimension, while their small sample properties may be problematic. Indeed, the problems of "too many instruments" are particularly serious in small samples and/or those with a large time dimension, since it is exactly in such cases that the rapid growth of the instrument count is to be expected. Consequently, GMM estimators can be severely biased and inefficient in macroeconomic panels, which are typically small. This poses a problem for our sample when analysing the cyclical character and determinants of fiscal policy, which consists of a maximum of 33 countries and 16 years, and hence does not fit the typical samples on which system GMM was originally implemented. In addition, the relatively small sample size also affects our estimation strategy, which starts from a relatively simple specification and then introduces numerous additional variables one at a time. While the opposite, general-to-specific approach is more common in the empirical literature, we are unable to implement it since we would face a considerable problem with degrees of freedom.

Our analysis of the effects of fiscal policy using fixed effects panel VAR also has some limits which are partially related to data availability. Most importantly, the use of fixed effects in dynamic panels is known to lead to biased coefficients, which is expected to affect our coefficients as well since we use only 18 years of data. While some studies show that impulse responses, which are of key interest when using panel VARs, are comparatively less biased, it is still possible that the bias of fixed effects in dynamic panels is also present in our study. Another issue for concern regarding the use of panel VAR is the imposition of slope homogeneity, which is common for most panel methods. In order to address this issue, we provide numerous modifications of our analysis, such as using fixed effects to capture unobserved heterogeneity, splitting the sample according to various country features and using cyclically-adjusted revenues. However, it should be taken into account that not all heterogeneity is accounted for in these manners, particularly when analysing the entire sample. Consequently, to the extent that heterogeneity remains present in our sample, the heterogeneity bias could still lead to biased estimates. Further, since we were unable to introduce period dummies, another potential source of bias in our results is related to the possibility of cross-section dependence (to the extent that it is not addressed by our use of a common time trend, country-specific time trends, and cyclically-adjusted revenues). This is mostly related to the fact that only recently has it become possible to use PVAR in empirical applications by relying on user-written codes and the code we use does not have this function (but is otherwise fairly comprehensive, including its relative flexibility in practical application and capabilities for generating tables and graphs that facilitate inference and reporting). Further, there are some weaknesses regarding our method of identification of fiscal policy shocks by using recursive VAR with annual data, which are employed due to the absence of quarterly fiscal data compiled on an accrual basis. Most importantly, the explicit assumption in our case is that government spending does not react to revenue and output movements within the year. While this mostly holds, since spending is largely pre-determined within the annual budget, there might be cases when this assumption is too strong, which means that spending shocks are not completely exogenous. Last but not least, our use of recursive identification of government spending shocks is widely accepted in the literature. However, this method prevents us from analysing effects of revenue shocks, since restrictions for such an analysis with recursive identification would require fairly strong assumptions regarding the contemporaneous effects among variables in the VAR.

The last important limitation of our research is more general and is related to the period under analysis. In particular, the last several years in our sample capture the period of the Great Recession, which also includes considerable changes in the determinants and effects of fiscal policy in European countries. We try to account for the crisis period in a few specifications by omitting the latest years from our investigation in order to focus on more 'normal' years. However, in most specifications we use the entire sample available at the time of working on the thesis in order to avoid more severe problems arising from short time series. The implicit assumption in our analysis is therefore that there are no structural breaks, which enables the use of estimation methods that assume no breaks in the data. If however the recent crisis does represent a structural break, then the use of system GMM and panel VAR would not be entirely appropriate, and consequently the validity of our results could be weakened.

6.6 Suggestions for further research

Our suggestions for future research are based on the limitations of our study discussed above, but also on issues that we chose to omit because they were beyond the scope of our thesis.

The main avenue for further research regarding the cyclical character of fiscal policy would be to use real-time instead of ex post data on fiscal policy and cyclical output movements. Real-time data are the ones that are available to policy-makers at the time of designing and implementing fiscal policy. Their use would enable researchers to distinguish whether the particular cyclical character of fiscal policy is due to the intentions of policy-makers, or to information that was unknown to policy-makers ex ante. Such an analysis would require the construction of a database of projected fiscal policy and projected output movements, which might not always be easily available. However, it would also shed additional light on the reasons behind the particular cyclical character of fiscal policy.

There are several ideas for further research regarding the effects of fiscal policy on output and other macroeconomic variables. For instance, the use of Bayesian estimation methods would make it possible to overcome, or at least to alleviate some of the weaknesses arising from the small sample problems. Related to this, Bayesian methods would also facilitate alternative methods for identification of fiscal policy shocks such as sign restrictions. Further, there is scope for research on the effects of fiscal policy in European countries, particularly transition countries, using narrative identification of fiscal policy shocks, which is often claimed to be able to overcome identification problems by directly inferring policy-maker intentions (i.e. whether particular policy measures are endogenous or exogenous). However, such an analysis would require the construction of a detailed dataset on reasons behind fiscal policy changes in a wide group of countries, which is usually done by investigating various legislative records. Last but not least, effects of fiscal policy could also be investigated by building single- or multi-country New Keynesian models. One way to proceed with such an idea would be to start from a relatively simple structural model and then to extend it by incorporating various fiscal policy features.

The final area where further research is needed and would indeed be welcome is related to the recent crisis and more generally to non-linearities in the determinants and effects of fiscal policy. Indeed, additional research is needed regarding possible changes in the cyclical character and in the effects of fiscal policy during and after the crisis. A possible approach that could incorporate both the pre-crisis and the crisis periods would be to use estimation methods that allow for time-varying parameters. However, in both cases, it should be taken into account that, in order to analyse these issues in a satisfactory manner, it is often required to use data series that are both longer and of higher frequency than the ones that are currently available.

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STAFFORDSHIRE UNIVERSITY

BUSINESS SCHOOL

ECONOMICS

CYCLICALITY, DETERMINANTS AND MACROECONOMIC EFFECTS OF FISCAL POLICY IN EUROPEAN COUNTRIES, WITH PARTICULAR REFERENCE TO TRANSITION COUNTRIES

- APPENDICES -

Rilind Kabashi

A thesis submitted in partial fulfilment of the requirement of Staffordshire University for the degree of Doctor of Philosophy

July 2015

Appendices

Appendix 3.1 - Data sources and definitions for Chapter 3

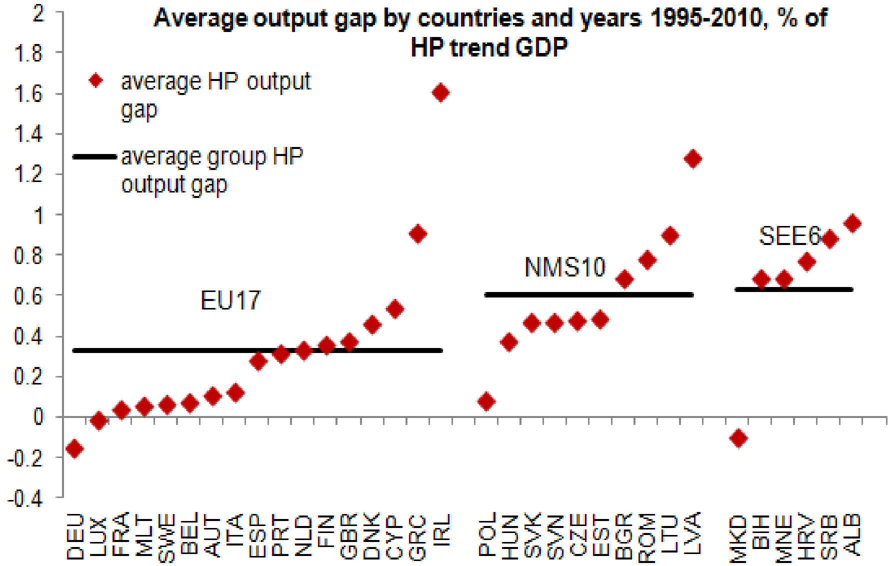
Variable code	Variable name	Variable description	Source/calculation
bal_pr2gdp	overall, unadjusted primary balance, % of nominal GDP	overall, cyclically unadjusted primary budget balance as a share of nominal GDP	AMECO Database of the European Commission (November 2011) for EU27. For SEE6, author's calculation based on data from national statistical offices, central banks or finance ministries, and international sources such as the IMF World Economic Outlook Database and EBRD Transition Reports
capb_ngdp_pot	cyclically-adjusted primary balance (production function potential GDP), % of nominal GDP	cyclically-adjusted primary balance as a share of nominal GDP, adjusted using the production function potential GDP	AMECO Database
capb_ngdp_tr	cyclically-adjusted primary balance (HP trend GDP), % of nominal GDP	cyclically-adjusted primary balance as a share of nominal GDP, adjusted using the Hodrick-Prescott trend GDP	AMECO Database for EU27. For SEE6, author's calculation based on data from national statistical offices, central banks or finance ministries, and international sources such as the IMF World Economic Outlook Database and EBRD Transition Reports. The cyclical adjustment is done following the methodology described in Fedelino et al. (2009), and using the author's calculation of Hodrick-Prescott trend real GDP. In absence of relevant information, revenue and expenditure elasticities for SEE6 are approximated by using respective averages for NMS calculated from country elasticities in EC (2005).
carev_ngdp_tr	cyclically-adjusted revenues, % of nominal GDP	cyclically-adjusted revenues as a share of nominal GDP, adjusted using the Hodrick-Prescott trend GDP	
caprexp_ngdp_tr	cyclically-adjusted primary expenditures, % of nominal GDP	cyclically-adjusted primary expenditures as a share of nominal GDP, adjusted using the Hodrick-Prescott trend GDP	
gap_pot	output gap, % of potential GDP	output gap as a share of potential real GDP based on production function	AMECO Database
gap_tr	output gap, % of HP trend GDP	output gap as a share of Hodrick-Prescott trend real GDP	AMECO Database for EU27. For SEE6, author's calculation based on data from national statistical offices, central banks or finance ministries, and international sources such as the IMF World Economic Outlook Database and EBRD Transition Reports
debt2gdp	public debt, % of nominal GDP	public debt as a share of nominal GDP	

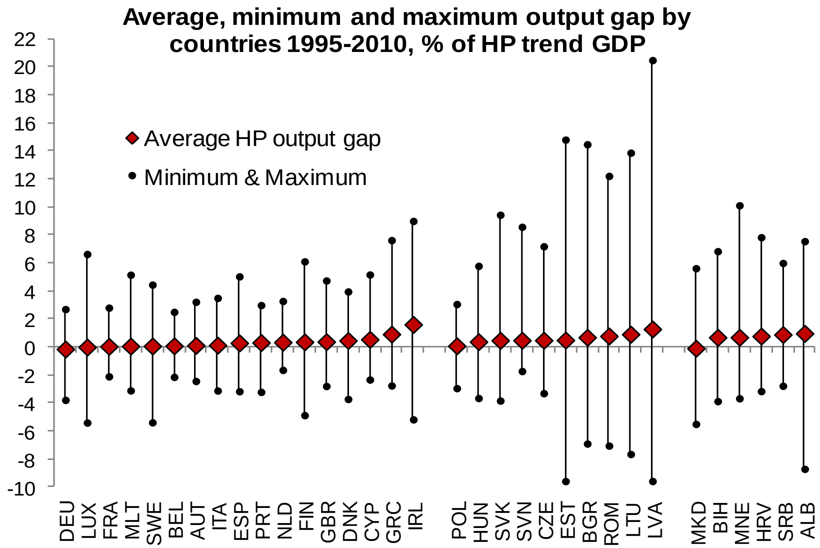
infl	inflation rate	average annual CPI inflation, in %	AMECO Database, except Albania, Bosnia and Herzegovina and Serbia from IMF WEO Database (September 2011)
maastricht	dummy for Maastricht criteria	dummy=1 for the eleven founding euro area members between 1995 and 1998, 0 otherwise	European Central Bank
sgp	dummy for SGP	dummy=1 if the country is a member of the euro area in that year, 0 otherwise	
legelec_dpi1	dummy for parliamentary elections	dummy=1 if there were parliamentary elections in that year, 0 otherwise	World Bank Database of Political Institutions 2010, except Montenegro and Serbia from www.parties-and-elections.eu
checks_dpi	number of checks in the system	number of checks and balances in the political system (ranging from 1 to 11)	World Bank Database of Political Institutions 2010
herfgov_dpi	fragmentation of government seats in parliament	sum of squares of the share of parliament seats controlled by each government party in total government-controlled seats in parliament (100=single-party government)	
maj_dpi	government majority in parliament	government-controlled seats in parliament as a share of total seats	
housesys_dpi1	dummy for electoral system	dummy=1 if most parliament seats are elected by the plurality system, 0 otherwise	World Bank Database of Political Institutions 2010, except Montenegro and Serbia from the Inter-Parliamentary Union (http://www.ipu.org/english/home.htm)
pres_dpi	dummy for political system	dummy=1 if the political system is presidential, 0 otherwise	World Bank Database of Political Institutions 2010
dec_exp	decentralisation of expenditures	share of expenditures of local and regional and sub-national state governments in total expenditures (sum of local and regional, state and central government expenditures)	Eurostat
dec_rev	decentralisation of revenues	share of revenues of local and regional and sub-national state governments in total revenues (sum of local and regional, state and central government revenues)	Eurostat

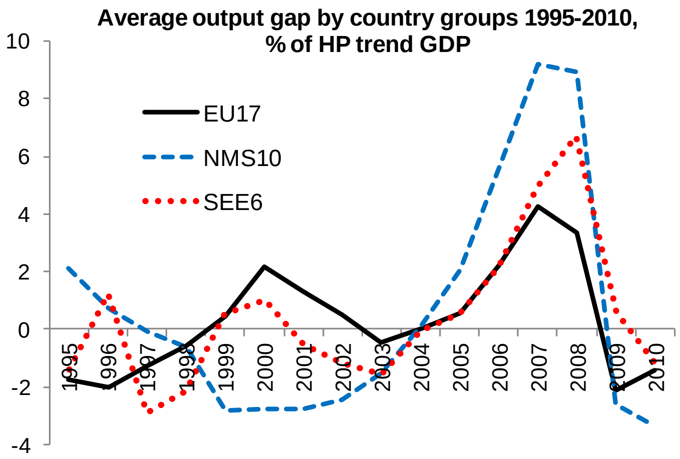
govparty	ideological composition of cabinet	cabinet posts by ideological orientation of parties as a share of total posts, weighted by the number of days the government was in office in a given year; ranging from hegemony of right-wing and centre parties to hegemony of left parties (range is 1 to 5, according to thresholds of shares of 0%, 33,3%, 66,6% and 100%)	Comparative Political Data Set III
gov_new	dummy for change in ideological composition of cabinet	dummy=1 if the ideological composition of government cabinet changed from the previous year, 0 otherwise	
gov_gap	ideological gap between new and old cabinet	ideological gap between the new and the old cabinet, calculated as difference in the ideological composition of the cabinet *govparty* (positive=move to the left)	
democ_pol	democratisation	level of institutionalised democracy, ranging from 0 to 10 for the highest level	Polity IV database
corr_wb	control of corruption	perception of corruption, ranging from -2.5 to 2.5 for highest to lowest corruption, respectively	World Bank Worldwide Governance Indicators 2010; between 1996 and 2002, data are reported for every second year, so values for 1997, 1999 and 2001 calculated by the author as averages of adjacent years
prog_prgf_imf	dummy for program or loan with IMF	dummy=1 if the country had in place an IMF program or a loan during the year, 0 otherwise	IMF Annual Reports (various issues) and IMF International Financial Statistics
pur_loan2ngdp	actual purchases and loans from the IMF, share of nominal GDP	purchases and loan disbursements from the IMF as a share of nominal GDP	IMF Annual Reports (various issues) and IMF International Financial Statistics; nominal GDP from AMECO for EU27, and for SEE6 from national statistical offices, the IMF WEO Database and EBRD Transition Reports
pur_loan2ngdp_dv	dummy for actual purchase/loan taken from IMF	dummy=1 if the country actually made a purchase or loan disbursement from the IMF during the year, 0 otherwise	IMF Annual Reports (various issues) and IMF International Financial Statistics

regime_imf	exchange rate regime	exchange rate regime according to the IMF classification, ranging from 1 to 8 for free floating	IMF Annual Reports from 1998; for the period before 1998, data from von Hagen and Zhou (2005) and central banks
rules	fiscal rules index	standardised index of the strength and coverage of national and sub-national fiscal rules, ranging from -1 to 2.3 for strongest rules	European Commission, Directorate General for Economic and Financial Affairs
deleg	delegation in fiscal governance	index of delegation in fiscal governance, ranging between 0 and 1 for countries with all rules and norms associated with delegation	Hallerberg et al. (2009) for old EU member states and Hallerberg and Yläoutinen (2010) for new EU member states
contr1	contracts in fiscal governance	index of contracts in fiscal governance, ranging between 0 and 1	
good	dummy for expansions	dummy=1 if output gap is positive, 0 otherwise	
bad	dummy for recessions	dummy=1 if output gap is negative, 0 otherwise	
eu17	dummy for EU17	dummy=1 for EU members before 2004 and Cyprus and Malta, 0 otherwise	
nms10	dummy for NMS10	dummy=1 for countries from Central and Eastern Europe that gained EU membership in 2004 or 2007, 0 otherwise	
see6	dummy for SEE6	dummy=1 for South-eastern European countries (Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia), 0 otherwise	

Appendix 3.2 - Additional graphs related to the output gap (Chapter 3)



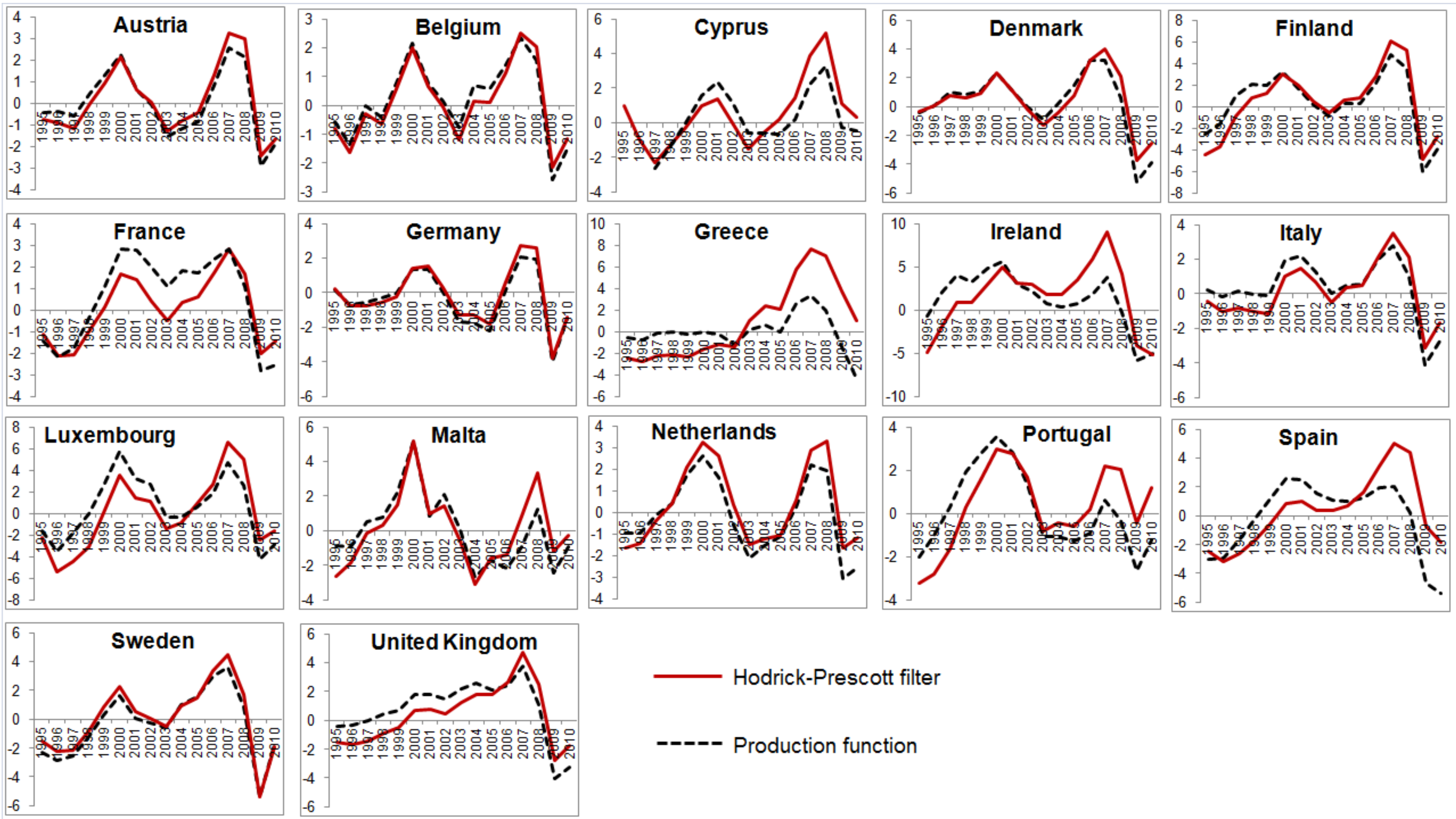


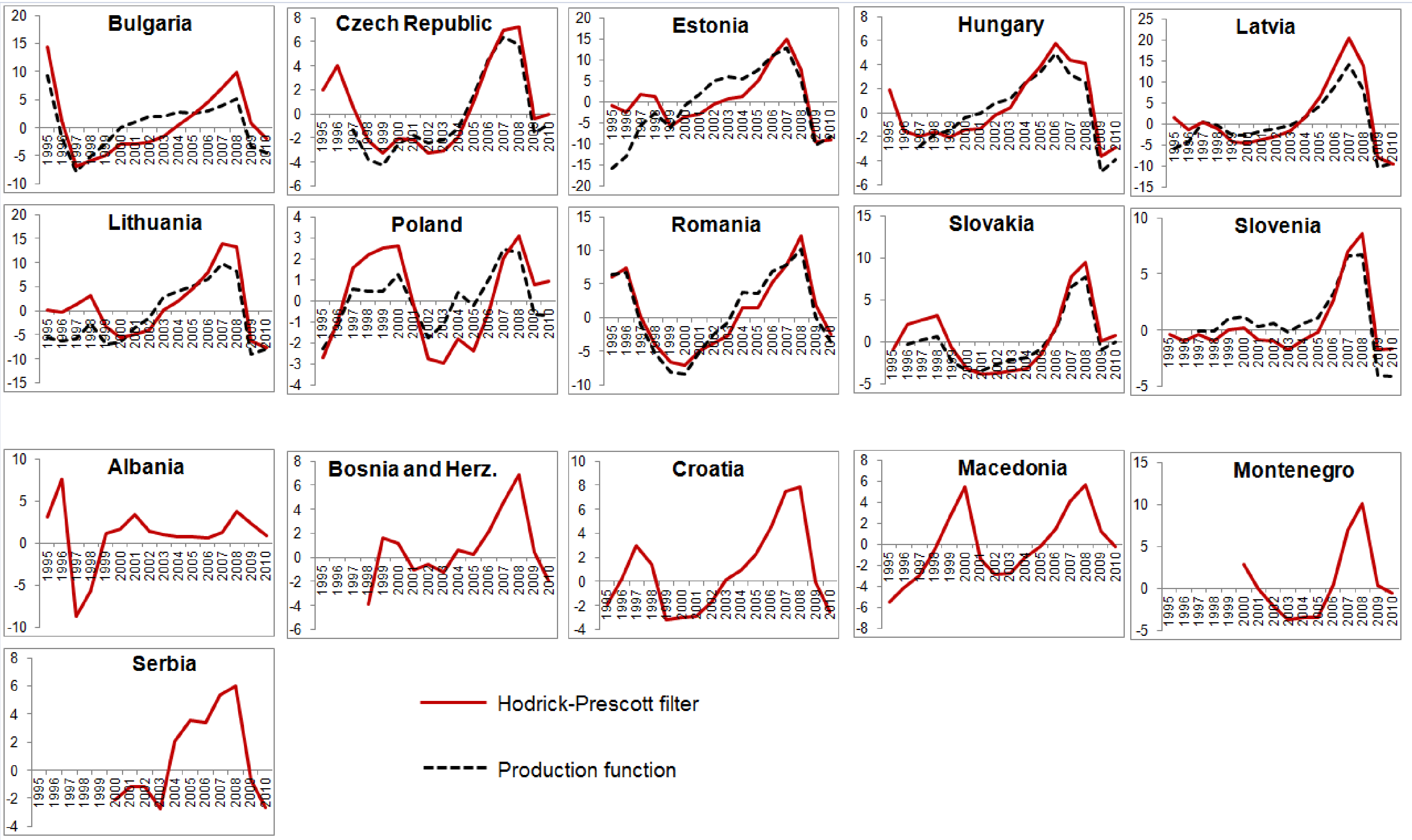


Source: European Commission AMECO Database for EU17, NMS10 and some SEE6 countries. National statistical offices, central banks or finance ministries, EBRD, and the IMF WEO Database for some SEE6 countries. For SEE6, gaps are based on author's calculations.

Note: All group averages are unweighted.

Output gaps in old EU member states, new EU member states and South-eastern Europe, as % of Hodrick-Prescott trend output and of potential output based on production function (ends in the next page)




Bulgaria
Czech Republic
Estonia
Hungary
Latvia
Lithuania
Poland
Romania
Slovakia
Slovenia
Albania
Bosnia and Herz.
Croatia
Macedonia
Montenegro
Serbia
Hodrick-Prescott filter
Production function

Appendix 3.3 - Stata printouts for tables in Chapter 3

Table 3.1 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl dy_1995-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_1995-
dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(19, 32)     =    131.32                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.712      0.069    10.26    0.00        0.571       0.854
             |
      gap_tr |     -0.155      0.061    -2.55    0.02       -0.279      -0.031
             |
    debt2gdp |
         L1. |      0.009      0.005     2.01    0.05       -0.000       0.018
             |
        infl |      0.016      0.008     2.03    0.05       -0.000       0.032
     dy_1995 |     -0.290      0.442    -0.66    0.52       -1.191       0.610
     dy_1996 |      0.665      0.481     1.38    0.18       -0.315       1.644
     dy_1997 |      0.175      0.704     0.25    0.80       -1.259       1.610
     dy_1998 |      0.376      0.661     0.57    0.57       -0.970       1.723
     dy_1999 |      0.159      0.562     0.28    0.78       -0.986       1.305
     dy_2000 |      0.808      0.567     1.42    0.16       -0.347       1.963
     dy_2001 |     -0.399      0.692    -0.58    0.57       -1.809       1.010
     dy_2002 |     -0.797      0.626    -1.27    0.21       -2.072       0.478
     dy_2003 |     -0.171      0.584    -0.29    0.77       -1.361       1.019
     dy_2004 |     -0.013      0.610    -0.02    0.98       -1.255       1.229
     dy_2005 |      0.314      0.617     0.51    0.61       -0.941       1.570
     dy_2006 |     -0.029      0.632    -0.05    0.96       -1.316       1.258
     dy_2007 |      0.460      0.703     0.65    0.52       -0.971       1.891
     dy_2008 |     -1.019      0.712    -1.43    0.16       -2.469       0.432
     dy_2009 |     -1.905      0.583    -3.27    0.00       -3.093      -0.718
     dy_2010 |     -0.464      0.443    -1.05    0.30       -1.367       0.438
       _cons |     -0.424      0.659    -0.64    0.52       -1.766       0.917
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_1995 dy_1996 dy_1997 dy_1998 dy_1999 dy_2000 dy_2001
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_1995 dy_1996 dy_1997 dy_1998 dy_1999 dy_2000 dy_2001
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.72  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.55  Pr > z =  0.579
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  13.60  Prob > chi2 =  0.009
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.36  Prob > chi2 =  0.851
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   0.82  Prob > chi2 =  0.662
    Difference (null H = exogenous): chi2(2)    =   0.54  Prob > chi2 =  0.765
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.30  Prob > chi2 =  0.584
    Difference (null H = exogenous): chi2(3)    =   1.06  Prob > chi2 =  0.787
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.09  Prob > chi2 =  0.297
    Difference (null H = exogenous): chi2(3)    =   0.27  Prob > chi2 =  0.965
```

Table 3.1 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 18                      Obs per group: min =         5
F(13, 32)     =     83.77                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.707      0.073     9.70    0.00        0.558       0.855
             |
      gap_tr |     -0.158      0.064    -2.48    0.02       -0.288      -0.028
             |
    debt2gdp |
         L1. |      0.009      0.004     2.15    0.04        0.001       0.018
             |
        infl |      0.017      0.006     2.85    0.01        0.005       0.029
     dy_2002 |     -0.781      0.396    -1.97    0.06       -1.588       0.026
     dy_2003 |     -0.239      0.293    -0.81    0.42       -0.835       0.358
     dy_2004 |     -0.178      0.288    -0.62    0.54       -0.765       0.408
     dy_2005 |      0.139      0.279     0.50    0.62       -0.429       0.707
     dy_2006 |     -0.205      0.253    -0.81    0.42       -0.720       0.311
     dy_2007 |      0.296      0.443     0.67    0.51       -0.608       1.199
     dy_2008 |     -1.181      0.405    -2.92    0.01       -2.006      -0.357
     dy_2009 |     -2.149      0.432    -4.97    0.00       -3.029      -1.268
     dy_2010 |     -0.681      0.454    -1.50    0.14       -1.604       0.243
       _cons |     -0.256      0.316    -0.81    0.42       -0.899       0.387
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
```

```
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.65  Pr > z =  0.515
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.44  Prob > chi2 =  0.004
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.78  Prob > chi2 =  0.776
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.22  Prob > chi2 =  0.543
    Difference (null H = exogenous): chi2(2)    =   0.56  Prob > chi2 =  0.756
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.69  Prob > chi2 =  0.406
    Difference (null H = exogenous): chi2(3)    =   1.09  Prob > chi2 =  0.779
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.44  Prob > chi2 =  0.230
    Difference (null H = exogenous): chi2(3)    =   0.34  Prob > chi2 =  0.952
```

Table 3.1 Column 3

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr L.debt2gdp infl dy_1995-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_1995-
dy_2010 ) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       467
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(19, 32)     =     26.82                                      avg =     14.15
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.765      0.083     9.24    0.00         0.597       0.934
             |
      gap_tr |      0.013      0.068     0.19    0.85        -0.125       0.150
             |
    debt2gdp |
         L1. |      0.009      0.006     1.49    0.15        -0.003       0.021
             |
        infl |      0.007      0.011     0.61    0.55        -0.015       0.029
     dy_1995 |     -1.428      0.756    -1.89    0.07        -2.967       0.111
     dy_1996 |      0.784      0.602     1.30    0.20        -0.443       2.011
     dy_1997 |      0.420      0.740     0.57    0.57        -1.087       1.926
     dy_1998 |      0.100      0.685     0.15    0.88        -1.295       1.495
     dy_1999 |      0.020      0.604     0.03    0.97        -1.210       1.251
     dy_2000 |      1.046      0.595     1.76    0.09        -0.165       2.257
     dy_2001 |     -0.706      0.789    -0.89    0.38        -2.314       0.902
     dy_2002 |     -1.043      0.716    -1.46    0.16        -2.501       0.416
     dy_2003 |     -0.661      0.645    -1.03    0.31        -1.976       0.653
     dy_2004 |      0.036      0.639     0.06    0.96        -1.265       1.337
     dy_2005 |      0.291      0.646     0.45    0.66        -1.026       1.608
     dy_2006 |      0.260      0.680     0.38    0.70        -1.124       1.645
     dy_2007 |      0.537      0.786     0.68    0.50        -1.064       2.138
     dy_2008 |     -1.687      0.786    -2.15    0.04        -3.287      -0.087
     dy_2009 |     -4.064      0.676    -6.01    0.00        -5.441      -2.688
     dy_2010 |     -0.245      0.473    -0.52    0.61        -1.208       0.718
       _cons |     -0.191      0.793    -0.24    0.81        -1.806       1.423
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_1995 dy_1996 dy_1997 dy_1998 dy_1999 dy_2000 dy_2001
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.bal_pr2gdp collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp infl dy_1995 dy_1996 dy_1997 dy_1998 dy_1999 dy_2000 dy_2001
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.bal_pr2gdp collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.02  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.77  Pr > z =  0.442
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  23.59  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   5.45  Prob > chi2 =  0.244
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.06  Prob > chi2 =  0.588
    Difference (null H = exogenous): chi2(2)    =   4.39  Prob > chi2 =  0.111
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.26  Prob > chi2 =  0.608
    Difference (null H = exogenous): chi2(3)    =   5.19  Prob > chi2 =  0.159
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.49  Prob > chi2 =  0.222
    Difference (null H = exogenous): chi2(3)    =   3.96  Prob > chi2 =  0.266
```

Table 3.1 Column 4

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010 ) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       467
Time variable : year                            Number of groups   =        33
Number of instruments = 18                      Obs per group: min =         5
F(13, 32)     =     36.69                                      avg =     14.15
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.729      0.072    10.12    0.00         0.582       0.876
             |
      gap_tr |     -0.006      0.058    -0.10    0.92        -0.124       0.113
             |
    debt2gdp |
         L1. |      0.009      0.005     1.73    0.09        -0.002       0.019
             |
        infl |      0.008      0.006     1.33    0.19        -0.004       0.021
     dy_2002 |     -0.836      0.383    -2.18    0.04        -1.617      -0.055
     dy_2003 |     -0.480      0.312    -1.54    0.13        -1.116       0.157
     dy_2004 |     -0.003      0.298    -0.01    0.99        -0.609       0.604
     dy_2005 |      0.299      0.315     0.95    0.35        -0.343       0.940
     dy_2006 |      0.247      0.271     0.91    0.37        -0.304       0.799
     dy_2007 |      0.649      0.460     1.41    0.17        -0.289       1.586
     dy_2008 |     -1.603      0.374    -4.28    0.00        -2.365      -0.841
     dy_2009 |     -4.194      0.428    -9.81    0.00        -5.065      -3.323
     dy_2010 |     -0.489      0.481    -1.02    0.32        -1.468       0.490
       _cons |     -0.143      0.393    -0.36    0.72        -0.944       0.659
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.bal_pr2gdp collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.bal_pr2gdp collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.96  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.68  Pr > z =  0.498
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  23.08  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.38  Prob > chi2 =  0.496
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.18  Prob > chi2 =  0.555
    Difference (null H = exogenous): chi2(2)    =   2.20  Prob > chi2 =  0.332
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.948
    Difference (null H = exogenous): chi2(3)    =   3.38  Prob > chi2 =  0.337
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.31  Prob > chi2 =  0.129
    Difference (null H = exogenous): chi2(3)    =   1.07  Prob > chi2 =  0.783
```

Table 3.1 Column 5

```
xtabond2 capb_ngdp_pot L.capb_ngdp_pot gap_pot L.debt2gdp infl dy_2002-dy_2010
if year>1994 & year<2011 & (eu27==1), gmm(L.capb_ngdp_pot, laglimits(1 2)
collapse) gmm(gap_pot, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010 ) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       405
Time variable : year                            Number of groups   =        27
Number of instruments = 18                      Obs per group: min =        10
F(13, 26)     =     55.83                                      avg =     15.00
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_~t |
         L1. |      0.833      0.138     6.02    0.00         0.549      1.118
             |
     gap_pot |     -0.124      0.058    -2.15    0.04        -0.243     -0.006
             |
    debt2gdp |
         L1. |      0.009      0.005     1.87    0.07        -0.001      0.019
             |
        infl |      0.019      0.003     5.52    0.00         0.012      0.026
     dy_2002 |     -0.954      0.380    -2.51    0.02        -1.735     -0.172
     dy_2003 |     -0.197      0.243    -0.81    0.43        -0.697      0.304
     dy_2004 |     -0.002      0.437    -0.00    1.00        -0.900      0.896
     dy_2005 |      0.134      0.360     0.37    0.71        -0.606      0.873
     dy_2006 |      0.011      0.323     0.04    0.97        -0.652      0.675
     dy_2007 |      0.673      0.526     1.28    0.21        -0.409      1.754
     dy_2008 |     -0.800      0.358    -2.23    0.03        -1.537     -0.064
     dy_2009 |     -2.361      0.631    -3.74    0.00        -3.657     -1.065
     dy_2010 |     -0.648      0.471    -1.38    0.18        -1.616      0.320
       _cons |     -0.377      0.242    -1.56    0.13        -0.874      0.121
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_pot collapsed
    L(1/2).L.capb_ngdp_pot collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_pot collapsed
    D.L.capb_ngdp_pot collapsed
------------------------------------------------------------------------------
```

```
Arellano-Bond test for AR(1) in first differences: z =  -3.63  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.49  Pr > z =  0.137
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =   9.06  Prob > chi2 =  0.060
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.94  Prob > chi2 =  0.414
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.98  Prob > chi2 =  0.225
    Difference (null H = exogenous): chi2(2)    =   0.96  Prob > chi2 =  0.619
  gmm(L.capb_ngdp_pot, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.36  Prob > chi2 =  0.547
    Difference (null H = exogenous): chi2(3)    =   3.58  Prob > chi2 =  0.311
  gmm(gap_pot, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.08  Prob > chi2 =  0.149
    Difference (null H = exogenous): chi2(3)    =   1.86  Prob > chi2 =  0.603
```

Table 3.1 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-dy_2010 ) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 18                      Obs per group: min =        10
F(13, 26)     =    201.26                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.700      0.086     8.15    0.00        0.523       0.876
             |
      gap_tr |     -0.162      0.053    -3.08    0.00       -0.271      -0.054
             |
    debt2gdp |
         L1. |      0.012      0.004     2.74    0.01        0.003       0.021
             |
        infl |      0.019      0.005     3.54    0.00        0.008       0.030
     dy_2002 |     -1.076      0.387    -2.78    0.01       -1.872      -0.281
     dy_2003 |     -0.487      0.238    -2.05    0.05       -0.975       0.002
     dy_2004 |     -0.360      0.324    -1.11    0.28       -1.026       0.305
     dy_2005 |     -0.107      0.291    -0.37    0.72       -0.706       0.491
     dy_2006 |     -0.251      0.225    -1.12    0.27       -0.714       0.212
     dy_2007 |      0.407      0.419     0.97    0.34       -0.453       1.267
     dy_2008 |     -0.938      0.349    -2.69    0.01       -1.655      -0.221
     dy_2009 |     -2.715      0.486    -5.59    0.00       -3.714      -1.717
     dy_2010 |     -1.028      0.492    -2.09    0.05       -2.039      -0.017
       _cons |     -0.330      0.336    -0.98    0.33       -1.020       0.360
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.54  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.02  Pr > z =  0.309
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  21.14  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.22  Prob > chi2 =  0.521
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.50  Prob > chi2 =  0.286
    Difference (null H = exogenous): chi2(2)    =   0.72  Prob > chi2 =  0.697
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.57  Prob > chi2 =  0.210
    Difference (null H = exogenous): chi2(3)    =   1.65  Prob > chi2 =  0.648
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.17  Prob > chi2 =  0.141
    Difference (null H = exogenous): chi2(3)    =   1.05  Prob > chi2 =  0.789
```

Table 3.2 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 18                      Obs per group: min =         5
F(13, 32)     =     83.77                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.707      0.073     9.70    0.00        0.558       0.855
             |
      gap_tr |     -0.158      0.064    -2.48    0.02       -0.288      -0.028
             |
    debt2gdp |
         L1. |      0.009      0.004     2.15    0.04        0.001       0.018
             |
        infl |      0.017      0.006     2.85    0.01        0.005       0.029
     dy_2002 |     -0.781      0.396    -1.97    0.06       -1.588       0.026
     dy_2003 |     -0.239      0.293    -0.81    0.42       -0.835       0.358
     dy_2004 |     -0.178      0.288    -0.62    0.54       -0.765       0.408
     dy_2005 |      0.139      0.279     0.50    0.62       -0.429       0.707
     dy_2006 |     -0.205      0.253    -0.81    0.42       -0.720       0.311
     dy_2007 |      0.296      0.443     0.67    0.51       -0.608       1.199
     dy_2008 |     -1.181      0.405    -2.92    0.01       -2.006      -0.357
     dy_2009 |     -2.149      0.432    -4.97    0.00       -3.029      -1.268
     dy_2010 |     -0.681      0.454    -1.50    0.14       -1.604       0.243
       _cons |     -0.256      0.316    -0.81    0.42       -0.899       0.387
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
```

```
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.65  Pr > z =  0.515
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.44  Prob > chi2 =  0.004
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.78  Prob > chi2 =  0.776
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.22  Prob > chi2 =  0.543
    Difference (null H = exogenous): chi2(2)    =   0.56  Prob > chi2 =  0.756
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.69  Prob > chi2 =  0.406
    Difference (null H = exogenous): chi2(3)    =   1.09  Prob > chi2 =  0.779
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.44  Prob > chi2 =  0.230
    Difference (null H = exogenous): chi2(3)    =   0.34  Prob > chi2 =  0.952
```

Table 3.2 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr_eu17 L.capb_ngdp_tr_nms10
L.capb_ngdp_tr_see6 gap_tr eu17 nms10 see6 L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr_eu17, laglimits(1
2) collapse) gmm(L.capb_ngdp_tr_nms10, laglimits(1 2) collapse)
gmm(L.capb_ngdp_tr_see6, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse) iv(L.debt2gdp eu17 nms10 see6 infl dy_2002-dy_2010) two robust small
nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         5
F(18, 33)     =    353.67                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp~17 |
         L1. |      0.900      0.079    11.45    0.00         0.740        1.060
             |
capb_ngdp~10 |
         L1. |      0.463      0.098     4.72    0.00         0.263        0.662
             |
capb_ngdp~e6 |
         L1. |      0.429      0.170     2.53    0.02         0.084        0.775
             |
      gap_tr |     -0.159      0.048    -3.35    0.00        -0.256       -0.063
        eu17 |     -0.145      0.266    -0.55    0.59        -0.687        0.396
       nms10 |     -0.810      0.302    -2.68    0.01        -1.425       -0.195
        see6 |     -0.328      0.586    -0.56    0.58        -1.519        0.864
             |
    debt2gdp |
         L1. |      0.006      0.004     1.35    0.19        -0.003        0.014
             |
        infl |      0.018      0.006     2.84    0.01         0.005        0.030
     dy_2002 |     -0.697      0.370    -1.88    0.07        -1.449        0.056
     dy_2003 |     -0.288      0.248    -1.16    0.25        -0.792        0.216
     dy_2004 |      0.163      0.362     0.45    0.66        -0.574        0.899
     dy_2005 |      0.434      0.309     1.40    0.17        -0.195        1.062
     dy_2006 |      0.146      0.294     0.50    0.62        -0.453        0.744
     dy_2007 |      0.345      0.424     0.81    0.42        -0.518        1.208
     dy_2008 |     -1.273      0.412    -3.09    0.00        -2.111       -0.435
     dy_2009 |     -2.378      0.354    -6.72    0.00        -3.098       -1.658
     dy_2010 |     -0.842      0.319    -2.64    0.01        -1.491       -0.193
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr_see6 collapsed
    L(1/2).L.capb_ngdp_tr_nms10 collapsed
    L(1/2).L.capb_ngdp_tr_eu17 collapsed
Instruments for levels equation
  Standard
    L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr_see6 collapsed
    D.L.capb_ngdp_tr_nms10 collapsed
    D.L.capb_ngdp_tr_eu17 collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.90  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.58  Pr > z =  0.564
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  12.68  Prob > chi2 =  0.123
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   6.54  Prob > chi2 =  0.587
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   1.07  Prob > chi2 =  0.898
    Difference (null H = exogenous): chi2(4)    =   5.47  Prob > chi2 =  0.243
  gmm(L.capb_ngdp_tr_eu17, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   5.33  Prob > chi2 =  0.377
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.749
  gmm(L.capb_ngdp_tr_nms10, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.72  Prob > chi2 =  0.743
    Difference (null H = exogenous): chi2(3)    =   3.82  Prob > chi2 =  0.281
  gmm(L.capb_ngdp_tr_see6, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   3.02  Prob > chi2 =  0.697
    Difference (null H = exogenous): chi2(3)    =   3.52  Prob > chi2 =  0.318
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.03  Prob > chi2 =  0.546
    Difference (null H = exogenous): chi2(3)    =   2.52  Prob > chi2 =  0.472
```

Table 3.2 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp infl dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10, laglimits (2 3)
collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)  iv(L.debt2gdp eu17 nms10
see6 infl dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         5
F(18, 33)     =    209.13                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.708      0.067    10.59    0.00         0.572       0.844
             |
 gap_tr_eu17 |     -0.039      0.103    -0.38    0.71        -0.248       0.170
gap_tr_nms10 |     -0.182      0.042    -4.37    0.00        -0.267      -0.097
 gap_tr_see6 |     -0.281      0.058    -4.87    0.00        -0.399      -0.164
        eu17 |      0.324      0.449     0.72    0.48        -0.589       1.237
       nms10 |     -0.241      0.269    -0.89    0.38        -0.788       0.307
        see6 |      0.381      0.301     1.27    0.21        -0.231       0.993
             |
    debt2gdp |
         L1. |      0.003      0.005     0.64    0.53        -0.007       0.014
             |
        infl |      0.020      0.004     5.31    0.00         0.012       0.028
     dy_2002 |     -0.887      0.371    -2.39    0.02        -1.643      -0.132
     dy_2003 |     -0.449      0.220    -2.04    0.05        -0.897      -0.001
     dy_2004 |     -0.298      0.277    -1.07    0.29        -0.862       0.267
     dy_2005 |      0.003      0.287     0.01    0.99        -0.581       0.587
     dy_2006 |     -0.352      0.249    -1.41    0.17        -0.858       0.154
     dy_2007 |      0.054      0.431     0.13    0.90        -0.823       0.931
     dy_2008 |     -1.316      0.402    -3.27    0.00        -2.134      -0.498
     dy_2009 |     -2.288      0.408    -5.60    0.00        -3.119      -1.458
     dy_2010 |     -0.708      0.366    -1.93    0.06        -1.453       0.038
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
```

```
  Standard
    L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.51  Pr > z =  0.613
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  34.91  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   3.61  Prob > chi2 =  0.891
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.28  Prob > chi2 =  0.684
    Difference (null H = exogenous): chi2(4)    =   1.33  Prob > chi2 =  0.857
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.87  Prob > chi2 =  0.720
    Difference (null H = exogenous): chi2(3)    =   0.74  Prob > chi2 =  0.865
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.41  Prob > chi2 =  0.790
    Difference (null H = exogenous): chi2(3)    =   1.20  Prob > chi2 =  0.754
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.23  Prob > chi2 =  0.664
    Difference (null H = exogenous): chi2(3)    =   0.38  Prob > chi2 =  0.945
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.60  Prob > chi2 =  0.762
    Difference (null H = exogenous): chi2(3)    =   1.01  Prob > chi2 =  0.799
```

Table 3.2 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp_eu17 L.debt2gdp_nms10
L.debt2gdp_see6 eu17 nms10 see6  infl dy_2002-dy_2010 if year>1994 & year<2011
& (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse) iv(L.debt2gdp_eu17 L.debt2gdp_nms10 L.debt2gdp_see6
eu17 nms10 see6  infl dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 22                      Obs per group: min =         5
F(18, 33)     =     80.77                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.701      0.072     9.68    0.00        0.553       0.848
             |
      gap_tr |     -0.158      0.070    -2.26    0.03       -0.301      -0.016
             |
debt2gdp_~17 |
         L1. |      0.004      0.006     0.80    0.43       -0.007       0.016
             |
debt2gdp_~10 |
         L1. |      0.013      0.012     1.13    0.27       -0.011       0.037
             |
debt2gdp_s~6 |
         L1. |     -0.033      0.016    -2.06    0.05       -0.065      -0.000
             |
        eu17 |      0.207      0.437     0.47    0.64       -0.682       1.095
       nms10 |     -0.674      0.468    -1.44    0.16       -1.625       0.277
        see6 |      1.537      0.615     2.50    0.02        0.287       2.787
        infl |      0.021      0.005     3.88    0.00        0.010       0.032
     dy_2002 |     -0.766      0.400    -1.91    0.06       -1.580       0.049
     dy_2003 |     -0.208      0.284    -0.73    0.47       -0.786       0.369
     dy_2004 |     -0.211      0.282    -0.75    0.46       -0.785       0.364
     dy_2005 |      0.108      0.288     0.37    0.71       -0.477       0.693
     dy_2006 |     -0.230      0.290    -0.79    0.43       -0.819       0.359
     dy_2007 |      0.222      0.480     0.46    0.65       -0.755       1.198
     dy_2008 |     -1.286      0.432    -2.97    0.01       -2.166      -0.406
     dy_2009 |     -2.251      0.420    -5.36    0.00       -3.106      -1.397
     dy_2010 |     -0.737      0.445    -1.66    0.11       -1.643       0.169
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp_eu17 L.debt2gdp_nms10 L.debt2gdp_see6 eu17 nms10 see6 infl
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
```

```
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp_eu17 L.debt2gdp_nms10 L.debt2gdp_see6 eu17 nms10 see6 infl
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.88  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.67  Pr > z =  0.504
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.61  Prob > chi2 =  0.004
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.78  Prob > chi2 =  0.777
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.26  Prob > chi2 =  0.533
    Difference (null H = exogenous): chi2(2)    =   0.52  Prob > chi2 =  0.772
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.76  Prob > chi2 =  0.384
    Difference (null H = exogenous): chi2(3)    =   1.02  Prob > chi2 =  0.797
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.40  Prob > chi2 =  0.237
    Difference (null H = exogenous): chi2(3)    =   0.38  Prob > chi2 =  0.945
```

Table 3.2 Column 5

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010 ) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       467
Time variable : year                            Number of groups   =        33
Number of instruments = 18                      Obs per group: min =         5
F(13, 32)     =     36.69                                      avg =     14.15
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.729      0.072    10.12    0.00         0.582       0.876
             |
      gap_tr |     -0.006      0.058    -0.10    0.92        -0.124       0.113
             |
    debt2gdp |
         L1. |      0.009      0.005     1.73    0.09        -0.002       0.019
             |
        infl |      0.008      0.006     1.33    0.19        -0.004       0.021
     dy_2002 |     -0.836      0.383    -2.18    0.04        -1.617      -0.055
     dy_2003 |     -0.480      0.312    -1.54    0.13        -1.116       0.157
     dy_2004 |     -0.003      0.298    -0.01    0.99        -0.609       0.604
     dy_2005 |      0.299      0.315     0.95    0.35        -0.343       0.940
     dy_2006 |      0.247      0.271     0.91    0.37        -0.304       0.799
     dy_2007 |      0.649      0.460     1.41    0.17        -0.289       1.586
     dy_2008 |     -1.603      0.374    -4.28    0.00        -2.365      -0.841
     dy_2009 |     -4.194      0.428    -9.81    0.00        -5.065      -3.323
     dy_2010 |     -0.489      0.481    -1.02    0.32        -1.468       0.490
       _cons |     -0.143      0.393    -0.36    0.72        -0.944       0.659
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.bal_pr2gdp collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.bal_pr2gdp collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.96  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.68  Pr > z =  0.498
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  23.08  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.38  Prob > chi2 =  0.496
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.18  Prob > chi2 =  0.555
    Difference (null H = exogenous): chi2(2)    =   2.20  Prob > chi2 =  0.332
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.948
    Difference (null H = exogenous): chi2(3)    =   3.38  Prob > chi2 =  0.337
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.31  Prob > chi2 =  0.129
    Difference (null H = exogenous): chi2(3)    =   1.07  Prob > chi2 =  0.783
```

Table 3.2 Column 6

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp infl dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2) collapse) gmm(gap_tr_eu17,
laglimits (2 3) collapse) gmm(gap_tr_nms10, laglimits (2 3) collapse)
gmm(gap_tr_see6, laglimits (2 3) collapse)  iv(L.debt2gdp eu17 nms10 see6 infl
dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       467
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         5
F(18, 33)     =    123.01                                      avg =     14.15
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.736      0.079     9.30    0.00         0.575       0.897
             |
 gap_tr_eu17 |      0.097      0.114     0.84    0.40        -0.136       0.329
gap_tr_nms10 |     -0.029      0.041    -0.72    0.48        -0.112       0.054
 gap_tr_see6 |     -0.015      0.056    -0.27    0.79        -0.130       0.100
        eu17 |      0.580      0.524     1.11    0.28        -0.486       1.646
       nms10 |      0.077      0.334     0.23    0.82        -0.603       0.757
        see6 |      0.517      0.355     1.46    0.15        -0.204       1.239
             |
    debt2gdp |
         L1. |      0.001      0.006     0.17    0.86        -0.011       0.013
             |
        infl |      0.009      0.003     2.96    0.01         0.003       0.016
     dy_2002 |     -0.932      0.384    -2.43    0.02        -1.714      -0.150
     dy_2003 |     -0.686      0.229    -3.00    0.01        -1.151      -0.220
     dy_2004 |     -0.236      0.302    -0.78    0.44        -0.850       0.378
     dy_2005 |      0.084      0.346     0.24    0.81        -0.620       0.788
     dy_2006 |     -0.063      0.259    -0.24    0.81        -0.591       0.464
     dy_2007 |      0.191      0.459     0.42    0.68        -0.744       1.125
     dy_2008 |     -2.042      0.391    -5.22    0.00        -2.838      -1.246
     dy_2009 |     -4.515      0.411   -10.98     0.00        -5.351      -3.679
     dy_2010 |     -0.514      0.599    -0.86    0.40        -1.732       0.704
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.bal_pr2gdp collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp eu17 nms10 see6 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.bal_pr2gdp collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.82  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.56  Pr > z =  0.573
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  39.03  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   5.69  Prob > chi2 =  0.682
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   4.27  Prob > chi2 =  0.371
    Difference (null H = exogenous): chi2(4)    =   1.42  Prob > chi2 =  0.841
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   4.45  Prob > chi2 =  0.487
    Difference (null H = exogenous): chi2(3)    =   1.24  Prob > chi2 =  0.744
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.60  Prob > chi2 =  0.467
    Difference (null H = exogenous): chi2(3)    =   1.09  Prob > chi2 =  0.780
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.17  Prob > chi2 =  0.525
    Difference (null H = exogenous): chi2(3)    =   1.52  Prob > chi2 =  0.679
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.61  Prob > chi2 =  0.465
    Difference (null H = exogenous): chi2(3)    =   1.07  Prob > chi2 =  0.783
```

Table 3.3 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl dy_2002-
dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 18                      Obs per group: min =         5
F(13, 32)     =     83.77                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.707      0.073     9.70    0.00        0.558       0.855
             |
      gap_tr |     -0.158      0.064    -2.48    0.02       -0.288      -0.028
             |
    debt2gdp |
         L1. |      0.009      0.004     2.15    0.04        0.001       0.018
             |
        infl |      0.017      0.006     2.85    0.01        0.005       0.029
     dy_2002 |     -0.781      0.396    -1.97    0.06       -1.588       0.026
     dy_2003 |     -0.239      0.293    -0.81    0.42       -0.835       0.358
     dy_2004 |     -0.178      0.288    -0.62    0.54       -0.765       0.408
     dy_2005 |      0.139      0.279     0.50    0.62       -0.429       0.707
     dy_2006 |     -0.205      0.253    -0.81    0.42       -0.720       0.311
     dy_2007 |      0.296      0.443     0.67    0.51       -0.608       1.199
     dy_2008 |     -1.181      0.405    -2.92    0.01       -2.006      -0.357
     dy_2009 |     -2.149      0.432    -4.97    0.00       -3.029      -1.268
     dy_2010 |     -0.681      0.454    -1.50    0.14       -1.604       0.243
       _cons |     -0.256      0.316    -0.81    0.42       -0.899       0.387
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.65  Pr > z =  0.515
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.44  Prob > chi2 =  0.004
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.78  Prob > chi2 =  0.776
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.22  Prob > chi2 =  0.543
    Difference (null H = exogenous): chi2(2)    =   0.56  Prob > chi2 =  0.756
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.69  Prob > chi2 =  0.406
    Difference (null H = exogenous): chi2(3)    =   1.09  Prob > chi2 =  0.779
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.44  Prob > chi2 =  0.230
    Difference (null H = exogenous): chi2(3)    =   0.34  Prob > chi2 =  0.952
```

Table 3.3 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 19                      Obs per group: min =         5
F(14, 32)     =     78.99                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.708      0.074     9.51    0.00        0.556       0.859
             |
      gap_tr |     -0.162      0.064    -2.51    0.02       -0.293      -0.031
             |
    debt2gdp |
         L1. |      0.009      0.004     2.24    0.03        0.001       0.018
             |
        infl |      0.016      0.006     2.77    0.01        0.004       0.027
legelec_dpi1 |     -0.570      0.201    -2.83    0.01       -0.980      -0.160
     dy_2002 |     -0.703      0.397    -1.77    0.09       -1.511       0.105
     dy_2003 |     -0.263      0.289    -0.91    0.37       -0.853       0.326
     dy_2004 |     -0.213      0.281    -0.76    0.45       -0.785       0.359
     dy_2005 |      0.117      0.280     0.42    0.68       -0.454       0.688
     dy_2006 |     -0.108      0.242    -0.45    0.66       -0.602       0.386
     dy_2007 |      0.343      0.451     0.76    0.45       -0.576       1.261
     dy_2008 |     -1.146      0.413    -2.77    0.01       -1.987      -0.304
     dy_2009 |     -2.193      0.424    -5.17    0.00       -3.057      -1.329
     dy_2010 |     -0.822      0.445    -1.85    0.07       -1.729       0.085
       _cons |     -0.109      0.290    -0.38    0.71       -0.699       0.482
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.91  Pr > z =  0.360
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.88  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.06  Prob > chi2 =  0.725
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.71  Prob > chi2 =  0.426
    Difference (null H = exogenous): chi2(2)    =   0.35  Prob > chi2 =  0.838
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.68  Prob > chi2 =  0.409
    Difference (null H = exogenous): chi2(3)    =   1.38  Prob > chi2 =  0.711
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.78  Prob > chi2 =  0.182
    Difference (null H = exogenous): chi2(3)    =   0.27  Prob > chi2 =  0.965
```

Table 3.3 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1_eu17
legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6 dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp infl
legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6 dy_2002-
dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 23                      Obs per group: min =         5
F(19, 33)     =    168.11                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.715      0.074     9.68    0.00        0.565       0.866
             |
      gap_tr |     -0.168      0.063    -2.64    0.01       -0.297      -0.038
             |
    debt2gdp |
         L1. |      0.005      0.005     0.93    0.36       -0.005       0.015
             |
        infl |      0.019      0.004     4.40    0.00        0.010       0.028
legelec_d~17 |     -0.594      0.230    -2.58    0.01       -1.063      -0.126
legelec_d~10 |     -0.570      0.492    -1.16    0.25       -1.571       0.431
legelec_d~e6 |     -0.361      0.318    -1.14    0.26       -1.009       0.286
        eu17 |      0.291      0.382     0.76    0.45       -0.487       1.068
       nms10 |     -0.257      0.243    -1.06    0.30       -0.752       0.238
        see6 |      0.041      0.266     0.15    0.88       -0.499       0.581
     dy_2002 |     -0.667      0.397    -1.68    0.10       -1.475       0.142
     dy_2003 |     -0.247      0.288    -0.86    0.40       -0.833       0.340
     dy_2004 |     -0.169      0.281    -0.60    0.55       -0.740       0.402
     dy_2005 |      0.152      0.286     0.53    0.60       -0.429       0.734
     dy_2006 |     -0.075      0.242    -0.31    0.76       -0.567       0.417
     dy_2007 |      0.376      0.450     0.84    0.41       -0.540       1.293
     dy_2008 |     -1.138      0.420    -2.71    0.01       -1.992      -0.283
     dy_2009 |     -2.152      0.425    -5.06    0.00       -3.016      -1.287
     dy_2010 |     -0.762      0.440    -1.73    0.09       -1.657       0.132
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6
    eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6
    eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.82  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.89  Pr > z =  0.373
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.96  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.98  Prob > chi2 =  0.740
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.71  Prob > chi2 =  0.425
    Difference (null H = exogenous): chi2(2)    =   0.27  Prob > chi2 =  0.876
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.49  Prob > chi2 =  0.484
    Difference (null H = exogenous): chi2(3)    =   1.49  Prob > chi2 =  0.685
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.71  Prob > chi2 =  0.191
    Difference (null H = exogenous): chi2(3)    =   0.27  Prob > chi2 =  0.966
```

Table 3.3 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.3 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr gap_tr_maastricht L.debt2gdp infl
legelec_dpi1 maastricht dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse) gmm(gap_tr_maastricht, laglimits (2 3) collapse)
iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 23                      Obs per group: min =         5
F(16, 32)     =     68.40                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.665      0.080     8.28    0.00        0.502       0.829
             |
      gap_tr |     -0.169      0.074    -2.28    0.03       -0.321      -0.018
gap_tr_maa~t |      0.447      0.238     1.88    0.07       -0.038       0.933
             |
    debt2gdp |
         L1. |      0.009      0.004     2.11    0.04        0.000       0.018
             |
        infl |      0.018      0.005     3.22    0.00        0.006       0.029
legelec_dpi1 |     -0.499      0.214    -2.33    0.03       -0.935      -0.062
  maastricht |      1.099      0.387     2.84    0.01        0.310       1.888
     dy_2002 |     -0.488      0.401    -1.22    0.23       -1.304       0.328
     dy_2003 |     -0.187      0.329    -0.57    0.57       -0.857       0.483
     dy_2004 |     -0.032      0.303    -0.10    0.92       -0.648       0.585
     dy_2005 |      0.236      0.320     0.74    0.47       -0.415       0.888
     dy_2006 |      0.092      0.263     0.35    0.73       -0.443       0.627
     dy_2007 |      0.387      0.484     0.80    0.43       -0.599       1.374
     dy_2008 |     -1.159      0.457    -2.54    0.02       -2.091      -0.228
     dy_2009 |     -2.214      0.470    -4.71    0.00       -3.172      -1.257
     dy_2010 |     -0.752      0.503    -1.49    0.14       -1.776       0.273
       _cons |     -0.327      0.271    -1.21    0.24       -0.879       0.225
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_maastricht collapsed
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
```

```
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_maastricht collapsed
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.57  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.43  Pr > z =  0.668
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  22.80  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   5.64  Prob > chi2 =  0.464
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   4.22  Prob > chi2 =  0.238
    Difference (null H = exogenous): chi2(3)    =   1.42  Prob > chi2 =  0.701
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   4.26  Prob > chi2 =  0.235
    Difference (null H = exogenous): chi2(3)    =   1.39  Prob > chi2 =  0.709
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   4.46  Prob > chi2 =  0.216
    Difference (null H = exogenous): chi2(3)    =   1.18  Prob > chi2 =  0.758
  gmm(gap_tr_maastricht, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.12  Prob > chi2 =  0.548
    Difference (null H = exogenous): chi2(3)    =   3.52  Prob > chi2 =  0.318
```

Table 3.3 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht sgp dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht sgp dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     74.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.692      0.073     9.49    0.00        0.543       0.840
             |
      gap_tr |     -0.154      0.068    -2.27    0.03       -0.293      -0.016
             |
    debt2gdp |
         L1. |      0.008      0.005     1.57    0.13       -0.002       0.018
             |
        infl |      0.017      0.005     3.24    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.200    -2.80    0.01       -0.968      -0.152
  maastricht |      0.688      0.222     3.10    0.00        0.236       1.140
         sgp |      0.046      0.234     0.20    0.85       -0.430       0.522
     dy_2002 |     -0.585      0.402    -1.46    0.15       -1.403       0.232
     dy_2003 |     -0.109      0.310    -0.35    0.73       -0.741       0.523
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.548
     dy_2005 |      0.287      0.299     0.96    0.34       -0.322       0.896
     dy_2006 |      0.037      0.249     0.15    0.88       -0.471       0.545
     dy_2007 |      0.444      0.447     0.99    0.33       -0.468       1.355
     dy_2008 |     -1.053      0.414    -2.55    0.02       -1.896      -0.210
     dy_2009 |     -2.082      0.437    -4.77    0.00       -2.972      -1.193
     dy_2010 |     -0.682      0.448    -1.52    0.14       -1.595       0.231
       _cons |     -0.230      0.293    -0.79    0.44       -0.826       0.366
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht sgp dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht sgp dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.81  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.54  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.22  Prob > chi2 =  0.695
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.76  Prob > chi2 =  0.415
    Difference (null H = exogenous): chi2(2)    =   0.46  Prob > chi2 =  0.793
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.93  Prob > chi2 =  0.334
    Difference (null H = exogenous): chi2(3)    =   1.29  Prob > chi2 =  0.732
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.172
    Difference (null H = exogenous): chi2(3)    =   0.36  Prob > chi2 =  0.949
```

Table 3.3 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr gap_tr_sgp L.debt2gdp infl
legelec_dpi1 sgp dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse) gmm(gap_tr_sgp, laglimits (2 3) collapse) iv(L.debt2gdp infl
legelec_dpi1 sgp dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 23                      Obs per group: min =         5
F(16, 32)     =     67.05                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.699      0.061    11.37    0.00         0.574       0.824
             |
      gap_tr |     -0.146      0.069    -2.10    0.04        -0.287      -0.005
  gap_tr_sgp |      0.139      0.204     0.68    0.50        -0.277       0.555
             |
    debt2gdp |
         L1. |      0.012      0.007     1.86    0.07        -0.001       0.026
             |
        infl |      0.017      0.004     3.83    0.00         0.008       0.025
legelec_dpi1 |     -0.543      0.214    -2.53    0.02        -0.980      -0.107
         sgp |     -0.201      0.267    -0.75    0.46        -0.745       0.343
     dy_2002 |     -0.659      0.427    -1.54    0.13        -1.528       0.211
     dy_2003 |     -0.301      0.370    -0.81    0.42        -1.055       0.452
     dy_2004 |     -0.120      0.330    -0.36    0.72        -0.792       0.552
     dy_2005 |      0.140      0.334     0.42    0.68        -0.541       0.822
     dy_2006 |     -0.174      0.308    -0.56    0.58        -0.801       0.453
     dy_2007 |      0.127      0.633     0.20    0.84        -1.163       1.417
     dy_2008 |     -1.365      0.560    -2.44    0.02        -2.505      -0.226
     dy_2009 |     -2.056      0.549    -3.74    0.00        -3.175      -0.937
     dy_2010 |     -0.672      0.352    -1.91    0.07        -1.389       0.045
       _cons |     -0.182      0.419    -0.44    0.67        -1.035       0.671
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 sgp dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_sgp collapsed
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 sgp dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
```

```
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_sgp collapsed
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.77  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.69  Pr > z =  0.493
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  53.81  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   4.07  Prob > chi2 =  0.667
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   2.30  Prob > chi2 =  0.512
    Difference (null H = exogenous): chi2(3)    =   1.77  Prob > chi2 =  0.622
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   3.48  Prob > chi2 =  0.324
    Difference (null H = exogenous): chi2(3)    =   0.59  Prob > chi2 =  0.898
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.75  Prob > chi2 =  0.432
    Difference (null H = exogenous): chi2(3)    =   1.32  Prob > chi2 =  0.723
  gmm(gap_tr_sgp, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.36  Prob > chi2 =  0.501
    Difference (null H = exogenous): chi2(3)    =   1.71  Prob > chi2 =  0.634
```

Table 3.3 Column 8

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010 if year>1994
& year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10, laglimits (2 3)
collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse) iv(L.debt2gdp infl
legelec_dpi1 maastricht dy_2002-dy_2010 eu17 nms10 see6 ) two robust small
nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    444.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.066    10.61    0.00         0.564      0.832
             |
 gap_tr_eu17 |      0.020      0.120     0.17    0.87        -0.223      0.263
gap_tr_nms10 |     -0.180      0.043    -4.20    0.00        -0.267     -0.093
 gap_tr_see6 |     -0.270      0.061    -4.44    0.00        -0.393     -0.146
        eu17 |      0.213      0.477     0.45    0.66        -0.757      1.183
       nms10 |     -0.174      0.253    -0.69    0.50        -0.687      0.340
        see6 |      0.369      0.291     1.27    0.21        -0.222      0.960
             |
    debt2gdp |
         L1. |      0.002      0.006     0.36    0.72        -0.009      0.013
             |
        infl |      0.020      0.004     5.37    0.00         0.012      0.027
legelec_dpi1 |     -0.489      0.190    -2.58    0.01        -0.875     -0.104
  maastricht |      0.832      0.352     2.36    0.02         0.116      1.547
     dy_2002 |     -0.624      0.375    -1.66    0.11        -1.387      0.139
     dy_2003 |     -0.228      0.262    -0.87    0.39        -0.760      0.304
     dy_2004 |     -0.135      0.310    -0.43    0.67        -0.766      0.496
     dy_2005 |      0.192      0.314     0.61    0.54        -0.446      0.831
     dy_2006 |     -0.169      0.253    -0.67    0.51        -0.684      0.346
     dy_2007 |      0.133      0.441     0.30    0.76        -0.764      1.031
     dy_2008 |     -1.295      0.415    -3.12    0.00        -2.138     -0.451
     dy_2009 |     -2.151      0.455    -4.73    0.00        -3.076     -1.226
     dy_2010 |     -0.582      0.337    -1.73    0.09        -1.267      0.103
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010 eu17 nms10 see6)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010 eu17 nms10 see6
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.84  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.628
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  33.36  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   4.04  Prob > chi2 =  0.854
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.86  Prob > chi2 =  0.582
    Difference (null H = exogenous): chi2(4)    =   1.18  Prob > chi2 =  0.882
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.57  Prob > chi2 =  0.766
    Difference (null H = exogenous): chi2(3)    =   1.46  Prob > chi2 =  0.691
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.48  Prob > chi2 =  0.780
    Difference (null H = exogenous): chi2(3)    =   1.56  Prob > chi2 =  0.668
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.72  Prob > chi2 =  0.590
    Difference (null H = exogenous): chi2(3)    =   0.31  Prob > chi2 =  0.957
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.83  Prob > chi2 =  0.726
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
```

Table 3.4 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00         0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03        -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07        -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00         0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01        -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00         0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16        -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73        -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86        -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34        -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89        -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33        -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02        -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00        -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14        -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43        -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.4 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|dc_alb==1|dc_bih==1|dc_mkd==1|dc_hrv==1), gmm(L.capb_ngdp_tr,
laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3) collapse) iv(L.debt2gdp
infl legelec_dpi1 maastricht dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       451
Time variable : year                            Number of groups   =        31
Number of instruments = 20                      Obs per group: min =         6
F(15, 30)     =     72.78                                      avg =     14.55
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.703      0.078     8.95    0.00         0.542       0.863
             |
      gap_tr |     -0.142      0.072    -1.96    0.06        -0.289       0.006
             |
    debt2gdp |
         L1. |      0.008      0.004     2.00    0.05        -0.000       0.016
             |
        infl |      0.018      0.006     3.29    0.00         0.007       0.030
legelec_dpi1 |     -0.591      0.210    -2.81    0.01        -1.020      -0.162
  maastricht |      0.669      0.196     3.41    0.00         0.268       1.070
     dy_2002 |     -0.560      0.406    -1.38    0.18        -1.390       0.270
     dy_2003 |     -0.059      0.314    -0.19    0.85        -0.700       0.581
     dy_2004 |     -0.057      0.300    -0.19    0.85        -0.671       0.556
     dy_2005 |      0.215      0.284     0.76    0.45        -0.364       0.794
     dy_2006 |      0.032      0.242     0.13    0.89        -0.461       0.526
     dy_2007 |      0.373      0.452     0.82    0.42        -0.551       1.296
     dy_2008 |     -0.939      0.409    -2.30    0.03        -1.774      -0.105
     dy_2009 |     -2.195      0.457    -4.81    0.00        -3.127      -1.262
     dy_2010 |     -0.643      0.484    -1.33    0.19        -1.632       0.345
       _cons |     -0.247      0.276    -0.90    0.38        -0.810       0.316
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.69  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.50  Pr > z =  0.618
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.69  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.13  Prob > chi2 =  0.713
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.62  Prob > chi2 =  0.446
    Difference (null H = exogenous): chi2(2)    =   0.51  Prob > chi2 =  0.775
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.03  Prob > chi2 =  0.309
    Difference (null H = exogenous): chi2(3)    =   1.09  Prob > chi2 =  0.779
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.64  Prob > chi2 =  0.200
    Difference (null H = exogenous): chi2(3)    =   0.49  Prob > chi2 =  0.922
```

Table 3.4 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht checks_dpi dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
checks_dpi dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       450
Time variable : year                            Number of groups   =        31
Number of instruments = 21                      Obs per group: min =         6
F(16, 30)     =     76.12                                      avg =     14.52
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.695      0.075     9.25    0.00         0.541       0.848
             |
      gap_tr |     -0.145      0.071    -2.03    0.05        -0.290       0.001
             |
    debt2gdp |
         L1. |      0.007      0.004     1.69    0.10        -0.001       0.015
             |
        infl |      0.021      0.006     3.27    0.00         0.008       0.034
legelec_dpi1 |     -0.590      0.208    -2.83    0.01        -1.014      -0.165
  maastricht |      0.767      0.251     3.05    0.00         0.254       1.280
  checks_dpi |     -0.153      0.122    -1.25    0.22        -0.401       0.096
     dy_2002 |     -0.591      0.402    -1.47    0.15        -1.413       0.230
     dy_2003 |     -0.099      0.313    -0.31    0.76        -0.738       0.541
     dy_2004 |     -0.103      0.306    -0.34    0.74        -0.728       0.522
     dy_2005 |      0.206      0.279     0.74    0.47        -0.364       0.777
     dy_2006 |      0.044      0.248     0.18    0.86        -0.462       0.550
     dy_2007 |      0.383      0.453     0.84    0.41        -0.543       1.309
     dy_2008 |     -0.957      0.411    -2.33    0.03        -1.795      -0.118
     dy_2009 |     -2.215      0.439    -5.05    0.00        -3.112      -1.319
     dy_2010 |     -0.688      0.479    -1.43    0.16        -1.667       0.291
       _cons |      0.414      0.505     0.82    0.42        -0.618       1.446
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht checks_dpi dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht checks_dpi dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.47  Pr > z =  0.636
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.88  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.16  Prob > chi2 =  0.706
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.61  Prob > chi2 =  0.446
    Difference (null H = exogenous): chi2(2)    =   0.55  Prob > chi2 =  0.761
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.93  Prob > chi2 =  0.335
    Difference (null H = exogenous): chi2(3)    =   1.23  Prob > chi2 =  0.745
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.72  Prob > chi2 =  0.190
    Difference (null H = exogenous): chi2(3)    =   0.44  Prob > chi2 =  0.932
```

Table 3.4 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht checks_dpi_eu17 checks_dpi_nms10 checks_dpi_see6 eu17 nms10 see6
dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht checks_dpi_eu17
checks_dpi_nms10 checks_dpi_see6 eu17 nms10 see6 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       450
Time variable : year                            Number of groups   =        31
Number of instruments = 25                      Obs per group: min =         6
F(21, 31)     =    100.86                                      avg =     14.52
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.693      0.072     9.69    0.00        0.547       0.839
             |
      gap_tr |     -0.148      0.069    -2.16    0.04       -0.289      -0.008
             |
    debt2gdp |
         L1. |      0.002      0.005     0.45    0.66       -0.008       0.012
             |
        infl |      0.030      0.007     4.23    0.00        0.016       0.044
legelec_dpi1 |     -0.587      0.205    -2.87    0.01       -1.005      -0.169
  maastricht |      0.535      0.245     2.18    0.04        0.035       1.034
checks_dp~17 |      0.117      0.106     1.10    0.28       -0.100       0.333
checks_dp~10 |     -0.457      0.263    -1.74    0.09       -0.993       0.079
checks_dp~e6 |     -0.682      0.120    -5.69    0.00       -0.926      -0.437
        eu17 |     -0.229      0.445    -0.51    0.61       -1.137       0.679
       nms10 |      1.542      1.043     1.48    0.15       -0.586       3.669
        see6 |      2.157      0.455     4.74    0.00        1.229       3.085
     dy_2002 |     -0.607      0.398    -1.53    0.14       -1.418       0.204
     dy_2003 |     -0.144      0.312    -0.46    0.65       -0.780       0.492
     dy_2004 |     -0.134      0.301    -0.45    0.66       -0.747       0.479
     dy_2005 |      0.236      0.292     0.81    0.43       -0.359       0.831
     dy_2006 |      0.115      0.233     0.50    0.62       -0.360       0.591
     dy_2007 |      0.488      0.427     1.14    0.26       -0.382       1.359
     dy_2008 |     -0.907      0.377    -2.41    0.02       -1.676      -0.138
     dy_2009 |     -2.128      0.443    -4.81    0.00       -3.031      -1.226
     dy_2010 |     -0.700      0.472    -1.48    0.15       -1.662       0.263
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht checks_dpi_eu17
    checks_dpi_nms10 checks_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht checks_dpi_eu17 checks_dpi_nms10
    checks_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.89  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.60  Pr > z =  0.551
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.67  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.91  Prob > chi2 =  0.752
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.52  Prob > chi2 =  0.468
    Difference (null H = exogenous): chi2(2)    =   0.40  Prob > chi2 =  0.820
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.81  Prob > chi2 =  0.367
    Difference (null H = exogenous): chi2(3)    =   1.10  Prob > chi2 =  0.777
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.59  Prob > chi2 =  0.208
    Difference (null H = exogenous): chi2(3)    =   0.33  Prob > chi2 =  0.955
```

Table 3.4 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht herfgov_dpi dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
herfgov_dpi dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       450
Time variable : year                            Number of groups   =        31
Number of instruments = 21                      Obs per group: min =         6
F(16, 30)     =     72.98                                      avg =     14.52
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.701      0.077     9.07    0.00         0.543       0.858
             |
      gap_tr |     -0.141      0.070    -2.02    0.05        -0.284       0.002
             |
    debt2gdp |
         L1. |      0.009      0.004     2.31    0.03         0.001       0.017
             |
        infl |      0.018      0.005     3.43    0.00         0.007       0.029
legelec_dpi1 |     -0.584      0.213    -2.74    0.01        -1.020      -0.149
  maastricht |      0.668      0.202     3.30    0.00         0.255       1.081
 herfgov_dpi |     -0.004      0.005    -0.71    0.48        -0.014       0.007
     dy_2002 |     -0.549      0.403    -1.36    0.18        -1.372       0.275
     dy_2003 |     -0.042      0.308    -0.14    0.89        -0.671       0.587
     dy_2004 |     -0.039      0.302    -0.13    0.90        -0.657       0.578
     dy_2005 |      0.214      0.283     0.76    0.46        -0.365       0.793
     dy_2006 |      0.026      0.229     0.11    0.91        -0.442       0.494
     dy_2007 |      0.359      0.436     0.82    0.42        -0.532       1.250
     dy_2008 |     -0.955      0.397    -2.41    0.02        -1.766      -0.144
     dy_2009 |     -2.195      0.458    -4.79    0.00        -3.130      -1.259
     dy_2010 |     -0.655      0.484    -1.36    0.19        -1.643       0.332
       _cons |     -0.065      0.429    -0.15    0.88        -0.942       0.812
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht herfgov_dpi dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht herfgov_dpi dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.67  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.52  Pr > z =  0.606
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.39  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.03  Prob > chi2 =  0.730
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.56  Prob > chi2 =  0.457
    Difference (null H = exogenous): chi2(2)    =   0.47  Prob > chi2 =  0.791
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.92  Prob > chi2 =  0.339
    Difference (null H = exogenous): chi2(3)    =   1.12  Prob > chi2 =  0.773
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.63  Prob > chi2 =  0.202
    Difference (null H = exogenous): chi2(3)    =   0.40  Prob > chi2 =  0.939
```

Table 3.4 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht herfgov_dpi_eu17 herfgov_dpi_nms10 herfgov_dpi_see6 eu17 nms10 see6
dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht herfgov_dpi_eu17
herfgov_dpi_nms10 herfgov_dpi_see6 eu17 nms10 see6 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       450
Time variable : year                            Number of groups   =        31
Number of instruments = 25                      Obs per group: min =         6
F(21, 31)     =    246.60                                      avg =     14.52
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.073     9.50    0.00        0.543       0.840
             |
      gap_tr |     -0.157      0.068    -2.31    0.03       -0.296      -0.019
             |
    debt2gdp |
         L1. |      0.004      0.004     0.95    0.35       -0.005       0.013
             |
        infl |      0.020      0.005     4.23    0.00        0.011       0.030
legelec_dpi1 |     -0.596      0.210    -2.83    0.01       -1.025      -0.167
  maastricht |      0.562      0.232     2.42    0.02        0.089       1.036
herfgov_d~17 |     -0.017      0.005    -3.44    0.00       -0.026      -0.007
herfgov_d~10 |      0.018      0.016     1.13    0.27       -0.014       0.051
herfgov_d~e6 |      0.010      0.009     1.05    0.30       -0.009       0.029
        eu17 |      1.280      0.536     2.39    0.02        0.188       2.373
       nms10 |     -1.382      0.943    -1.47    0.15       -3.304       0.540
        see6 |     -0.585      0.599    -0.98    0.34       -1.807       0.638
     dy_2002 |     -0.534      0.388    -1.38    0.18       -1.325       0.256
     dy_2003 |     -0.023      0.297    -0.08    0.94       -0.629       0.583
     dy_2004 |     -0.061      0.301    -0.20    0.84       -0.674       0.553
     dy_2005 |      0.237      0.299     0.79    0.43       -0.373       0.847
     dy_2006 |      0.152      0.248     0.61    0.54       -0.353       0.658
     dy_2007 |      0.470      0.419     1.12    0.27       -0.385       1.325
     dy_2008 |     -0.905      0.378    -2.39    0.02       -1.676      -0.134
     dy_2009 |     -2.276      0.421    -5.40    0.00       -3.135      -1.416
     dy_2010 |     -0.818      0.462    -1.77    0.09       -1.761       0.125
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht herfgov_dpi_eu17
    herfgov_dpi_nms10 herfgov_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht herfgov_dpi_eu17 herfgov_dpi_nms10
    herfgov_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.64  Pr > z =  0.520
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  14.34  Prob > chi2 =  0.006
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.01  Prob > chi2 =  0.734
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.63  Prob > chi2 =  0.443
    Difference (null H = exogenous): chi2(2)    =   0.38  Prob > chi2 =  0.828
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.99  Prob > chi2 =  0.319
    Difference (null H = exogenous): chi2(3)    =   1.02  Prob > chi2 =  0.797
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.48  Prob > chi2 =  0.223
    Difference (null H = exogenous): chi2(3)    =   0.52  Prob > chi2 =  0.913
```

Table 3.4 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht maj_dpi dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht maj_dpi
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       449
Time variable : year                            Number of groups   =        31
Number of instruments = 21                      Obs per group: min =         6
F(16, 30)     =    112.21                                      avg =     14.48
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.686      0.074     9.29    0.00        0.535       0.836
             |
      gap_tr |     -0.133      0.069    -1.92    0.06       -0.275       0.008
             |
    debt2gdp |
         L1. |      0.008      0.004     2.03    0.05       -0.000       0.016
             |
        infl |      0.024      0.006     3.96    0.00        0.012       0.036
legelec_dpi1 |     -0.589      0.215    -2.74    0.01       -1.028      -0.151
  maastricht |      0.688      0.249     2.76    0.01        0.179       1.196
     maj_dpi |      0.052      0.025     2.08    0.05        0.001       0.103
     dy_2002 |     -0.490      0.403    -1.22    0.23       -1.312       0.332
     dy_2003 |      0.010      0.344     0.03    0.98       -0.692       0.712
     dy_2004 |     -0.078      0.309    -0.25    0.80       -0.708       0.553
     dy_2005 |      0.247      0.308     0.80    0.43       -0.381       0.875
     dy_2006 |      0.003      0.202     0.02    0.99       -0.409       0.416
     dy_2007 |      0.195      0.417     0.47    0.64       -0.657       1.048
     dy_2008 |     -1.187      0.380    -3.12    0.00       -1.963      -0.411
     dy_2009 |     -2.327      0.468    -4.98    0.00       -3.282      -1.372
     dy_2010 |     -0.822      0.511    -1.61    0.12       -1.867       0.222
       _cons |     -3.124      1.444    -2.16    0.04       -6.073      -0.176
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht maj_dpi dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht maj_dpi dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.00  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.27  Pr > z =  0.788
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  14.99  Prob > chi2 =  0.005
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.90  Prob > chi2 =  0.754
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.32  Prob > chi2 =  0.516
    Difference (null H = exogenous): chi2(2)    =   0.58  Prob > chi2 =  0.750
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.60  Prob > chi2 =  0.440
    Difference (null H = exogenous): chi2(3)    =   1.30  Prob > chi2 =  0.729
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.60  Prob > chi2 =  0.206
    Difference (null H = exogenous): chi2(3)    =   0.30  Prob > chi2 =  0.960
```

Table 3.4 Column 8

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht maj_dpi_eu17 maj_dpi_nms10 maj_dpi_see6 eu17 nms10 see6 dy_2002-
dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr,
laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp
infl legelec_dpi1 maastricht maj_dpi_eu17 maj_dpi_nms10 maj_dpi_see6 eu17 nms10
see6 dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       449
Time variable : year                            Number of groups   =        31
Number of instruments = 25                      Obs per group: min =         6
F(21, 31)     =    181.90                                      avg =     14.48
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.695      0.067    10.30    0.00         0.557       0.832
             |
      gap_tr |     -0.130      0.072    -1.80    0.08        -0.278       0.018
             |
    debt2gdp |
         L1. |      0.003      0.005     0.55    0.59        -0.007       0.013
             |
        infl |      0.030      0.007     4.38    0.00         0.016       0.044
legelec_dpi1 |     -0.551      0.224    -2.46    0.02        -1.007      -0.095
  maastricht |      0.559      0.231     2.42    0.02         0.088       1.031
maj_dpi_eu17 |      0.032      0.018     1.78    0.09        -0.005       0.068
maj_dpi_n~10 |      0.090      0.047     1.90    0.07        -0.006       0.187
maj_dpi_see6 |     -0.019      0.033    -0.56    0.58        -0.086       0.049
        eu17 |     -1.512      1.130    -1.34    0.19        -3.816       0.793
       nms10 |     -5.270      2.625    -2.01    0.05        -10.624       0.084
        see6 |      1.260      2.175     0.58    0.57        -3.176       5.697
     dy_2002 |     -0.516      0.392    -1.32    0.20        -1.315       0.283
     dy_2003 |     -0.058      0.331    -0.18    0.86        -0.734       0.617
     dy_2004 |     -0.167      0.327    -0.51    0.61        -0.833       0.499
     dy_2005 |      0.205      0.304     0.67    0.51        -0.415       0.824
     dy_2006 |     -0.067      0.240    -0.28    0.78        -0.556       0.422
     dy_2007 |      0.118      0.475     0.25    0.81        -0.851       1.086
     dy_2008 |     -1.288      0.435    -2.96    0.01        -2.175      -0.401
     dy_2009 |     -2.390      0.477    -5.00    0.00        -3.363      -1.416
     dy_2010 |     -0.856      0.475    -1.80    0.08        -1.825       0.114
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht maj_dpi_eu17 maj_dpi_nms10
    maj_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
```

```
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht maj_dpi_eu17 maj_dpi_nms10
    maj_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.12  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.06  Pr > z =  0.953
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.39  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.84  Prob > chi2 =  0.765
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.35  Prob > chi2 =  0.509
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.782
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.52  Prob > chi2 =  0.471
    Difference (null H = exogenous): chi2(3)    =   1.32  Prob > chi2 =  0.724
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.65  Prob > chi2 =  0.199
    Difference (null H = exogenous): chi2(3)    =   0.19  Prob > chi2 =  0.979
```

Table 3.5 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.5 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht housesys_dpi1 dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
housesys_dpi1 dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     76.55                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.684      0.076     9.03    0.00        0.529       0.838
             |
      gap_tr |     -0.153      0.068    -2.23    0.03       -0.292      -0.013
             |
    debt2gdp |
         L1. |      0.009      0.004     2.05    0.05        0.000       0.017
             |
        infl |      0.016      0.006     2.85    0.01        0.005       0.028
legelec_dpi1 |     -0.560      0.202    -2.77    0.01       -0.971      -0.148
  maastricht |      0.664      0.197     3.36    0.00        0.262       1.066
housesys_d~1 |     -0.506      0.175    -2.88    0.01       -0.863      -0.149
     dy_2002 |     -0.584      0.403    -1.45    0.16       -1.405       0.237
     dy_2003 |     -0.128      0.310    -0.41    0.68       -0.760       0.503
     dy_2004 |     -0.076      0.295    -0.26    0.80       -0.678       0.525
     dy_2005 |      0.256      0.296     0.87    0.39       -0.346       0.859
     dy_2006 |     -0.010      0.240    -0.04    0.97       -0.499       0.479
     dy_2007 |      0.413      0.445     0.93    0.36       -0.494       1.320
     dy_2008 |     -1.079      0.408    -2.65    0.01       -1.910      -0.248
     dy_2009 |     -2.123      0.444    -4.79    0.00       -3.027      -1.220
     dy_2010 |     -0.733      0.461    -1.59    0.12       -1.672       0.207
       _cons |     -0.148      0.298    -0.50    0.62       -0.754       0.459
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht housesys_dpi1 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht housesys_dpi1 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.78  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.82  Pr > z =  0.414
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.29  Prob > chi2 =  0.683
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.88  Prob > chi2 =  0.391
    Difference (null H = exogenous): chi2(2)    =   0.41  Prob > chi2 =  0.813
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.02  Prob > chi2 =  0.313
    Difference (null H = exogenous): chi2(3)    =   1.27  Prob > chi2 =  0.736
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.87  Prob > chi2 =  0.172
    Difference (null H = exogenous): chi2(3)    =   0.42  Prob > chi2 =  0.936
```

Table 3.5 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht housesys_dpi1_eu17 housesys_dpi1_nms10 housesys_dpi1_see6 eu17 nms10
see6 dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht housesys_dpi1_eu17
housesys_dpi1_nms10 housesys_dpi1_see6 eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =   3202.28                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.689      0.076     9.06    0.00        0.534       0.843
             |
      gap_tr |     -0.158      0.068    -2.31    0.03       -0.296      -0.019
             |
    debt2gdp |
         L1. |      0.005      0.005     1.03    0.31       -0.005       0.016
             |
        infl |      0.020      0.005     3.92    0.00        0.009       0.030
legelec_dpi1 |     -0.550      0.204    -2.69    0.01       -0.966      -0.134
  maastricht |      0.534      0.201     2.66    0.01        0.125       0.943
housesys_~17 |     -0.466      0.153    -3.05    0.00       -0.778      -0.155
housesys_~10 |     -0.205      0.281    -0.73    0.47       -0.777       0.367
housesys_~e6 |     -1.043      0.519    -2.01    0.05       -2.099       0.013
        eu17 |      0.197      0.416     0.47    0.64       -0.650       1.044
       nms10 |     -0.333      0.304    -1.10    0.28       -0.952       0.285
        see6 |      0.274      0.302     0.91    0.37       -0.340       0.888
     dy_2002 |     -0.598      0.398    -1.50    0.14       -1.409       0.212
     dy_2003 |     -0.166      0.298    -0.56    0.58       -0.773       0.440
     dy_2004 |     -0.125      0.287    -0.44    0.67       -0.710       0.459
     dy_2005 |      0.203      0.287     0.71    0.49       -0.382       0.787
     dy_2006 |     -0.058      0.228    -0.26    0.80       -0.523       0.406
     dy_2007 |      0.363      0.443     0.82    0.42       -0.539       1.265
     dy_2008 |     -1.139      0.417    -2.73    0.01       -1.988      -0.290
     dy_2009 |     -2.186      0.435    -5.02    0.00       -3.071      -1.301
     dy_2010 |     -0.785      0.457    -1.72    0.10       -1.716       0.145
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht housesys_dpi1_eu17
    housesys_dpi1_nms10 housesys_dpi1_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht housesys_dpi1_eu17
    housesys_dpi1_nms10 housesys_dpi1_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.87  Pr > z =  0.385
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.54  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.32  Prob > chi2 =  0.678
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.98  Prob > chi2 =  0.371
    Difference (null H = exogenous): chi2(2)    =   0.33  Prob > chi2 =  0.847
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.99  Prob > chi2 =  0.321
    Difference (null H = exogenous): chi2(3)    =   1.33  Prob > chi2 =  0.722
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.85  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.46  Prob > chi2 =  0.927
```

Table 3.5 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht pres_dpi dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht pres_dpi
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     80.18                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.690      0.074     9.34    0.00         0.539      0.840
             |
      gap_tr |     -0.155      0.068    -2.28    0.03        -0.293     -0.017
             |
    debt2gdp |
         L1. |      0.008      0.004     1.79    0.08        -0.001      0.016
             |
        infl |      0.017      0.005     3.09    0.00         0.006      0.028
legelec_dpi1 |     -0.558      0.201    -2.77    0.01        -0.969     -0.148
  maastricht |      0.627      0.199     3.15    0.00         0.221      1.032
    pres_dpi |     -0.353      0.190    -1.86    0.07        -0.740      0.034
     dy_2002 |     -0.590      0.401    -1.47    0.15        -1.406      0.226
     dy_2003 |     -0.113      0.311    -0.36    0.72        -0.748      0.521
     dy_2004 |     -0.057      0.295    -0.19    0.85        -0.658      0.545
     dy_2005 |      0.283      0.299     0.95    0.35        -0.326      0.892
     dy_2006 |      0.039      0.248     0.16    0.88        -0.467      0.544
     dy_2007 |      0.449      0.451     1.00    0.33        -0.469      1.367
     dy_2008 |     -1.046      0.411    -2.54    0.02        -1.883     -0.209
     dy_2009 |     -2.084      0.440    -4.74    0.00        -2.981     -1.188
     dy_2010 |     -0.689      0.447    -1.54    0.13        -1.600      0.222
       _cons |     -0.153      0.300    -0.51    0.61        -0.765      0.458
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht pres_dpi dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht pres_dpi dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.79  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.77  Pr > z =  0.442
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.16  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.20  Prob > chi2 =  0.699
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.75  Prob > chi2 =  0.417
    Difference (null H = exogenous): chi2(2)    =   0.45  Prob > chi2 =  0.799
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.93  Prob > chi2 =  0.335
    Difference (null H = exogenous): chi2(3)    =   1.27  Prob > chi2 =  0.736
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.83  Prob > chi2 =  0.176
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.5 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht pres_dpi_eu17 pres_dpi_nms10 pres_dpi_see6 eu17 nms10 see6 dy_2002-
dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr,
laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp
infl legelec_dpi1 maastricht pres_dpi_eu17 pres_dpi_nms10 pres_dpi_see6 eu17
nms10 see6 dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
Using a generalized inverse to calculate optimal weighting matrix for two-step
estimation.
Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =     76.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.711      0.075     9.43    0.00        0.557       0.864
             |
      gap_tr |     -0.169      0.068    -2.49    0.02       -0.306      -0.031
             |
    debt2gdp |
         L1. |      0.005      0.005     0.93    0.36       -0.005       0.015
             |
        infl |      0.020      0.005     3.92    0.00        0.010       0.030
 legelec_dpi1 |     -0.588      0.224    -2.62    0.01       -1.045      -0.131
  maastricht |     -0.090      1.846    -0.05    0.96       -3.846       3.666
pres_dpi_~17 |    -10.369     22.405    -0.46    0.65      -55.952      35.213
pres_dpi_~10 |     -0.378      0.226    -1.67    0.10       -0.838       0.083
pres_dpi_s~6 |     -0.028      0.290    -0.10    0.92       -0.618       0.561
        eu17 |      0.892      2.206     0.40    0.69       -3.595       5.380
       nms10 |     -0.176      0.381    -0.46    0.65       -0.951       0.600
        see6 |      0.086      0.357     0.24    0.81       -0.639       0.812
     dy_2002 |     -0.665      0.443    -1.50    0.14       -1.566       0.236
     dy_2003 |     -0.218      0.425    -0.51    0.61       -1.084       0.647
     dy_2004 |     -0.160      0.404    -0.40    0.69       -0.981       0.661
     dy_2005 |      0.142      0.469     0.30    0.76       -0.812       1.097
     dy_2006 |     -0.045      0.332    -0.14    0.89       -0.722       0.631
     dy_2007 |      0.417      0.454     0.92    0.36       -0.507       1.341
     dy_2008 |     -1.111      0.442    -2.51    0.02       -2.010      -0.211
     dy_2009 |     -2.120      0.445    -4.77    0.00       -3.025      -1.215
     dy_2010 |     -0.813      0.605    -1.34    0.19       -2.044       0.418
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht pres_dpi_eu17 pres_dpi_nms10
```

```
    pres_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht pres_dpi_eu17 pres_dpi_nms10
    pres_dpi_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.88  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.93  Pr > z =  0.352
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.65  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.95  Prob > chi2 =  0.745
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.72  Prob > chi2 =  0.423
    Difference (null H = exogenous): chi2(2)    =   0.23  Prob > chi2 =  0.892
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(3)    =   1.95  Prob > chi2 =  0.583
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(3)    =   1.95  Prob > chi2 =  0.583
```

Table 3.5 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dec_exp dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dec_exp
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 21                      Obs per group: min =        10
F(16, 26)     =    205.53                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.700      0.090     7.78    0.00        0.515       0.885
             |
      gap_tr |     -0.168      0.055    -3.03    0.01       -0.282      -0.054
             |
    debt2gdp |
         L1. |      0.010      0.004     2.22    0.04        0.001       0.019
             |
        infl |      0.021      0.005     4.27    0.00        0.011       0.031
legelec_dpi1 |     -0.598      0.246    -2.43    0.02       -1.103      -0.093
  maastricht |      0.387      0.178     2.18    0.04        0.022       0.752
     dec_exp |      0.025      0.012     2.18    0.04        0.001       0.049
     dy_2002 |     -0.914      0.376    -2.43    0.02       -1.687      -0.141
     dy_2003 |     -0.435      0.221    -1.96    0.06       -0.889       0.020
     dy_2004 |     -0.259      0.329    -0.79    0.44       -0.935       0.417
     dy_2005 |     -0.016      0.307    -0.05    0.96       -0.648       0.616
     dy_2006 |     -0.050      0.198    -0.25    0.80       -0.457       0.357
     dy_2007 |      0.501      0.408     1.23    0.23       -0.337       1.340
     dy_2008 |     -0.874      0.329    -2.66    0.01       -1.550      -0.198
     dy_2009 |     -2.671      0.515    -5.18    0.00       -3.731      -1.612
     dy_2010 |     -1.165      0.499    -2.33    0.03       -2.191      -0.138
       _cons |     -0.913      0.465    -1.96    0.06       -1.868       0.042
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dec_exp dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dec_exp dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.53  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.16  Pr > z =  0.246
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  20.30  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.25  Prob > chi2 =  0.517
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.91  Prob > chi2 =  0.234
    Difference (null H = exogenous): chi2(2)    =   0.34  Prob > chi2 =  0.845
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.81  Prob > chi2 =  0.368
    Difference (null H = exogenous): chi2(3)    =   2.44  Prob > chi2 =  0.487
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.57  Prob > chi2 =  0.109
    Difference (null H = exogenous): chi2(3)    =   0.68  Prob > chi2 =  0.879
```

Table 3.5 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dec_exp_eu17 dec_exp_nms10 eu17 nms10 dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1
maastricht dec_exp_eu17 dec_exp_nms10 eu17 nms10 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 23                      Obs per group: min =        10
F(19, 27)     =    910.56                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.702      0.090     7.77    0.00        0.516       0.887
             |
      gap_tr |     -0.177      0.055    -3.22    0.00       -0.290      -0.064
             |
    debt2gdp |
         L1. |      0.007      0.006     1.29    0.21       -0.004       0.019
             |
        infl |      0.024      0.005     4.58    0.00        0.013       0.035
legelec_dpi1 |     -0.592      0.242    -2.45    0.02       -1.088      -0.096
  maastricht |      0.325      0.175     1.85    0.07       -0.035       0.685
dec_exp_eu17 |      0.022      0.011     2.00    0.06       -0.001       0.044
dec_exp_n~10 |      0.054      0.042     1.31    0.20       -0.031       0.140
        eu17 |     -0.570      0.537    -1.06    0.30       -1.671       0.531
       nms10 |     -1.732      1.161    -1.49    0.15       -4.115       0.651
     dy_2002 |     -0.916      0.371    -2.47    0.02       -1.677      -0.155
     dy_2003 |     -0.440      0.197    -2.23    0.03       -0.844      -0.036
     dy_2004 |     -0.256      0.330    -0.78    0.44       -0.933       0.420
     dy_2005 |     -0.019      0.314    -0.06    0.95       -0.664       0.625
     dy_2006 |     -0.025      0.201    -0.13    0.90       -0.437       0.386
     dy_2007 |      0.542      0.412     1.32    0.20       -0.303       1.387
     dy_2008 |     -0.868      0.338    -2.57    0.02       -1.562      -0.175
     dy_2009 |     -2.682      0.523    -5.13    0.00       -3.756      -1.608
     dy_2010 |     -1.177      0.501    -2.35    0.03       -2.206      -0.148
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dec_exp_eu17 dec_exp_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
```

```
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dec_exp_eu17 dec_exp_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.62  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.16  Pr > z =  0.247
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  20.86  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.17  Prob > chi2 =  0.530
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.91  Prob > chi2 =  0.234
    Difference (null H = exogenous): chi2(2)    =   0.26  Prob > chi2 =  0.878
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.62  Prob > chi2 =  0.430
    Difference (null H = exogenous): chi2(3)    =   2.54  Prob > chi2 =  0.467
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.53  Prob > chi2 =  0.111
    Difference (null H = exogenous): chi2(3)    =   0.63  Prob > chi2 =  0.889
```

Table 3.6 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)      =     79.39                                     avg =     14.06
Prob > F       =     0.000                                     max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00         0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03        -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07        -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00         0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01        -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00         0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16        -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73        -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86        -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34        -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89        -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33        -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02        -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00        -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14        -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43        -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.6 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht democ_pol dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht democ_pol
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       458
Time variable : year                            Number of groups   =        32
Number of instruments = 21                      Obs per group: min =         5
F(16, 31)     =     64.93                                      avg =     14.31
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.074     9.49    0.00         0.548       0.848
             |
      gap_tr |     -0.153      0.069    -2.24    0.03        -0.293      -0.013
             |
    debt2gdp |
         L1. |      0.006      0.004     1.32    0.20        -0.003       0.015
             |
        infl |      0.020      0.005     4.00    0.00         0.010       0.030
legelec_dpi1 |     -0.593      0.205    -2.90    0.01        -1.011      -0.175
  maastricht |      0.574      0.183     3.14    0.00         0.201       0.947
   democ_pol |      0.289      0.125     2.32    0.03         0.035       0.544
     dy_2002 |     -0.610      0.397    -1.54    0.13        -1.419       0.200
     dy_2003 |     -0.110      0.295    -0.37    0.71        -0.712       0.492
     dy_2004 |     -0.078      0.301    -0.26    0.80        -0.691       0.536
     dy_2005 |      0.219      0.312     0.70    0.49        -0.416       0.855
     dy_2006 |     -0.057      0.254    -0.23    0.82        -0.574       0.460
     dy_2007 |      0.474      0.453     1.05    0.30        -0.449       1.398
     dy_2008 |     -1.015      0.396    -2.56    0.02        -1.822      -0.208
     dy_2009 |     -2.103      0.449    -4.68    0.00        -3.019      -1.187
     dy_2010 |     -0.705      0.461    -1.53    0.14        -1.645       0.235
       _cons |     -2.855      1.088    -2.62    0.01        -5.075      -0.636
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht democ_pol dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht democ_pol dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.82  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.01  Pr > z =  0.314
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.70  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.25  Prob > chi2 =  0.690
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.82  Prob > chi2 =  0.403
    Difference (null H = exogenous): chi2(2)    =   0.43  Prob > chi2 =  0.806
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.72  Prob > chi2 =  0.398
    Difference (null H = exogenous): chi2(3)    =   1.53  Prob > chi2 =  0.675
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.02  Prob > chi2 =  0.155
    Difference (null H = exogenous): chi2(3)    =   0.23  Prob > chi2 =  0.973
```

Table 3.6 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht democ_pol_eu17 democ_pol_nms10 democ_pol_see6 eu17 nms10 see6
dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht democ_pol_eu17
democ_pol_nms10 democ_pol_see6 eu17 nms10 see6 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       458
Time variable : year                            Number of groups   =        32
Number of instruments = 25                      Obs per group: min =         5
F(21, 32)     =    105.46                                      avg =     14.31
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.701      0.072     9.70    0.00        0.554       0.848
             |
      gap_tr |     -0.152      0.072    -2.13    0.04       -0.298      -0.006
             |
    debt2gdp |
         L1. |      0.004      0.005     0.90    0.38       -0.006       0.015
             |
        infl |      0.021      0.005     4.49    0.00        0.011       0.031
legelec_dpi1 |     -0.602      0.211    -2.85    0.01       -1.033      -0.172
  maastricht |      0.502      0.184     2.74    0.01        0.128       0.876
democ_pol~17 |      0.322      0.166     1.93    0.06       -0.017       0.661
democ_pol~10 |      0.173      0.142     1.22    0.23       -0.116       0.463
democ_pol~e6 |      0.589      0.358     1.64    0.11       -0.141       1.318
        eu17 |     -2.994      1.581    -1.89    0.07       -6.214       0.226
       nms10 |     -1.887      1.311    -1.44    0.16       -4.558       0.784
        see6 |     -4.807      2.989    -1.61    0.12       -10.896       1.282
     dy_2002 |     -0.650      0.379    -1.71    0.10       -1.423       0.122
     dy_2003 |     -0.157      0.266    -0.59    0.56       -0.699       0.385
     dy_2004 |     -0.124      0.298    -0.42    0.68       -0.730       0.482
     dy_2005 |      0.146      0.326     0.45    0.66       -0.519       0.810
     dy_2006 |     -0.181      0.300    -0.60    0.55       -0.791       0.430
     dy_2007 |      0.335      0.524     0.64    0.53       -0.732       1.402
     dy_2008 |     -1.154      0.452    -2.55    0.02       -2.074      -0.233
     dy_2009 |     -2.235      0.426    -5.24    0.00       -3.103      -1.367
     dy_2010 |     -0.816      0.434    -1.88    0.07       -1.701       0.068
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht democ_pol_eu17 democ_pol_nms10
    democ_pol_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht democ_pol_eu17 democ_pol_nms10
    democ_pol_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.81  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.06  Pr > z =  0.288
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.34  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.19  Prob > chi2 =  0.701
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.67  Prob > chi2 =  0.433
    Difference (null H = exogenous): chi2(2)    =   0.51  Prob > chi2 =  0.773
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.71  Prob > chi2 =  0.401
    Difference (null H = exogenous): chi2(3)    =   1.48  Prob > chi2 =  0.686
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.93  Prob > chi2 =  0.164
    Difference (null H = exogenous): chi2(3)    =   0.25  Prob > chi2 =  0.969
```

Table 3.6 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht corr_wb dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht corr_wb
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       448
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     62.64                                      avg =     13.58
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.690      0.073     9.40    0.00        0.540       0.839
             |
      gap_tr |     -0.174      0.063    -2.79    0.01       -0.302      -0.047
             |
    debt2gdp |
         L1. |      0.008      0.004     2.21    0.03        0.001       0.016
             |
        infl |      0.022      0.005     4.56    0.00        0.012       0.033
legelec_dpi1 |     -0.614      0.210    -2.93    0.01       -1.042      -0.187
  maastricht |      0.572      0.260     2.20    0.04        0.042       1.102
     corr_wb |      0.383      0.137     2.80    0.01        0.104       0.662
     dy_2002 |     -0.519      0.393    -1.32    0.20       -1.320       0.282
     dy_2003 |     -0.091      0.306    -0.30    0.77       -0.714       0.532
     dy_2004 |      0.029      0.297     0.10    0.92       -0.575       0.633
     dy_2005 |      0.302      0.287     1.05    0.30       -0.283       0.887
     dy_2006 |      0.189      0.253     0.75    0.46       -0.327       0.705
     dy_2007 |      0.703      0.460     1.53    0.14       -0.235       1.640
     dy_2008 |     -0.849      0.397    -2.14    0.04       -1.657      -0.041
     dy_2009 |     -1.801      0.440    -4.09    0.00       -2.698      -0.904
     dy_2010 |     -0.577      0.446    -1.29    0.21       -1.487       0.332
       _cons |     -0.609      0.231    -2.64    0.01       -1.080      -0.138
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht corr_wb dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht corr_wb dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.71  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.631
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  21.42  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.84  Prob > chi2 =  0.584
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.30  Prob > chi2 =  0.522
    Difference (null H = exogenous): chi2(2)    =   1.55  Prob > chi2 =  0.462
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.27  Prob > chi2 =  0.605
    Difference (null H = exogenous): chi2(3)    =   2.58  Prob > chi2 =  0.462
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.47  Prob > chi2 =  0.226
    Difference (null H = exogenous): chi2(3)    =   1.38  Prob > chi2 =  0.711
```

Table 3.6 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht corr_wb_eu17 corr_wb_nms10 corr_wb_see6 eu17 nms10 see6 dy_2002-
dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr,
laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp
infl legelec_dpi1 maastricht corr_wb_eu17 corr_wb_nms10 corr_wb_see6 eu17 nms10
see6 dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       448
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =     90.30                                      avg =     13.58
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.656      0.074     8.87    0.00         0.505       0.806
             |
      gap_tr |     -0.185      0.061    -3.00    0.01        -0.310      -0.060
             |
    debt2gdp |
         L1. |      0.016      0.006     2.75    0.01         0.004       0.027
             |
        infl |      0.023      0.004     5.88    0.00         0.015       0.031
legelec_dpi1 |     -0.592      0.203    -2.91    0.01        -1.005      -0.178
  maastricht |      0.501      0.239     2.10    0.04         0.015       0.986
corr_wb_eu17 |      0.944      0.284     3.33    0.00         0.367       1.521
corr_wb_n~10 |      0.541      0.393     1.38    0.18        -0.259       1.340
corr_wb_see6 |      1.859      0.919     2.02    0.05        -0.011       3.729
        eu17 |     -1.946      0.626    -3.11    0.00        -3.220      -0.672
       nms10 |     -0.881      0.276    -3.19    0.00        -1.442      -0.320
        see6 |      0.178      0.514     0.35    0.73        -0.867       1.223
     dy_2002 |     -0.514      0.379    -1.36    0.18        -1.285       0.257
     dy_2003 |     -0.160      0.289    -0.55    0.58        -0.749       0.428
     dy_2004 |     -0.072      0.280    -0.26    0.80        -0.642       0.499
     dy_2005 |      0.248      0.271     0.92    0.37        -0.302       0.799
     dy_2006 |      0.133      0.244     0.55    0.59        -0.363       0.630
     dy_2007 |      0.647      0.444     1.46    0.16        -0.257       1.550
     dy_2008 |     -0.944      0.404    -2.34    0.03        -1.766      -0.122
     dy_2009 |     -2.026      0.431    -4.70    0.00        -2.902      -1.149
     dy_2010 |     -0.874      0.415    -2.11    0.04        -1.718      -0.030
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht corr_wb_eu17 corr_wb_nms10
    corr_wb_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
```

```
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht corr_wb_eu17 corr_wb_nms10
    corr_wb_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.68  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.44  Pr > z =  0.662
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  19.60  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.21  Prob > chi2 =  0.697
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.27  Prob > chi2 =  0.529
    Difference (null H = exogenous): chi2(2)    =   0.94  Prob > chi2 =  0.625
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(3)    =   2.21  Prob > chi2 =  0.529
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.45  Prob > chi2 =  0.229
    Difference (null H = exogenous): chi2(3)    =   0.77  Prob > chi2 =  0.858
```

Table 3.6 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht corr_wb democ_pol dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht corr_wb
democ_pol dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       442
Time variable : year                            Number of groups   =        32
Number of instruments = 22                      Obs per group: min =         5
F(17, 31)     =     53.48                                      avg =     13.81
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.692      0.075     9.28    0.00        0.540       0.844
             |
      gap_tr |     -0.177      0.065    -2.74    0.01       -0.309      -0.046
             |
    debt2gdp |
         L1. |      0.008      0.004     1.86    0.07       -0.001       0.016
             |
        infl |      0.023      0.005     4.74    0.00        0.013       0.032
legelec_dpi1 |     -0.629      0.214    -2.93    0.01       -1.066      -0.192
  maastricht |      0.550      0.257     2.14    0.04        0.026       1.074
     corr_wb |      0.339      0.185     1.84    0.08       -0.038       0.716
   democ_pol |      0.090      0.159     0.56    0.58       -0.235       0.415
     dy_2002 |     -0.543      0.389    -1.40    0.17       -1.337       0.250
     dy_2003 |     -0.130      0.291    -0.45    0.66       -0.724       0.464
     dy_2004 |     -0.019      0.304    -0.06    0.95       -0.639       0.600
     dy_2005 |      0.242      0.303     0.80    0.43       -0.376       0.860
     dy_2006 |      0.124      0.279     0.45    0.66       -0.444       0.692
     dy_2007 |      0.739      0.491     1.50    0.14       -0.263       1.740
     dy_2008 |     -0.810      0.397    -2.04    0.05       -1.619      -0.001
     dy_2009 |     -1.883      0.447    -4.21    0.00       -2.795      -0.971
     dy_2010 |     -0.632      0.447    -1.41    0.17       -1.544       0.280
       _cons |     -1.381      1.321    -1.05    0.30       -4.075       1.314
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht corr_wb democ_pol dy_2002
    dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht corr_wb democ_pol dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
```

```
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.72  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.65  Pr > z =  0.515
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  21.73  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.80  Prob > chi2 =  0.591
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.48  Prob > chi2 =  0.476
    Difference (null H = exogenous): chi2(2)    =   1.32  Prob > chi2 =  0.517
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.13  Prob > chi2 =  0.723
    Difference (null H = exogenous): chi2(3)    =   2.68  Prob > chi2 =  0.444
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.67  Prob > chi2 =  0.196
    Difference (null H = exogenous): chi2(3)    =   1.13  Prob > chi2 =  0.770
```

Table 3.6 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht corr_wb democ_pol corr_wb_democ_pol dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1
maastricht corr_wb democ_pol corr_wb_democ_pol dy_2002-dy_2010) two robust
small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       442
Time variable : year                            Number of groups   =        32
Number of instruments = 23                      Obs per group: min =         5
F(18, 31)     =     53.61                                      avg =     13.81
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.075     9.27    0.00         0.539       0.843
             |
      gap_tr |     -0.178      0.065    -2.75    0.01        -0.310      -0.046
             |
    debt2gdp |
         L1. |      0.008      0.004     1.98    0.06        -0.000       0.016
             |
        infl |      0.023      0.005     4.69    0.00         0.013       0.033
legelec_dpi1 |     -0.628      0.215    -2.92    0.01        -1.067      -0.189
  maastricht |      0.545      0.255     2.14    0.04         0.024       1.066
     corr_wb |      0.408      1.272     0.32    0.75        -2.186       3.002
   democ_pol |      0.084      0.155     0.54    0.59        -0.233       0.401
corr_wb_de~l |     -0.007      0.137    -0.05    0.96        -0.286       0.273
     dy_2002 |     -0.553      0.388    -1.43    0.16        -1.344       0.238
     dy_2003 |     -0.139      0.287    -0.49    0.63        -0.724       0.445
     dy_2004 |     -0.024      0.301    -0.08    0.94        -0.637       0.589
     dy_2005 |      0.238      0.303     0.79    0.44        -0.380       0.856
     dy_2006 |      0.122      0.280     0.44    0.67        -0.449       0.693
     dy_2007 |      0.739      0.496     1.49    0.15        -0.273       1.752
     dy_2008 |     -0.807      0.405    -2.00    0.05        -1.632       0.018
     dy_2009 |     -1.890      0.444    -4.25    0.00        -2.797      -0.984
     dy_2010 |     -0.645      0.436    -1.48    0.15        -1.533       0.244
       _cons |     -1.331      1.276    -1.04    0.30        -3.933       1.271
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht corr_wb democ_pol
    corr_wb_democ_pol dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
```

```
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht corr_wb democ_pol
    corr_wb_democ_pol dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.72  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.65  Pr > z =  0.515
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  22.22  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.83  Prob > chi2 =  0.587
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.48  Prob > chi2 =  0.476
    Difference (null H = exogenous): chi2(2)    =   1.35  Prob > chi2 =  0.510
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.10  Prob > chi2 =  0.748
    Difference (null H = exogenous): chi2(3)    =   2.73  Prob > chi2 =  0.436
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.68  Prob > chi2 =  0.194
    Difference (null H = exogenous): chi2(3)    =   1.15  Prob > chi2 =  0.766
```

Table 3.7 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00         0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03        -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07        -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00         0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01        -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00         0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16        -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73        -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86        -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34        -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89        -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33        -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02        -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00        -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14        -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43        -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.7 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2009 if year>1994 & year<2010 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2009) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       387
Time variable : year                            Number of groups   =        27
Number of instruments = 19                      Obs per group: min =         9
F(14, 26)     =     61.55                                      avg =     14.33
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.676      0.111     6.08    0.00        0.447       0.904
             |
      gap_tr |     -0.167      0.062    -2.70    0.01       -0.294      -0.040
             |
    debt2gdp |
         L1. |      0.011      0.007     1.60    0.12       -0.003       0.025
             |
        infl |      0.015      0.006     2.40    0.02        0.002       0.028
legelec_dpi1 |     -0.631      0.228    -2.76    0.01       -1.100      -0.161
  maastricht |      0.485      0.187     2.59    0.02        0.100       0.869
     dy_2002 |     -0.752      0.369    -2.04    0.05       -1.511       0.007
     dy_2003 |     -0.317      0.232    -1.37    0.18       -0.793       0.160
     dy_2004 |     -0.142      0.361    -0.39    0.70       -0.884       0.600
     dy_2005 |      0.079      0.326     0.24    0.81       -0.592       0.749
     dy_2006 |      0.107      0.291     0.37    0.72       -0.493       0.706
     dy_2007 |      0.441      0.499     0.88    0.38       -0.585       1.467
     dy_2008 |     -0.952      0.322    -2.95    0.01       -1.615      -0.289
     dy_2009 |     -2.629      0.541    -4.86    0.00       -3.741      -1.516
       _cons |     -0.203      0.436    -0.47    0.65       -1.098       0.693
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
```

```
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.11  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   1.19  Pr > z =  0.234
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  18.59  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.54  Prob > chi2 =  0.473
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.86  Prob > chi2 =  0.240
    Difference (null H = exogenous): chi2(2)    =   0.68  Prob > chi2 =  0.713
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.962
    Difference (null H = exogenous): chi2(3)    =   3.53  Prob > chi2 =  0.317
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   3.50  Prob > chi2 =  0.061
    Difference (null H = exogenous): chi2(3)    =   0.03  Prob > chi2 =  0.999
```

Table 3.7 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht govparty dy_2002-dy_2009 if year>1994 & year<2010 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht govparty dy_2002-dy_2009)
two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       386
Time variable : year                            Number of groups   =        27
Number of instruments = 20                      Obs per group: min =         9
F(15, 26)     =     66.39                                      avg =     14.30
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.680      0.112     6.06    0.00         0.449      0.910
             |
      gap_tr |     -0.168      0.063    -2.68    0.01        -0.296     -0.039
             |
    debt2gdp |
         L1. |      0.011      0.007     1.67    0.11        -0.003      0.024
             |
        infl |      0.015      0.006     2.36    0.03         0.002      0.028
legelec_dpi1 |     -0.623      0.228    -2.74    0.01        -1.091     -0.155
  maastricht |      0.480      0.191     2.50    0.02         0.086      0.873
    govparty |     -0.027      0.068    -0.39    0.70        -0.167      0.114
     dy_2002 |     -0.763      0.370    -2.06    0.05        -1.523     -0.003
     dy_2003 |     -0.329      0.242    -1.36    0.19        -0.828      0.169
     dy_2004 |     -0.155      0.365    -0.42    0.67        -0.905      0.595
     dy_2005 |      0.066      0.329     0.20    0.84        -0.611      0.743
     dy_2006 |      0.106      0.292     0.36    0.72        -0.494      0.705
     dy_2007 |      0.461      0.507     0.91    0.37        -0.582      1.503
     dy_2008 |     -0.928      0.323    -2.87    0.01        -1.593     -0.264
     dy_2009 |     -2.602      0.553    -4.70    0.00        -3.739     -1.465
       _cons |     -0.134      0.504    -0.27    0.79        -1.169      0.901
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht govparty dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht govparty dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.14  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   1.18  Pr > z =  0.239
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.05  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.37  Prob > chi2 =  0.497
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.88  Prob > chi2 =  0.237
    Difference (null H = exogenous): chi2(2)    =   0.50  Prob > chi2 =  0.780
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.975
    Difference (null H = exogenous): chi2(3)    =   3.37  Prob > chi2 =  0.338
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   3.33  Prob > chi2 =  0.068
    Difference (null H = exogenous): chi2(3)    =   0.04  Prob > chi2 =  0.998
```

Table 3.7 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht govparty_eu17 govparty_nms10 eu17 nms10 dy_2002-dy_2009 if year>1994
& year<2010 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1
maastricht govparty_eu17 govparty_nms10 eu17 nms10 dy_2002-dy_2009) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       386
Time variable : year                            Number of groups   =        27
Number of instruments = 22                      Obs per group: min =         9
F(18, 27)     =     66.77                                      avg =     14.30
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.680      0.110     6.20    0.00         0.455       0.905
             |
      gap_tr |     -0.170      0.059    -2.88    0.01        -0.292      -0.049
             |
    debt2gdp |
         L1. |      0.007      0.007     1.03    0.31        -0.007       0.022
             |
        infl |      0.019      0.006     3.34    0.00         0.007       0.030
legelec_dpi1 |     -0.633      0.228    -2.77    0.01        -1.101      -0.164
  maastricht |      0.407      0.196     2.07    0.05         0.004       0.809
govparty_e~6 |     -0.119      0.054    -2.19    0.04        -0.229      -0.008
govparty_n~0 |      0.261      0.168     1.55    0.13        -0.084       0.605
        eu17 |      0.478      0.583     0.82    0.42        -0.719       1.674
       nms10 |     -0.988      0.594    -1.66    0.11        -2.207       0.231
     dy_2002 |     -0.865      0.352    -2.46    0.02        -1.587      -0.144
     dy_2003 |     -0.426      0.232    -1.84    0.08        -0.902       0.049
     dy_2004 |     -0.202      0.383    -0.53    0.60        -0.988       0.585
     dy_2005 |      0.011      0.326     0.03    0.97        -0.658       0.680
     dy_2006 |      0.038      0.325     0.12    0.91        -0.628       0.704
     dy_2007 |      0.472      0.492     0.96    0.35        -0.536       1.481
     dy_2008 |     -0.924      0.308    -3.00    0.01        -1.556      -0.291
     dy_2009 |     -2.507      0.516    -4.86    0.00        -3.566      -1.449
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht govparty_eu17 govparty_nms10
    eu17 nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp infl legelec_dpi1 maastricht govparty_eu17 govparty_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.18  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   1.12  Pr > z =  0.261
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.14  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.33  Prob > chi2 =  0.504
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.91  Prob > chi2 =  0.234
    Difference (null H = exogenous): chi2(2)    =   0.42  Prob > chi2 =  0.810
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.977
    Difference (null H = exogenous): chi2(3)    =   3.33  Prob > chi2 =  0.344
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.75  Prob > chi2 =  0.097
    Difference (null H = exogenous): chi2(3)    =   0.58  Prob > chi2 =  0.901
```

Table 3.7 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht gov_new dy_2002-dy_2009 if year>1994 & year<2010 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht gov_new dy_2002-dy_2009)
two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       387
Time variable : year                            Number of groups   =        27
Number of instruments = 20                      Obs per group: min =         9
F(15, 26)     =     57.14                                      avg =     14.33
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.678      0.114     5.96    0.00         0.444       0.913
             |
      gap_tr |     -0.164      0.062    -2.65    0.01        -0.291      -0.037
             |
    debt2gdp |
         L1. |      0.011      0.007     1.63    0.11        -0.003       0.025
             |
        infl |      0.014      0.006     2.29    0.03         0.001       0.027
legelec_dpi1 |     -0.650      0.244    -2.66    0.01        -1.152      -0.147
  maastricht |      0.476      0.192     2.48    0.02         0.082       0.871
     gov_new |      0.163      0.258     0.63    0.53        -0.366       0.693
     dy_2002 |     -0.762      0.381    -2.00    0.06        -1.545       0.020
     dy_2003 |     -0.308      0.232    -1.33    0.19        -0.785       0.168
     dy_2004 |     -0.125      0.361    -0.35    0.73        -0.867       0.617
     dy_2005 |      0.058      0.330     0.18    0.86        -0.620       0.736
     dy_2006 |      0.092      0.293     0.31    0.76        -0.511       0.695
     dy_2007 |      0.393      0.490     0.80    0.43        -0.614       1.401
     dy_2008 |     -0.961      0.324    -2.96    0.01        -1.628      -0.295
     dy_2009 |     -2.643      0.538    -4.91    0.00        -3.748      -1.537
       _cons |     -0.253      0.436    -0.58    0.57        -1.150       0.643
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht gov_new dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht gov_new dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.07  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   1.16  Pr > z =  0.246
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  18.60  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.57  Prob > chi2 =  0.468
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.75  Prob > chi2 =  0.252
    Difference (null H = exogenous): chi2(2)    =   0.81  Prob > chi2 =  0.666
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.01  Prob > chi2 =  0.929
    Difference (null H = exogenous): chi2(3)    =   3.56  Prob > chi2 =  0.313
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   3.49  Prob > chi2 =  0.062
    Difference (null H = exogenous): chi2(3)    =   0.08  Prob > chi2 =  0.995
```

Table 3.7 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht gov_new_eu17 gov_new_nms10 eu17 nms10 dy_2002-dy_2009 if year>1994 &
year<2010 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
gov_new_eu17 gov_new_nms10  eu17 nms10 dy_2002-dy_2009) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       387
Time variable : year                            Number of groups   =        27
Number of instruments = 22                      Obs per group: min =         9
F(18, 27)     =     59.10                                      avg =     14.33
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.682      0.114     5.99    0.00        0.448       0.916
             |
      gap_tr |     -0.168      0.058    -2.88    0.01       -0.288      -0.049
             |
    debt2gdp |
         L1. |      0.007      0.008     0.97    0.34       -0.008       0.023
             |
        infl |      0.017      0.006     2.81    0.01        0.005       0.029
legelec_dpi1 |     -0.645      0.247    -2.62    0.01       -1.152      -0.139
  maastricht |      0.401      0.181     2.21    0.04        0.029       0.772
gov_new_eu17 |      0.171      0.210     0.81    0.42       -0.260       0.602
gov_new_n~10 |      0.119      0.497     0.24    0.81       -0.901       1.138
        eu17 |      0.102      0.606     0.17    0.87       -1.142       1.345
       nms10 |     -0.325      0.385    -0.84    0.41       -1.116       0.466
     dy_2002 |     -0.793      0.367    -2.16    0.04       -1.547      -0.039
     dy_2003 |     -0.358      0.240    -1.49    0.15       -0.850       0.134
     dy_2004 |     -0.147      0.378    -0.39    0.70       -0.922       0.629
     dy_2005 |      0.051      0.329     0.15    0.88       -0.624       0.725
     dy_2006 |      0.062      0.289     0.21    0.83       -0.531       0.655
     dy_2007 |      0.431      0.453     0.95    0.35       -0.499       1.360
     dy_2008 |     -0.918      0.293    -3.13    0.00       -1.519      -0.317
     dy_2009 |     -2.542      0.542    -4.69    0.00       -3.653      -1.430
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht gov_new_eu17 gov_new_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht gov_new_eu17 gov_new_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.99  Pr > z =  0.003
Arellano-Bond test for AR(2) in first differences: z =   1.15  Pr > z =  0.251
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.10  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.28  Prob > chi2 =  0.513
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.92  Prob > chi2 =  0.232
    Difference (null H = exogenous): chi2(2)    =   0.35  Prob > chi2 =  0.839
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.00  Prob > chi2 =  0.962
    Difference (null H = exogenous): chi2(3)    =   3.27  Prob > chi2 =  0.351
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   3.02  Prob > chi2 =  0.082
    Difference (null H = exogenous): chi2(3)    =   0.26  Prob > chi2 =  0.968
```

Table 3.7 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht gov_gap dy_2002-dy_2009 if year>1994 & year<2010 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht gov_gap dy_2002-dy_2009)
two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       385
Time variable : year                            Number of groups   =        27
Number of instruments = 20                      Obs per group: min =         9
F(15, 26)     =     68.03                                      avg =     14.26
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.679      0.114     5.98    0.00         0.446       0.913
             |
      gap_tr |     -0.169      0.065    -2.61    0.01        -0.302      -0.036
             |
    debt2gdp |
         L1. |      0.011      0.007     1.55    0.13        -0.004       0.025
             |
        infl |      0.016      0.007     2.32    0.03         0.002       0.030
legelec_dpi1 |     -0.615      0.227    -2.71    0.01        -1.081      -0.149
  maastricht |      0.453      0.178     2.54    0.02         0.086       0.820
     gov_gap |      0.049      0.214     0.23    0.82        -0.391       0.489
     dy_2002 |     -0.738      0.383    -1.93    0.06        -1.525       0.049
     dy_2003 |     -0.305      0.241    -1.27    0.22        -0.799       0.190
     dy_2004 |     -0.143      0.361    -0.40    0.70        -0.885       0.599
     dy_2005 |      0.065      0.321     0.20    0.84        -0.594       0.724
     dy_2006 |      0.104      0.305     0.34    0.74        -0.523       0.730
     dy_2007 |      0.467      0.536     0.87    0.39        -0.634       1.568
     dy_2008 |     -0.909      0.337    -2.70    0.01        -1.603      -0.216
     dy_2009 |     -2.584      0.535    -4.83    0.00        -3.684      -1.483
       _cons |     -0.204      0.445    -0.46    0.65        -1.120       0.711
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht gov_gap dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht gov_gap dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.20  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   1.16  Pr > z =  0.248
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.44  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.28  Prob > chi2 =  0.512
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.84  Prob > chi2 =  0.242
    Difference (null H = exogenous): chi2(2)    =   0.44  Prob > chi2 =  0.802
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.01  Prob > chi2 =  0.909
    Difference (null H = exogenous): chi2(3)    =   3.27  Prob > chi2 =  0.352
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   3.17  Prob > chi2 =  0.075
    Difference (null H = exogenous): chi2(3)    =   0.11  Prob > chi2 =  0.991
```

Table 3.7 Column 8

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht gov_gap_eu17 gov_gap_nms10 eu17 nms10 dy_2002-dy_2009 if year>1994 &
year<2010 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
gov_gap_eu17 gov_gap_nms10  eu17 nms10 dy_2002-dy_2009) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       385
Time variable : year                            Number of groups   =        27
Number of instruments = 22                      Obs per group: min =         9
F(18, 27)     =     81.30                                      avg =     14.26
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.693      0.117     5.94    0.00         0.454       0.932
             |
      gap_tr |     -0.175      0.060    -2.91    0.01        -0.298      -0.051
             |
    debt2gdp |
         L1. |      0.006      0.007     0.88    0.39        -0.008       0.021
             |
        infl |      0.025      0.007     3.47    0.00         0.010       0.040
 legelec_dpi1 |     -0.663      0.214    -3.10    0.00        -1.101      -0.225
  maastricht |      0.494      0.211     2.35    0.03         0.062       0.926
gov_gap_eu17 |     -0.274      0.114    -2.40    0.02        -0.509      -0.040
gov_gap_n~10 |      0.629      0.411     1.53    0.14        -0.214       1.471
        eu17 |      0.114      0.563     0.20    0.84        -1.041       1.269
       nms10 |     -0.348      0.379    -0.92    0.37        -1.127       0.430
     dy_2002 |     -0.870      0.352    -2.47    0.02        -1.593      -0.148
     dy_2003 |     -0.314      0.228    -1.38    0.18        -0.783       0.154
     dy_2004 |     -0.034      0.398    -0.09    0.93        -0.850       0.782
     dy_2005 |      0.168      0.336     0.50    0.62        -0.521       0.857
     dy_2006 |      0.181      0.322     0.56    0.58        -0.478       0.841
     dy_2007 |      0.583      0.458     1.27    0.21        -0.357       1.523
     dy_2008 |     -0.789      0.293    -2.69    0.01        -1.391      -0.187
     dy_2009 |     -2.285      0.530    -4.31    0.00        -3.372      -1.198
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht gov_gap_eu17 gov_gap_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht gov_gap_eu17 gov_gap_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.26  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.96  Pr > z =  0.339
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.17  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.55  Prob > chi2 =  0.470
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.84  Prob > chi2 =  0.242
    Difference (null H = exogenous): chi2(2)    =   0.71  Prob > chi2 =  0.701
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.01  Prob > chi2 =  0.915
    Difference (null H = exogenous): chi2(3)    =   3.54  Prob > chi2 =  0.316
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.61  Prob > chi2 =  0.106
    Difference (null H = exogenous): chi2(3)    =   0.94  Prob > chi2 =  0.815
```

Table 3.8 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.8 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht prog_prgf_imf dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
prog_prgf_imf dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     64.54                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.695      0.072     9.71    0.00        0.549       0.841
             |
      gap_tr |     -0.159      0.064    -2.50    0.02       -0.289      -0.029
             |
    debt2gdp |
         L1. |      0.007      0.004     1.65    0.11       -0.002       0.016
             |
        infl |      0.018      0.006     3.13    0.00        0.006       0.030
legelec_dpi1 |     -0.557      0.196    -2.84    0.01       -0.956      -0.158
  maastricht |      0.635      0.190     3.34    0.00        0.248       1.022
prog_prgf_~f |     -0.205      0.472    -0.44    0.67       -1.166       0.756
     dy_2002 |     -0.562      0.387    -1.45    0.16       -1.351       0.227
     dy_2003 |     -0.092      0.304    -0.30    0.76       -0.711       0.527
     dy_2004 |     -0.041      0.300    -0.14    0.89       -0.651       0.569
     dy_2005 |      0.310      0.295     1.05    0.30       -0.292       0.911
     dy_2006 |      0.069      0.248     0.28    0.78       -0.436       0.573
     dy_2007 |      0.443      0.425     1.04    0.31       -0.424       1.309
     dy_2008 |     -1.035      0.392    -2.64    0.01       -1.833      -0.236
     dy_2009 |     -2.061      0.448    -4.60    0.00       -2.973      -1.149
     dy_2010 |     -0.697      0.456    -1.53    0.14       -1.627       0.232
       _cons |     -0.148      0.311    -0.48    0.64       -0.781       0.485
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht prog_prgf_imf dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht prog_prgf_imf dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.74  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.448
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  16.05  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.12  Prob > chi2 =  0.713
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.58  Prob > chi2 =  0.454
    Difference (null H = exogenous): chi2(2)    =   0.54  Prob > chi2 =  0.762
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.55  Prob > chi2 =  0.459
    Difference (null H = exogenous): chi2(3)    =   1.57  Prob > chi2 =  0.665
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.80  Prob > chi2 =  0.179
    Difference (null H = exogenous): chi2(3)    =   0.32  Prob > chi2 =  0.957
```

Table 3.8 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht prog_prgf_imf_eu17 prog_prgf_imf_nms10 prog_prgf_imf_see6 eu17 nms10
see6 dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht prog_prgf_imf_eu17
prog_prgf_imf_nms10 prog_prgf_imf_see6 eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =    756.29                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.710      0.073     9.66    0.00        0.560       0.859
             |
      gap_tr |     -0.145      0.060    -2.42    0.02       -0.268      -0.023
             |
    debt2gdp |
         L1. |      0.007      0.007     1.01    0.32       -0.007       0.020
             |
        infl |      0.021      0.005     4.02    0.00        0.010       0.032
legelec_dpi1 |     -0.584      0.197    -2.96    0.01       -0.985      -0.183
  maastricht |      0.572      0.196     2.92    0.01        0.173       0.970
prog_prgf~17 |     -7.463     14.328    -0.52    0.61      -36.614      21.689
prog_prgf~10 |     -0.086      0.657    -0.13    0.90       -1.422       1.251
prog_prgf~e6 |     -0.487      0.484    -1.01    0.32       -1.473       0.498
        eu17 |     -0.033      0.505    -0.07    0.95       -1.061       0.994
       nms10 |     -0.424      0.399    -1.06    0.30       -1.235       0.387
        see6 |      0.094      0.464     0.20    0.84       -0.850       1.038
     dy_2002 |     -0.546      0.381    -1.43    0.16       -1.321       0.228
     dy_2003 |      0.004      0.314     0.01    0.99       -0.634       0.642
     dy_2004 |      0.028      0.327     0.09    0.93       -0.637       0.694
     dy_2005 |      0.304      0.287     1.06    0.30       -0.279       0.888
     dy_2006 |      0.083      0.258     0.32    0.75       -0.443       0.608
     dy_2007 |      0.373      0.394     0.95    0.35       -0.428       1.174
     dy_2008 |     -1.122      0.396    -2.83    0.01       -1.928      -0.315
     dy_2009 |     -1.954      0.463    -4.22    0.00       -2.896      -1.013
     dy_2010 |     -0.653      0.414    -1.58    0.12       -1.496       0.190
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht prog_prgf_imf_eu17
    prog_prgf_imf_nms10 prog_prgf_imf_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht prog_prgf_imf_eu17
    prog_prgf_imf_nms10 prog_prgf_imf_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.85  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.61  Pr > z =  0.542
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =   7.77  Prob > chi2 =  0.100
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.88  Prob > chi2 =  0.757
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.44  Prob > chi2 =  0.487
    Difference (null H = exogenous): chi2(2)    =   0.44  Prob > chi2 =  0.801
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.06  Prob > chi2 =  0.807
    Difference (null H = exogenous): chi2(3)    =   1.82  Prob > chi2 =  0.610
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.37  Prob > chi2 =  0.242
    Difference (null H = exogenous): chi2(3)    =   0.52  Prob > chi2 =  0.915
```

Table 3.8 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht pur_loan2ngdp dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
pur_loan2ngdp dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     62.38                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.693      0.080     8.61    0.00         0.529       0.856
             |
      gap_tr |     -0.143      0.078    -1.82    0.08        -0.302       0.017
             |
    debt2gdp |
         L1. |      0.008      0.005     1.48    0.15        -0.003       0.019
             |
        infl |      0.015      0.005     2.76    0.01         0.004       0.025
legelec_dpi1 |     -0.513      0.224    -2.30    0.03        -0.969      -0.058
  maastricht |      0.664      0.216     3.08    0.00         0.225       1.103
pur_loan2n~p |      0.483      0.181     2.68    0.01         0.115       0.851
     dy_2002 |     -0.580      0.428    -1.35    0.19        -1.452       0.293
     dy_2003 |     -0.144      0.338    -0.43    0.67        -0.832       0.544
     dy_2004 |     -0.070      0.319    -0.22    0.83        -0.719       0.579
     dy_2005 |      0.322      0.327     0.99    0.33        -0.343       0.988
     dy_2006 |      0.003      0.288     0.01    0.99        -0.584       0.589
     dy_2007 |      0.308      0.468     0.66    0.52        -0.646       1.261
     dy_2008 |     -1.255      0.464    -2.71    0.01        -2.200      -0.311
     dy_2009 |     -2.439      0.478    -5.11    0.00        -3.412      -1.466
     dy_2010 |     -0.930      0.451    -2.06    0.05        -1.848      -0.012
       _cons |     -0.228      0.331    -0.69    0.50        -0.902       0.447
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.72  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.68  Pr > z =  0.498
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  22.83  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.82  Prob > chi2 =  0.430
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.26  Prob > chi2 =  0.323
    Difference (null H = exogenous): chi2(2)    =   1.56  Prob > chi2 =  0.458
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.63  Prob > chi2 =  0.202
    Difference (null H = exogenous): chi2(3)    =   2.20  Prob > chi2 =  0.532
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.37  Prob > chi2 =  0.124
    Difference (null H = exogenous): chi2(3)    =   1.45  Prob > chi2 =  0.693
```

Table 3.8 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht pur_loan2ngdp_eu17 pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10
see6 dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_eu17
pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =     72.03                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.696      0.085     8.20    0.00         0.524       0.869
             |
      gap_tr |     -0.150      0.079    -1.89    0.07        -0.311       0.012
             |
    debt2gdp |
         L1. |      0.003      0.008     0.35    0.73        -0.013       0.018
             |
        infl |      0.018      0.005     3.63    0.00         0.008       0.027
legelec_dpi1 |     -0.479      0.229    -2.09    0.04        -0.945      -0.012
  maastricht |      0.525      0.230     2.28    0.03         0.056       0.994
pur_l~p_eu17 |      1.125      0.297     3.79    0.00         0.521       1.730
pur_~p_nms10 |      0.301      0.165     1.82    0.08        -0.035       0.636
pur_l~p_see6 |      0.660      0.184     3.59    0.00         0.285       1.034
        eu17 |      0.272      0.479     0.57    0.57        -0.702       1.247
       nms10 |     -0.369      0.352    -1.05    0.30        -1.086       0.348
        see6 |     -0.024      0.404    -0.06    0.95        -0.847       0.798
     dy_2002 |     -0.603      0.434    -1.39    0.17        -1.485       0.279
     dy_2003 |     -0.140      0.344    -0.41    0.69        -0.839       0.559
     dy_2004 |     -0.048      0.330    -0.14    0.89        -0.719       0.624
     dy_2005 |      0.317      0.330     0.96    0.34        -0.355       0.989
     dy_2006 |      0.029      0.304     0.10    0.92        -0.588       0.647
     dy_2007 |      0.289      0.475     0.61    0.55        -0.677       1.255
     dy_2008 |     -1.202      0.490    -2.45    0.02        -2.199      -0.206
     dy_2009 |     -2.420      0.494    -4.90    0.00        -3.424      -1.415
     dy_2010 |     -0.982      0.457    -2.15    0.04        -1.911      -0.053
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_eu17
    pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_eu17
    pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.70  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.73  Pr > z =  0.466
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  28.10  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   4.43  Prob > chi2 =  0.351
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.31  Prob > chi2 =  0.315
    Difference (null H = exogenous): chi2(2)    =   2.12  Prob > chi2 =  0.347
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   2.29  Prob > chi2 =  0.130
    Difference (null H = exogenous): chi2(3)    =   2.14  Prob > chi2 =  0.545
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.50  Prob > chi2 =  0.114
    Difference (null H = exogenous): chi2(3)    =   1.93  Prob > chi2 =  0.587
```

Table 3.8 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht pur_loan2ngdp_eu17 pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10
see6 dy_2002-dy_2010 if year>1994 & year<2011 & dv_grc_2010==1 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
pur_loan2ngdp_eu17 pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6
dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.
pur_loan2ngdp_eu17 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
Using a generalized inverse to calculate optimal weighting matrix for two-step
estimation.
Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       463
Time variable : year                            Number of groups   =        33
Number of instruments = 24                      Obs per group: min =         5
F(20, 33)     =     78.74                                      avg =     14.03
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.697      0.086     8.08    0.00        0.521       0.872
             |
      gap_tr |     -0.144      0.079    -1.82    0.08       -0.305       0.017
             |
    debt2gdp |
         L1. |      0.005      0.008     0.59    0.56       -0.011       0.020
             |
        infl |      0.018      0.005     3.73    0.00        0.008       0.028
legelec_dpi1 |     -0.481      0.231    -2.08    0.04       -0.951      -0.011
  maastricht |      0.509      0.236     2.16    0.04        0.030       0.989
pur_~p_nms10 |      0.286      0.165     1.73    0.09       -0.050       0.622
pur_l~p_see6 |      0.643      0.189     3.40    0.00        0.258       1.027
        eu17 |      0.181      0.473     0.38    0.70       -0.782       1.144
       nms10 |     -0.443      0.345    -1.28    0.21       -1.145       0.259
        see6 |     -0.137      0.412    -0.33    0.74       -0.975       0.701
     dy_2002 |     -0.595      0.439    -1.36    0.18       -1.488       0.298
     dy_2003 |     -0.113      0.348    -0.32    0.75       -0.820       0.595
     dy_2004 |     -0.006      0.333    -0.02    0.99       -0.683       0.671
     dy_2005 |      0.305      0.334     0.91    0.37       -0.375       0.985
     dy_2006 |      0.050      0.314     0.16    0.87       -0.588       0.688
     dy_2007 |      0.283      0.507     0.56    0.58       -0.748       1.315
     dy_2008 |     -1.188      0.510    -2.33    0.03       -2.227      -0.150
     dy_2009 |     -2.333      0.516    -4.53    0.00       -3.382      -1.284
     dy_2010 |     -0.946      0.465    -2.03    0.05       -1.891      -0.000
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
```

```
    D.(L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_eu17
    pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_eu17
    pur_loan2ngdp_nms10 pur_loan2ngdp_see6 eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.68  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.75  Pr > z =  0.453
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  29.04  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   4.91  Prob > chi2 =  0.296
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.32  Prob > chi2 =  0.314
    Difference (null H = exogenous): chi2(2)    =   2.60  Prob > chi2 =  0.273
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   2.37  Prob > chi2 =  0.124
    Difference (null H = exogenous): chi2(3)    =   2.55  Prob > chi2 =  0.467
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.57  Prob > chi2 =  0.109
    Difference (null H = exogenous): chi2(3)    =   2.34  Prob > chi2 =  0.505
```

Table 3.8 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr gap_tr_pur_loan2ngdp_dv L.debt2gdp
infl legelec_dpi1 maastricht pur_loan2ngdp_dv dy_2002-dy_2010 if year>1994 &
year<2011 & dv_grc_2010==1 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1
2) collapse) gmm(gap_tr, laglimits (2 3) collapse) gmm(gap_tr_pur_loan2ngdp_dv,
> laglimits (2 3) collapse) iv(L.debt2gdp infl legelec_dpi1 maastricht
pur_loan2ngdp_dv dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       463
Time variable : year                            Number of groups   =        33
Number of instruments = 24                      Obs per group: min =         5
F(17, 32)     =     56.66                                      avg =     14.03
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
 capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.722      0.079     9.09    0.00         0.560       0.884
             |
      gap_tr |     -0.316      0.122    -2.59    0.01        -0.564      -0.067
gap_tr_pur~v |      0.620      0.231     2.68    0.01         0.149       1.091
             |
    debt2gdp |
         L1. |      0.004      0.006     0.77    0.45        -0.007       0.016
             |
        infl |      0.016      0.011     1.51    0.14        -0.006       0.038
legelec_dpi1 |     -0.485      0.253    -1.91    0.06        -1.001       0.031
  maastricht |      0.363      0.313     1.16    0.25        -0.273       1.000
pur_loan2n~v |      0.117      0.871     0.13    0.89        -1.657       1.891
     dy_2002 |     -0.783      0.429    -1.83    0.08        -1.658       0.091
     dy_2003 |     -0.355      0.436    -0.82    0.42        -1.243       0.532
     dy_2004 |     -0.224      0.371    -0.60    0.55        -0.980       0.531
     dy_2005 |      0.494      0.346     1.43    0.16        -0.211       1.198
     dy_2006 |      0.430      0.430     1.00    0.32        -0.446       1.307
     dy_2007 |      1.377      0.790     1.74    0.09        -0.233       2.987
     dy_2008 |     -0.646      0.486    -1.33    0.19        -1.636       0.343
     dy_2009 |     -2.252      0.663    -3.39    0.00        -3.604      -0.901
     dy_2010 |     -1.192      0.596    -2.00    0.05        -2.407       0.023
       _cons |      0.003      0.368     0.01    0.99        -0.746       0.752
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_dv dy_2002
    dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_pur_loan2ngdp_dv collapsed
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp infl legelec_dpi1 maastricht pur_loan2ngdp_dv dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_pur_loan2ngdp_dv collapsed
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.75  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.31  Pr > z =  0.189
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  19.81  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   7.15  Prob > chi2 =  0.307
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   5.11  Prob > chi2 =  0.164
    Difference (null H = exogenous): chi2(3)    =   2.04  Prob > chi2 =  0.565
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   1.66  Prob > chi2 =  0.647
    Difference (null H = exogenous): chi2(3)    =   5.49  Prob > chi2 =  0.139
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.43  Prob > chi2 =  0.488
    Difference (null H = exogenous): chi2(3)    =   4.72  Prob > chi2 =  0.194
  gmm(gap_tr_pur_loan2ngdp_dv, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.81  Prob > chi2 =  0.421
    Difference (null H = exogenous): chi2(3)    =   4.33  Prob > chi2 =  0.228
```

Table 3.8 Column 8

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht regime_imf dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
regime_imf dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 21                      Obs per group: min =         5
F(16, 32)     =     79.57                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.714      0.074     9.61    0.00         0.563       0.866
             |
      gap_tr |     -0.155      0.072    -2.15    0.04        -0.302      -0.008
             |
    debt2gdp |
         L1. |      0.007      0.004     1.69    0.10        -0.001       0.016
             |
        infl |      0.018      0.005     3.81    0.00         0.008       0.028
legelec_dpi1 |     -0.575      0.211    -2.73    0.01        -1.004      -0.145
  maastricht |      0.683      0.192     3.56    0.00         0.293       1.074
  regime_imf |     -0.019      0.048    -0.40    0.69        -0.117       0.078
     dy_2002 |     -0.581      0.409    -1.42    0.16        -1.413       0.251
     dy_2003 |     -0.081      0.311    -0.26    0.80        -0.714       0.553
     dy_2004 |     -0.031      0.292    -0.11    0.92        -0.627       0.564
     dy_2005 |      0.313      0.301     1.04    0.31        -0.301       0.926
     dy_2006 |      0.058      0.248     0.23    0.82        -0.447       0.563
     dy_2007 |      0.476      0.462     1.03    0.31        -0.465       1.417
     dy_2008 |     -1.033      0.423    -2.44    0.02        -1.895      -0.172
     dy_2009 |     -2.003      0.443    -4.52    0.00        -2.904      -1.101
     dy_2010 |     -0.646      0.461    -1.40    0.17        -1.584       0.293
       _cons |     -0.141      0.363    -0.39    0.70        -0.881       0.600
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht regime_imf dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht regime_imf dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.62  Pr > z =  0.534
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.82  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.22  Prob > chi2 =  0.695
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.87  Prob > chi2 =  0.393
    Difference (null H = exogenous): chi2(2)    =   0.36  Prob > chi2 =  0.837
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.76  Prob > chi2 =  0.385
    Difference (null H = exogenous): chi2(3)    =   1.47  Prob > chi2 =  0.690
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.87  Prob > chi2 =  0.172
    Difference (null H = exogenous): chi2(3)    =   0.35  Prob > chi2 =  0.950
```

Table 3.8 Column 9

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht regime_imf_eu17 regime_imf_nms10 regime_imf_see6 eu17 nms10 see6
dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht  regime_imf_eu17
regime_imf_nms10 regime_imf_see6 eu17 nms10 see6 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(21, 33)     =    128.88                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.719      0.074     9.67    0.00        0.568       0.871
             |
      gap_tr |     -0.158      0.071    -2.23    0.03       -0.302      -0.014
             |
    debt2gdp |
         L1. |      0.005      0.005     1.03    0.31       -0.005       0.015
             |
        infl |      0.022      0.004     5.76    0.00        0.014       0.029
legelec_dpi1 |     -0.570      0.211    -2.70    0.01       -0.999      -0.140
  maastricht |      0.436      0.267     1.63    0.11       -0.107       0.980
regim~f_eu17 |      0.054      0.076     0.71    0.48       -0.101       0.209
regi~f_nms10 |     -0.052      0.075    -0.70    0.49       -0.205       0.100
regim~f_see6 |     -0.047      0.043    -1.08    0.29       -0.134       0.041
        eu17 |     -0.093      0.456    -0.20    0.84       -1.020       0.834
       nms10 |     -0.152      0.438    -0.35    0.73       -1.043       0.739
        see6 |      0.151      0.273     0.55    0.58       -0.404       0.707
     dy_2002 |     -0.581      0.408    -1.43    0.16       -1.411       0.248
     dy_2003 |     -0.085      0.310    -0.27    0.79       -0.716       0.547
     dy_2004 |     -0.038      0.293    -0.13    0.90       -0.634       0.557
     dy_2005 |      0.305      0.300     1.01    0.32       -0.306       0.916
     dy_2006 |      0.048      0.249     0.19    0.85       -0.459       0.554
     dy_2007 |      0.469      0.464     1.01    0.32       -0.475       1.414
     dy_2008 |     -1.035      0.437    -2.37    0.02       -1.924      -0.146
     dy_2009 |     -1.991      0.443    -4.49    0.00       -2.893      -1.089
     dy_2010 |     -0.632      0.464    -1.36    0.18       -1.575       0.311
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht regime_imf_eu17
    regime_imf_nms10 regime_imf_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht regime_imf_eu17 regime_imf_nms10
    regime_imf_see6 eu17 nms10 see6 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.81  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.62  Pr > z =  0.534
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  15.69  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.17  Prob > chi2 =  0.705
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.84  Prob > chi2 =  0.399
    Difference (null H = exogenous): chi2(2)    =   0.33  Prob > chi2 =  0.847
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.73  Prob > chi2 =  0.394
    Difference (null H = exogenous): chi2(3)    =   1.44  Prob > chi2 =  0.696
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.81  Prob > chi2 =  0.179
    Difference (null H = exogenous): chi2(3)    =   0.36  Prob > chi2 =  0.948
```

Table 3.9 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.9 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 20                      Obs per group: min =        10
F(15, 26)     =    220.37                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.089     7.82    0.00         0.515       0.882
             |
      gap_tr |     -0.157      0.058    -2.73    0.01        -0.276      -0.039
             |
    debt2gdp |
         L1. |      0.011      0.004     2.74    0.01         0.003       0.020
             |
        infl |      0.019      0.005     3.68    0.00         0.008       0.029
legelec_dpi1 |     -0.602      0.249    -2.42    0.02        -1.115      -0.090
  maastricht |      0.467      0.176     2.65    0.01         0.105       0.829
     dy_2002 |     -0.898      0.384    -2.34    0.03        -1.686      -0.109
     dy_2003 |     -0.401      0.249    -1.61    0.12        -0.913       0.111
     dy_2004 |     -0.229      0.339    -0.67    0.51        -0.927       0.469
     dy_2005 |      0.015      0.308     0.05    0.96        -0.618       0.649
     dy_2006 |     -0.045      0.202    -0.22    0.82        -0.460       0.369
     dy_2007 |      0.497      0.416     1.20    0.24        -0.358       1.352
     dy_2008 |     -0.835      0.339    -2.46    0.02        -1.532      -0.137
     dy_2009 |     -2.642      0.502    -5.27    0.00        -3.673      -1.611
     dy_2010 |     -1.050      0.473    -2.22    0.04        -2.022      -0.078
       _cons |     -0.267      0.296    -0.90    0.38        -0.876       0.342
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.50  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.32  Pr > z =  0.188
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  22.83  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.55  Prob > chi2 =  0.470
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.99  Prob > chi2 =  0.224
    Difference (null H = exogenous): chi2(2)    =   0.56  Prob > chi2 =  0.757
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.52  Prob > chi2 =  0.217
    Difference (null H = exogenous): chi2(3)    =   2.03  Prob > chi2 =  0.567
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.56  Prob > chi2 =  0.109
    Difference (null H = exogenous): chi2(3)    =   0.99  Prob > chi2 =  0.805
```

Table 3.9 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht rules dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht rules dy_2002-dy_2010)
two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 21                      Obs per group: min =        10
F(16, 26)     =    156.92                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.703      0.091     7.75    0.00        0.517       0.890
             |
      gap_tr |     -0.168      0.059    -2.82    0.01       -0.290      -0.045
             |
    debt2gdp |
         L1. |      0.017      0.005     3.64    0.00        0.007       0.026
             |
        infl |      0.025      0.005     4.62    0.00        0.014       0.036
legelec_dpi1 |     -0.656      0.255    -2.57    0.02       -1.181      -0.131
  maastricht |      0.482      0.198     2.43    0.02        0.075       0.890
       rules |      0.550      0.129     4.27    0.00        0.285       0.815
     dy_2002 |     -1.016      0.383    -2.66    0.01       -1.802      -0.230
     dy_2003 |     -0.587      0.226    -2.60    0.02       -1.051      -0.123
     dy_2004 |     -0.414      0.350    -1.18    0.25       -1.132       0.305
     dy_2005 |     -0.139      0.337    -0.41    0.68       -0.832       0.554
     dy_2006 |     -0.212      0.216    -0.98    0.33       -0.655       0.231
     dy_2007 |      0.330      0.424     0.78    0.44       -0.541       1.201
     dy_2008 |     -1.038      0.350    -2.96    0.01       -1.758      -0.318
     dy_2009 |     -2.808      0.524    -5.36    0.00       -3.885      -1.731
     dy_2010 |     -1.396      0.580    -2.41    0.02       -2.587      -0.205
       _cons |     -0.604      0.270    -2.24    0.03       -1.159      -0.049
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht rules dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht rules dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.40  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   1.14  Pr > z =  0.254
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  23.68  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.28  Prob > chi2 =  0.513
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.82  Prob > chi2 =  0.245
    Difference (null H = exogenous): chi2(2)    =   0.46  Prob > chi2 =  0.795
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.02  Prob > chi2 =  0.312
    Difference (null H = exogenous): chi2(3)    =   2.25  Prob > chi2 =  0.522
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.56  Prob > chi2 =  0.110
    Difference (null H = exogenous): chi2(3)    =   0.72  Prob > chi2 =  0.870
```

Table 3.9 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht rules_eu17 rules_nms10 eu17 nms10 dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht
rules_eu17 rules_nms10 eu17 nms10 dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 23                      Obs per group: min =        10
F(19, 27)     =    425.73                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.705      0.085     8.28    0.00        0.531       0.880
             |
      gap_tr |     -0.171      0.059    -2.89    0.01       -0.293      -0.050
             |
    debt2gdp |
         L1. |      0.015      0.005     2.91    0.01        0.005       0.026
             |
        infl |      0.026      0.005     5.54    0.00        0.016       0.035
legelec_dpi1 |     -0.651      0.253    -2.57    0.02       -1.170      -0.132
  maastricht |      0.441      0.219     2.01    0.05       -0.009       0.891
  rules_eu17 |      0.518      0.126     4.12    0.00        0.260       0.776
 rules_nms10 |      0.610      0.217     2.81    0.01        0.165       1.055
        eu17 |     -0.476      0.399    -1.19    0.24       -1.294       0.342
       nms10 |     -0.632      0.283    -2.23    0.03       -1.213      -0.052
     dy_2002 |     -1.017      0.376    -2.70    0.01       -1.789      -0.244
     dy_2003 |     -0.593      0.231    -2.57    0.02       -1.065      -0.120
     dy_2004 |     -0.419      0.340    -1.23    0.23       -1.117       0.280
     dy_2005 |     -0.148      0.339    -0.44    0.66       -0.844       0.547
     dy_2006 |     -0.213      0.221    -0.96    0.34       -0.667       0.241
     dy_2007 |      0.337      0.416     0.81    0.42       -0.516       1.191
     dy_2008 |     -1.034      0.341    -3.03    0.01       -1.734      -0.334
     dy_2009 |     -2.811      0.507    -5.55    0.00       -3.850      -1.771
     dy_2010 |     -1.386      0.543    -2.55    0.02       -2.499      -0.272
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht rules_eu17 rules_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp infl legelec_dpi1 maastricht rules_eu17 rules_nms10 eu17 nms10
    dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.40  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   1.15  Pr > z =  0.250
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  24.56  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.30  Prob > chi2 =  0.509
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.89  Prob > chi2 =  0.236
    Difference (null H = exogenous): chi2(2)    =   0.41  Prob > chi2 =  0.814
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.05  Prob > chi2 =  0.307
    Difference (null H = exogenous): chi2(3)    =   2.26  Prob > chi2 =  0.521
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.62  Prob > chi2 =  0.105
    Difference (null H = exogenous): chi2(3)    =   0.68  Prob > chi2 =  0.879
```

Table 3.9 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr gap_tr_rules L.debt2gdp infl
legelec_dpi1 rules maastricht dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits
(2 3) collapse) gmm(gap_tr_rules, laglimits (2 3) collapse)  iv(L.debt2gdp infl
legelec_dpi1 rules maastricht dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 24                      Obs per group: min =        10
F(17, 26)     =    267.16                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.785      0.076    10.33    0.00         0.629       0.941
             |
      gap_tr |     -0.141      0.037    -3.80    0.00        -0.217      -0.065
gap_tr_rules |     -0.019      0.088    -0.21    0.83        -0.199       0.162
             |
    debt2gdp |
         L1. |      0.014      0.005     2.89    0.01         0.004       0.024
             |
        infl |      0.027      0.004     6.54    0.00         0.019       0.036
legelec_dpi1 |     -0.748      0.257    -2.91    0.01        -1.278      -0.219
       rules |      0.469      0.117     4.00    0.00         0.228       0.709
  maastricht |      0.488      0.176     2.77    0.01         0.126       0.850
     dy_2002 |     -0.853      0.389    -2.19    0.04        -1.652      -0.054
     dy_2003 |     -0.617      0.228    -2.70    0.01        -1.086      -0.148
     dy_2004 |     -0.258      0.342    -0.76    0.46        -0.961       0.444
     dy_2005 |     -0.016      0.331    -0.05    0.96        -0.696       0.665
     dy_2006 |     -0.178      0.246    -0.72    0.48        -0.684       0.329
     dy_2007 |      0.278      0.357     0.78    0.44        -0.456       1.013
     dy_2008 |     -0.996      0.371    -2.68    0.01        -1.759      -0.233
     dy_2009 |     -2.483      0.500    -4.96    0.00        -3.511      -1.454
     dy_2010 |     -1.091      0.639    -1.71    0.10        -2.405       0.223
       _cons |     -0.545      0.274    -1.99    0.06        -1.108       0.017
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 rules maastricht dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_rules collapsed
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 rules maastricht dy_2002 dy_2003 dy_2004
```

```
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_rules collapsed
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.28  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   1.01  Pr > z =  0.310
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  25.01  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   5.05  Prob > chi2 =  0.537
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   3.71  Prob > chi2 =  0.294
    Difference (null H = exogenous): chi2(3)    =   1.34  Prob > chi2 =  0.720
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   2.49  Prob > chi2 =  0.478
    Difference (null H = exogenous): chi2(3)    =   2.57  Prob > chi2 =  0.464
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   3.60  Prob > chi2 =  0.308
    Difference (null H = exogenous): chi2(3)    =   1.45  Prob > chi2 =  0.693
  gmm(gap_tr_rules, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   3.27  Prob > chi2 =  0.352
    Difference (null H = exogenous): chi2(3)    =   1.78  Prob > chi2 =  0.619
```

Table 3.9 Column 6

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1 deleg
contr1 maastricht dy_2002-dy_2007 if year>1994 & year<2008 & (eu27==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 deleg contr1 maastricht dy_2002-
dy_2007) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       291
Time variable : year                            Number of groups   =        25
Number of instruments = 19                      Obs per group: min =         7
F(14, 24)     =     35.92                                      avg =     11.64
Prob > F      =     0.000                                      max =        13
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.534      0.100     5.34    0.00         0.327       0.740
             |
      gap_tr |     -0.118      0.049    -2.43    0.02        -0.219      -0.018
             |
    debt2gdp |
         L1. |      0.008      0.007     1.11    0.28        -0.007       0.023
             |
        infl |      0.000      0.023     0.01    0.99        -0.048       0.048
legelec_dpi1 |     -0.450      0.166    -2.71    0.01        -0.791      -0.108
       deleg |     -0.986      0.766    -1.29    0.21        -2.566       0.594
      contr1 |      1.582      0.501     3.16    0.00         0.548       2.617
  maastricht |      0.466      0.200     2.33    0.03         0.054       0.879
     dy_2002 |     -0.870      0.371    -2.35    0.03        -1.637      -0.104
     dy_2003 |     -0.895      0.375    -2.39    0.03        -1.670      -0.121
     dy_2004 |     -0.887      0.433    -2.05    0.05        -1.782       0.007
     dy_2005 |     -0.888      0.435    -2.04    0.05        -1.786       0.009
     dy_2006 |     -1.006      0.477    -2.11    0.05        -1.990      -0.023
     dy_2007 |     -0.894      0.599    -1.49    0.15        -2.130       0.342
       _cons |      0.082      0.662     0.12    0.90        -1.284       1.447
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 deleg contr1 maastricht dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 deleg contr1 maastricht dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
```

```
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.18  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.94  Pr > z =  0.349
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =   3.28  Prob > chi2 =  0.512
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.56  Prob > chi2 =  0.634
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   0.51  Prob > chi2 =  0.773
    Difference (null H = exogenous): chi2(2)    =   2.04  Prob > chi2 =  0.360
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.48  Prob > chi2 =  0.489
    Difference (null H = exogenous): chi2(3)    =   2.08  Prob > chi2 =  0.556
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   0.01  Prob > chi2 =  0.917
    Difference (null H = exogenous): chi2(3)    =   2.55  Prob > chi2 =  0.467
```

Table 3.9 Column 7

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
deleg_eu17 deleg_nms10 contr1_eu17 contr1_nms10 eu17 nms10 maastricht dy_2002-
dy_2007 if year>1994 & year<2008 & (eu27==1), gmm(L.capb_ngdp_tr, laglimits(1
2) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp infl
legelec_dpi1 maastricht deleg_eu17 deleg_nms10 contr1_eu17 contr1_nms10 eu17
nms10 dy_2002-dy_2007) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       291
Time variable : year                            Number of groups   =        25
Number of instruments = 22                      Obs per group: min =         7
F(18, 25)     =     64.38                                      avg =     11.64
Prob > F      =     0.000                                      max =        13
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.479      0.114     4.18    0.00         0.243       0.714
             |
      gap_tr |     -0.113      0.067    -1.69    0.10        -0.251       0.025
             |
    debt2gdp |
         L1. |      0.002      0.007     0.33    0.75        -0.013       0.018
             |
        infl |      0.028      0.017     1.67    0.11        -0.006       0.062
legelec_dpi1 |     -0.359      0.168    -2.13    0.04        -0.706      -0.012
  deleg_eu17 |     -2.489      1.039    -2.40    0.02        -4.630      -0.349
 deleg_nms10 |      0.950      1.142     0.83    0.41        -1.401       3.301
 contr1_eu17 |      0.574      0.374     1.53    0.14        -0.197       1.345
contr1_nms10 |      1.831      0.842     2.18    0.04         0.098       3.565
        eu17 |      2.240      1.130     1.98    0.06        -0.088       4.567
       nms10 |     -1.168      0.778    -1.50    0.15        -2.770       0.434
  maastricht |      0.012      0.228     0.05    0.96        -0.458       0.483
     dy_2002 |     -0.559      0.333    -1.68    0.11        -1.244       0.127
     dy_2003 |     -0.836      0.336    -2.49    0.02        -1.528      -0.144
     dy_2004 |     -0.850      0.448    -1.90    0.07        -1.773       0.073
     dy_2005 |     -0.753      0.459    -1.64    0.11        -1.697       0.192
     dy_2006 |     -0.925      0.465    -1.99    0.06        -1.883       0.034
     dy_2007 |     -0.997      0.577    -1.73    0.10        -2.186       0.192
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht deleg_eu17 deleg_nms10
    contr1_eu17 contr1_nms10 eu17 nms10 dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp infl legelec_dpi1 maastricht deleg_eu17 deleg_nms10 contr1_eu17
    contr1_nms10 eu17 nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.11  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   0.82  Pr > z =  0.414
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =   3.94  Prob > chi2 =  0.414
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   4.45  Prob > chi2 =  0.349
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   0.72  Prob > chi2 =  0.698
    Difference (null H = exogenous): chi2(2)    =   3.73  Prob > chi2 =  0.155
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.44  Prob > chi2 =  0.508
    Difference (null H = exogenous): chi2(3)    =   4.01  Prob > chi2 =  0.261
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   0.27  Prob > chi2 =  0.604
    Difference (null H = exogenous): chi2(3)    =   4.18  Prob > chi2 =  0.243
```

Table 3.10 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp legelec_dpi1 maastricht
infl dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse) iv(L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.10 Column 2

```
xtabond2 carev_ngdp_tr L.carev_ngdp_tr gap_tr L.debt2gdp legelec_dpi1
maastricht infl dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.carev_ngdp_tr, laglimits(1 4) collapse) gmm(gap_tr, laglimits (2 3)
collapse) iv(L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       484
Time variable : year                            Number of groups   =        33
Number of instruments = 22                      Obs per group: min =         8
F(15, 32)     =     34.19                                      avg =     14.67
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
carev_ngdp~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
carev_ngdp~r |
         L1. |      0.553      0.296     1.87    0.07       -0.051       1.156
             |
      gap_tr |     -0.187      0.116    -1.61    0.12       -0.424       0.049
             |
    debt2gdp |
         L1. |      0.024      0.022     1.11    0.28       -0.020       0.068
             |
legelec_dpi1 |     -0.322      0.147    -2.20    0.04       -0.621      -0.024
  maastricht |      0.776      0.737     1.05    0.30       -0.725       2.276
        infl |     -0.063      0.031    -2.01    0.05       -0.127       0.001
     dy_2002 |      0.024      0.432     0.06    0.96       -0.856       0.905
     dy_2003 |      0.209      0.418     0.50    0.62       -0.643       1.060
     dy_2004 |     -0.294      0.341    -0.86    0.39       -0.987       0.400
     dy_2005 |      0.183      0.350     0.52    0.61       -0.531       0.896
     dy_2006 |      0.159      0.560     0.28    0.78       -0.980       1.299
     dy_2007 |      0.461      0.740     0.62    0.54       -1.046       1.969
     dy_2008 |      0.589      0.444     1.33    0.19       -0.315       1.492
     dy_2009 |      0.986      0.767     1.29    0.21       -0.576       2.548
     dy_2010 |     -0.397      0.377    -1.05    0.30       -1.164       0.371
       _cons |     17.715     11.452     1.55    0.13       -5.613      41.042
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/4).L.carev_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.carev_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.02  Pr > z =  0.044
Arellano-Bond test for AR(2) in first differences: z =  -0.93  Pr > z =  0.353
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  40.83  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   9.26  Prob > chi2 =  0.159
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   5.26  Prob > chi2 =  0.262
    Difference (null H = exogenous): chi2(2)    =   4.01  Prob > chi2 =  0.135
  gmm(L.carev_ngdp_tr, collapse lag(1 4))
    Hansen test excluding group:     chi2(1)    =   3.85  Prob > chi2 =  0.050
    Difference (null H = exogenous): chi2(5)    =   5.42  Prob > chi2 =  0.367
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   4.14  Prob > chi2 =  0.246
    Difference (null H = exogenous): chi2(3)    =   5.12  Prob > chi2 =  0.163
```

Table 3.10 Column 3

```
xtabond2 caprexp_ngdp_tr L.caprexp_ngdp_tr gap_tr L.debt2gdp legelec_dpi1
maastricht infl dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.caprexp_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       465
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =    130.49                                      avg =     14.09
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
caprexp_ng~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
caprexp_ng~r |
         L1. |      0.739      0.260     2.84    0.01         0.210       1.268
             |
      gap_tr |     -0.063      0.089    -0.70    0.49        -0.244       0.119
             |
    debt2gdp |
         L1. |      0.012      0.010     1.12    0.27        -0.010       0.033
             |
legelec_dpi1 |      0.425      0.153     2.78    0.01         0.113       0.736
  maastricht |     -0.193      0.730    -0.26    0.79        -1.681       1.295
        infl |     -0.028      0.021    -1.36    0.18        -0.071       0.014
     dy_2002 |      0.642      0.291     2.21    0.03         0.049       1.235
     dy_2003 |      0.845      0.427     1.98    0.06        -0.023       1.714
     dy_2004 |     -0.212      0.456    -0.46    0.65        -1.141       0.718
     dy_2005 |      0.386      0.315     1.22    0.23        -0.256       1.027
     dy_2006 |      0.628      0.375     1.67    0.10        -0.136       1.392
     dy_2007 |      0.490      0.633     0.77    0.44        -0.800       1.780
     dy_2008 |      2.406      0.516     4.66    0.00         1.354       3.458
     dy_2009 |      3.737      0.546     6.85    0.00         2.625       4.848
     dy_2010 |      1.147      0.905     1.27    0.21        -0.696       2.990
       _cons |     10.124     10.399     0.97    0.34        -11.058      31.306
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.caprexp_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.caprexp_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.02  Pr > z =  0.043
Arellano-Bond test for AR(2) in first differences: z =   0.44  Pr > z =  0.660
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =   8.40  Prob > chi2 =  0.078
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   4.60  Prob > chi2 =  0.331
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.83  Prob > chi2 =  0.401
    Difference (null H = exogenous): chi2(2)    =   2.77  Prob > chi2 =  0.251
  gmm(L.caprexp_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.03  Prob > chi2 =  0.874
    Difference (null H = exogenous): chi2(3)    =   4.57  Prob > chi2 =  0.206
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   0.07  Prob > chi2 =  0.786
    Difference (null H = exogenous): chi2(3)    =   4.52  Prob > chi2 =  0.210
```

Table 3.10 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    444.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.066    10.61    0.00        0.564       0.832
             |
 gap_tr_eu17 |      0.020      0.120     0.17    0.87       -0.223       0.263
gap_tr_nms10 |     -0.180      0.043    -4.20    0.00       -0.267      -0.093
 gap_tr_see6 |     -0.270      0.061    -4.44    0.00       -0.393      -0.146
        eu17 |      0.213      0.477     0.45    0.66       -0.757       1.183
       nms10 |     -0.174      0.253    -0.69    0.50       -0.687       0.340
        see6 |      0.369      0.291     1.27    0.21       -0.222       0.960
             |
    debt2gdp |
         L1. |      0.002      0.006     0.36    0.72       -0.009       0.013
             |
legelec_dpi1 |     -0.489      0.190    -2.58    0.01       -0.875      -0.104
  maastricht |      0.832      0.352     2.36    0.02        0.116       1.547
        infl |      0.020      0.004     5.37    0.00        0.012       0.027
     dy_2002 |     -0.624      0.375    -1.66    0.11       -1.387       0.139
     dy_2003 |     -0.228      0.262    -0.87    0.39       -0.760       0.304
     dy_2004 |     -0.135      0.310    -0.43    0.67       -0.766       0.496
     dy_2005 |      0.192      0.314     0.61    0.54       -0.446       0.831
     dy_2006 |     -0.169      0.253    -0.67    0.51       -0.684       0.346
     dy_2007 |      0.133      0.441     0.30    0.76       -0.764       1.031
     dy_2008 |     -1.295      0.415    -3.12    0.00       -2.138      -0.451
     dy_2009 |     -2.151      0.455    -4.73    0.00       -3.076      -1.226
     dy_2010 |     -0.582      0.337    -1.73    0.09       -1.267       0.103
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.84  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.628
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  33.36  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   4.04  Prob > chi2 =  0.854
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.86  Prob > chi2 =  0.582
    Difference (null H = exogenous): chi2(4)    =   1.18  Prob > chi2 =  0.882
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.57  Prob > chi2 =  0.766
    Difference (null H = exogenous): chi2(3)    =   1.46  Prob > chi2 =  0.691
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.48  Prob > chi2 =  0.780
    Difference (null H = exogenous): chi2(3)    =   1.56  Prob > chi2 =  0.668
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.72  Prob > chi2 =  0.590
    Difference (null H = exogenous): chi2(3)    =   0.31  Prob > chi2 =  0.957
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.83  Prob > chi2 =  0.726
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
```

Table 3.10 Column 5

```
xtabond2 carev_ngdp_tr L.carev_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6
eu17 nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.carev_ngdp_tr, laglimits(1 4)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       484
Time variable : year                            Number of groups   =        33
Number of instruments = 30                      Obs per group: min =         8
F(20, 33)     =  17215.54                                      avg =     14.67
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
carev_ngdp~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
carev_ngdp~r |
         L1. |      0.889      0.163     5.45    0.00         0.557       1.221
             |
 gap_tr_eu17 |     -0.200      0.065    -3.07    0.00        -0.333      -0.067
gap_tr_nms10 |     -0.167      0.060    -2.79    0.01        -0.288      -0.045
 gap_tr_see6 |     -0.121      0.517    -0.23    0.82        -1.174       0.932
        eu17 |      4.636      6.871     0.67    0.50        -9.343      18.614
       nms10 |      4.042      6.279     0.64    0.52        -8.734      16.817
        see6 |      3.723      5.903     0.63    0.53        -8.287      15.734
             |
    debt2gdp |
         L1. |      0.002      0.009     0.19    0.85        -0.017       0.021
             |
legelec_dpi1 |     -0.226      0.201    -1.12    0.27        -0.636       0.183
  maastricht |     -0.098      0.329    -0.30    0.77        -0.767       0.570
        infl |      0.001      0.021     0.04    0.97        -0.042       0.043
     dy_2002 |      0.240      0.457     0.52    0.60        -0.690       1.170
     dy_2003 |      0.341      0.290     1.18    0.25        -0.248       0.930
     dy_2004 |     -0.187      0.377    -0.50    0.62        -0.954       0.579
     dy_2005 |      0.510      0.290     1.76    0.09        -0.081       1.101
     dy_2006 |      0.391      0.517     0.75    0.46        -0.662       1.443
     dy_2007 |      0.743      0.589     1.26    0.22        -0.455       1.941
     dy_2008 |      0.832      0.805     1.03    0.31        -0.807       2.471
     dy_2009 |      1.591      0.780     2.04    0.05         0.003       3.179
     dy_2010 |     -0.085      0.303    -0.28    0.78        -0.702       0.532
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/4).L.carev_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.carev_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.60  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.13  Pr > z =  0.257
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(10)   =  57.76  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(10)   =  13.71  Prob > chi2 =  0.187
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(6)    =   6.80  Prob > chi2 =  0.340
    Difference (null H = exogenous): chi2(4)    =   6.91  Prob > chi2 =  0.141
  gmm(L.carev_ngdp_tr, collapse lag(1 4))
    Hansen test excluding group:     chi2(5)    =  12.02  Prob > chi2 =  0.034
    Difference (null H = exogenous): chi2(5)    =   1.69  Prob > chi2 =  0.890
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(7)    =  10.11  Prob > chi2 =  0.182
    Difference (null H = exogenous): chi2(3)    =   3.60  Prob > chi2 =  0.309
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(7)    =   7.98  Prob > chi2 =  0.334
    Difference (null H = exogenous): chi2(3)    =   5.73  Prob > chi2 =  0.126
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(7)    =   6.23  Prob > chi2 =  0.513
    Difference (null H = exogenous): chi2(3)    =   7.48  Prob > chi2 =  0.058
```

Table 3.10 Column 6

```
xtabond2 caprexp_ngdp_tr L.caprexp_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6
eu17 nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.caprexp_ngdp_tr, laglimits(1
2) collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits(2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       465
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =   4644.31                                      avg =     14.09
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
caprexp_ng~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
caprexp_ng~r |
         L1. |      0.594      0.149     3.98    0.00         0.290      0.898
             |
 gap_tr_eu17 |     -0.410      0.121    -3.39    0.00        -0.656     -0.164
gap_tr_nms10 |     -0.123      0.080    -1.54    0.13        -0.285      0.039
 gap_tr_see6 |      0.210      0.142     1.48    0.15        -0.078      0.499
        eu17 |     16.972      5.856     2.90    0.01         5.057     28.886
       nms10 |     15.488      5.830     2.66    0.01         3.627     27.349
        see6 |     13.109      5.032     2.61    0.01         2.871     23.346
             |
    debt2gdp |
         L1. |      0.005      0.008     0.70    0.49        -0.010      0.021
             |
legelec_dpi1 |      0.496      0.168     2.96    0.01         0.154      0.837
  maastricht |     -0.518      0.468    -1.11    0.28        -1.470      0.434
        infl |     -0.028      0.009    -2.96    0.01        -0.047     -0.009
     dy_2002 |      0.497      0.343     1.45    0.16        -0.201      1.195
     dy_2003 |      0.536      0.500     1.07    0.29        -0.482      1.554
     dy_2004 |      0.161      0.442     0.36    0.72        -0.738      1.060
     dy_2005 |      0.570      0.414     1.37    0.18        -0.273      1.413
     dy_2006 |      1.139      0.476     2.39    0.02         0.171      2.107
     dy_2007 |      1.469      0.650     2.26    0.03         0.146      2.791
     dy_2008 |      2.774      0.619     4.48    0.00         1.515      4.034
     dy_2009 |      3.436      0.716     4.80    0.00         1.978      4.893
     dy_2010 |      1.240      0.874     1.42    0.17        -0.538      3.019
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.caprexp_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.caprexp_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.21  Pr > z =  0.027
Arellano-Bond test for AR(2) in first differences: z =   0.36  Pr > z =  0.715
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  25.30  Prob > chi2 =  0.001
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   6.92  Prob > chi2 =  0.545
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   6.03  Prob > chi2 =  0.197
    Difference (null H = exogenous): chi2(4)    =   0.90  Prob > chi2 =  0.925
  gmm(L.caprexp_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   6.56  Prob > chi2 =  0.255
    Difference (null H = exogenous): chi2(3)    =   0.36  Prob > chi2 =  0.949
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   6.47  Prob > chi2 =  0.263
    Difference (null H = exogenous): chi2(3)    =   0.46  Prob > chi2 =  0.928
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.51  Prob > chi2 =  0.478
    Difference (null H = exogenous): chi2(3)    =   2.41  Prob > chi2 =  0.492
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.62  Prob > chi2 =  0.345
    Difference (null H = exogenous): chi2(3)    =   1.30  Prob > chi2 =  0.728
```

Table 3.10 Column 7

```
xtabond2 carev_ngdp_tr L.carev_ngdp_tr gap_tr L.debt2gdp legelec_dpi1_eu17
legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6 maastricht infl dy_2002-
dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.carev_ngdp_tr,
laglimits(1 4) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp
legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6
maastricht infl dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       484
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         8
F(20, 33)     =   1058.13                                      avg =     14.67
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
carev_ngdp~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
carev_ngdp~r |
         L1. |      0.329      0.316     1.04    0.31       -0.313       0.971
             |
      gap_tr |     -0.260      0.106    -2.45    0.02       -0.476      -0.044
             |
    debt2gdp |
         L1. |      0.020      0.017     1.17    0.25       -0.015       0.054
             |
legelec_d~17 |     -0.246      0.128    -1.92    0.06       -0.506       0.015
legelec_d~10 |     -0.356      0.312    -1.14    0.26       -0.990       0.279
legelec_d~e6 |     -0.422      0.629    -0.67    0.51       -1.701       0.857
        eu17 |     28.518     13.428     2.12    0.04        1.198      55.838
       nms10 |     25.466     11.667     2.18    0.04        1.729      49.202
        see6 |     25.223     11.739     2.15    0.04        1.340      49.107
  maastricht |      0.975      0.726     1.34    0.19       -0.502       2.452
        infl |     -0.044      0.019    -2.36    0.02       -0.082      -0.006
     dy_2002 |     -0.163      0.370    -0.44    0.66       -0.916       0.590
     dy_2003 |      0.139      0.468     0.30    0.77       -0.813       1.091
     dy_2004 |     -0.164      0.356    -0.46    0.65       -0.890       0.561
     dy_2005 |      0.224      0.417     0.54    0.60       -0.625       1.073
     dy_2006 |      0.263      0.563     0.47    0.64       -0.883       1.409
     dy_2007 |      0.669      0.647     1.03    0.31       -0.646       1.985
     dy_2008 |      0.654      0.453     1.44    0.16       -0.267       1.576
     dy_2009 |      0.618      0.886     0.70    0.49       -1.185       2.421
     dy_2010 |     -0.209      0.450    -0.46    0.65       -1.124       0.706
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17
    nms10 see6 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007
    dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/4).L.carev_ngdp_tr collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17
    nms10 see6 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007
    dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.carev_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.16  Pr > z =  0.246
Arellano-Bond test for AR(2) in first differences: z =  -0.79  Pr > z =  0.432
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  31.90  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   6.14  Prob > chi2 =  0.408
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   5.09  Prob > chi2 =  0.279
    Difference (null H = exogenous): chi2(2)    =   1.05  Prob > chi2 =  0.592
  gmm(L.carev_ngdp_tr, collapse lag(1 4))
    Hansen test excluding group:     chi2(1)    =   1.92  Prob > chi2 =  0.165
    Difference (null H = exogenous): chi2(5)    =   4.21  Prob > chi2 =  0.519
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.69  Prob > chi2 =  0.441
    Difference (null H = exogenous): chi2(3)    =   3.44  Prob > chi2 =  0.328
```

Table 3.10 Column 8

```
xtabond2 caprexp_ngdp_tr L.caprexp_ngdp_tr gap_tr L.debt2gdp legelec_dpi1_eu17
legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6 maastricht infl dy_2002-
dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.caprexp_ngdp_tr,
laglimits(1 4) collapse) gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp
legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17 nms10 see6
maastricht infl dy_2002-dy_2010) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       465
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         5
F(20, 33)     =   4198.06                                      avg =     14.09
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
caprexp_ng~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
caprexp_ng~r |
         L1. |      0.695      0.221     3.15    0.00         0.245       1.145
             |
      gap_tr |     -0.108      0.084    -1.28    0.21        -0.278       0.063
             |
    debt2gdp |
         L1. |      0.000      0.008     0.05    0.96        -0.015       0.016
             |
legelec_d~17 |      0.498      0.109     4.56    0.00         0.276       0.721
legelec_d~10 |      0.252      0.591     0.43    0.67        -0.951       1.455
legelec_d~e6 |      0.428      0.425     1.01    0.32        -0.437       1.293
        eu17 |     12.679      9.147     1.39    0.17        -5.929      31.288
       nms10 |     11.675      8.786     1.33    0.19        -6.201      29.551
        see6 |     10.472      8.227     1.27    0.21        -6.266      27.209
  maastricht |     -0.030      0.621    -0.05    0.96        -1.293       1.234
        infl |     -0.022      0.013    -1.68    0.10        -0.048       0.005
     dy_2002 |      0.526      0.336     1.57    0.13        -0.157       1.209
     dy_2003 |      0.891      0.523     1.70    0.10        -0.174       1.956
     dy_2004 |     -0.021      0.403    -0.05    0.96        -0.841       0.799
     dy_2005 |      0.491      0.350     1.40    0.17        -0.221       1.202
     dy_2006 |      0.885      0.340     2.60    0.01         0.194       1.576
     dy_2007 |      0.880      0.560     1.57    0.13        -0.259       2.020
     dy_2008 |      2.619      0.502     5.21    0.00         1.597       3.641
     dy_2009 |      3.644      0.585     6.23    0.00         2.455       4.834
     dy_2010 |      0.993      0.822     1.21    0.24        -0.680       2.666
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17
    nms10 see6 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007
    dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/4).L.caprexp_ngdp_tr collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1_eu17 legelec_dpi1_nms10 legelec_dpi1_see6 eu17
    nms10 see6 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007
    dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.caprexp_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.11  Pr > z =  0.035
Arellano-Bond test for AR(2) in first differences: z =   0.42  Pr > z =  0.677
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =   7.46  Prob > chi2 =  0.280
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   6.42  Prob > chi2 =  0.378
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   4.47  Prob > chi2 =  0.346
    Difference (null H = exogenous): chi2(2)    =   1.94  Prob > chi2 =  0.378
  gmm(L.caprexp_ngdp_tr, collapse lag(1 4))
    Hansen test excluding group:     chi2(1)    =   0.64  Prob > chi2 =  0.422
    Difference (null H = exogenous): chi2(5)    =   5.77  Prob > chi2 =  0.329
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   0.27  Prob > chi2 =  0.966
    Difference (null H = exogenous): chi2(3)    =   6.15  Prob > chi2 =  0.105
```

Table 3.11 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp legelec_dpi1 maastricht
infl dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691       0.074     9.30    0.00         0.539       0.842
             |
      gap_tr |     -0.153       0.068    -2.25    0.03        -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008       0.004     1.90    0.07        -0.001       0.017
             |
legelec_dpi1 |     -0.560       0.202    -2.78    0.01        -0.970      -0.149
  maastricht |      0.665       0.199     3.34    0.00         0.259       1.071
        infl |      0.017       0.005     3.11    0.00         0.006       0.028
     dy_2002 |     -0.585       0.402    -1.45    0.16        -1.404       0.235
     dy_2003 |     -0.107       0.311    -0.34    0.73        -0.740       0.526
     dy_2004 |     -0.052       0.295    -0.18    0.86        -0.652       0.549
     dy_2005 |      0.288       0.298     0.97    0.34        -0.319       0.896
     dy_2006 |      0.035       0.248     0.14    0.89        -0.470       0.539
     dy_2007 |      0.441       0.449     0.98    0.33        -0.474       1.356
     dy_2008 |     -1.053       0.413    -2.55    0.02        -1.895      -0.211
     dy_2009 |     -2.084       0.439    -4.75    0.00        -2.977      -1.191
     dy_2010 |     -0.679       0.451    -1.51    0.14        -1.597       0.240
       _cons |     -0.228       0.285    -0.80    0.43        -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.11 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_good gap_tr_bad good bad L.debt2gdp
legelec_dpi1 maastricht infl dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr_good, laglimits (2 3) collapse) gmm(gap_tr_bad, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002-dy_2010)
two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 24                      Obs per group: min =         5
F(18, 33)     =     98.40                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.717      0.076     9.48    0.00         0.563        0.871
             |
 gap_tr_good |     -0.538      0.132    -4.08    0.00        -0.807       -0.270
  gap_tr_bad |      0.135      0.250     0.54    0.59        -0.374        0.643
        good |      1.053      0.488     2.16    0.04         0.059        2.047
         bad |      0.782      0.664     1.18    0.25        -0.568        2.132
             |
    debt2gdp |
         L1. |     -0.001      0.006    -0.14    0.89        -0.012        0.011
             |
legelec_dpi1 |     -0.614      0.219    -2.81    0.01        -1.059       -0.169
  maastricht |      0.649      0.236     2.75    0.01         0.169        1.129
        infl |      0.016      0.006     2.54    0.02         0.003        0.029
     dy_2002 |     -0.905      0.401    -2.25    0.03        -1.722       -0.088
     dy_2003 |     -0.429      0.257    -1.67    0.10        -0.951        0.093
     dy_2004 |     -0.270      0.373    -0.72    0.47        -1.030        0.489
     dy_2005 |      0.242      0.317     0.76    0.45        -0.403        0.887
     dy_2006 |      0.432      0.248     1.74    0.09        -0.072        0.936
     dy_2007 |      1.782      0.543     3.28    0.00         0.676        2.887
     dy_2008 |      0.227      0.524     0.43    0.67        -0.838        1.293
     dy_2009 |     -1.921      0.496    -3.87    0.00        -2.929       -0.912
     dy_2010 |     -0.834      0.415    -2.01    0.05        -1.678        0.010
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_bad collapsed
    L(2/3).gap_tr_good collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_bad collapsed
    DL.gap_tr_good collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.71  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.58  Pr > z =  0.559
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =  14.66  Prob > chi2 =  0.023
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   4.15  Prob > chi2 =  0.656
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   2.95  Prob > chi2 =  0.400
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   1.47  Prob > chi2 =  0.688
    Difference (null H = exogenous): chi2(3)    =   2.68  Prob > chi2 =  0.444
  gmm(gap_tr_good, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   1.98  Prob > chi2 =  0.577
    Difference (null H = exogenous): chi2(3)    =   2.18  Prob > chi2 =  0.537
  gmm(gap_tr_bad, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   2.23  Prob > chi2 =  0.526
    Difference (null H = exogenous): chi2(3)    =   1.92  Prob > chi2 =  0.589
```

Table 3.11 Column 3

```
xtabond2 carev_ngdp_tr L.carev_ngdp_tr gap_tr_good gap_tr_bad good bad
L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.carev_ngdp_tr, laglimits(1 4) collapse)
gmm(gap_tr_good, laglimits (2 3) collapse) gmm(gap_tr_bad, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002-dy_2010)
two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       484
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         8
F(18, 33)      =   4232.69                                     avg =     14.67
Prob > F       =     0.000                                     max =        16
------------------------------------------------------------------------------
             |              Corrected
carev_ngdp~r |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
carev_ngdp~r |
         L1. |      0.486       0.284     1.71    0.10       -0.093       1.065
             |
 gap_tr_good |     -0.074       0.144    -0.51    0.61       -0.368       0.220
  gap_tr_bad |     -0.349       0.270    -1.29    0.21       -0.899       0.201
        good |     19.831      10.465     1.89    0.07       -1.461      41.123
         bad |     19.844      10.131     1.96    0.06       -0.768      40.455
             |
    debt2gdp |
         L1. |      0.030       0.027     1.12    0.27       -0.024       0.084
             |
legelec_dpi1 |     -0.353       0.156    -2.26    0.03       -0.671      -0.035
  maastricht |      0.894       0.804     1.11    0.27       -0.741       2.529
        infl |     -0.061       0.022    -2.79    0.01       -0.105      -0.017
     dy_2002 |      0.045       0.328     0.14    0.89       -0.621       0.712
     dy_2003 |      0.218       0.390     0.56    0.58       -0.575       1.011
     dy_2004 |     -0.221       0.378    -0.58    0.56       -0.990       0.548
     dy_2005 |      0.215       0.348     0.62    0.54       -0.494       0.924
     dy_2006 |      0.100       0.579     0.17    0.86       -1.077       1.278
     dy_2007 |      0.138       0.904     0.15    0.88       -1.702       1.977
     dy_2008 |      0.184       0.778     0.24    0.81       -1.399       1.768
     dy_2009 |      0.763       0.700     1.09    0.28       -0.661       2.187
     dy_2010 |     -0.440       0.386    -1.14    0.26       -1.226       0.346
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_bad collapsed
    L(2/3).gap_tr_good collapsed
    L(1/4).L.carev_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_bad collapsed
    DL.gap_tr_good collapsed
    D.L.carev_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.05  Pr > z =  0.041
Arellano-Bond test for AR(2) in first differences: z =  -0.76  Pr > z =  0.447
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  42.55  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =  10.09  Prob > chi2 =  0.259
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(5)    =   6.11  Prob > chi2 =  0.295
    Difference (null H = exogenous): chi2(3)    =   3.98  Prob > chi2 =  0.264
  gmm(L.carev_ngdp_tr, collapse lag(1 4))
    Hansen test excluding group:     chi2(3)    =   4.29  Prob > chi2 =  0.232
    Difference (null H = exogenous): chi2(5)    =   5.80  Prob > chi2 =  0.326
  gmm(gap_tr_good, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   8.56  Prob > chi2 =  0.128
    Difference (null H = exogenous): chi2(3)    =   1.53  Prob > chi2 =  0.675
  gmm(gap_tr_bad, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   8.57  Prob > chi2 =  0.128
    Difference (null H = exogenous): chi2(3)    =   1.52  Prob > chi2 =  0.677
```

Table 3.11 Column 4

```
xtabond2 caprexp_ngdp_tr L.caprexp_ngdp_tr gap_tr_good gap_tr_bad good bad
L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.caprexp_ngdp_tr, laglimits (1 2) collapse)
gmm(gap_tr_good, laglimits (2 3) collapse) gmm(gap_tr_bad, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002-dy_2010)
two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       465
Time variable : year                            Number of groups   =        33
Number of instruments = 24                      Obs per group: min =         5
F(18, 33)     =   1702.08                                      avg =     14.09
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
caprexp_ng~r |      Coef.   Std. Err.       t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
caprexp_ng~r |
         L1. |      0.432       0.325     1.33    0.19        -0.228       1.093
             |
 gap_tr_good |      0.302       0.150     2.02    0.05        -0.003       0.606
  gap_tr_bad |     -0.486       0.301    -1.62    0.12        -1.099       0.126
        good |     20.921      12.573     1.66    0.11        -4.660      46.501
         bad |     21.144      12.422     1.70    0.10        -4.129      46.417
             |
    debt2gdp |
         L1. |      0.030       0.015     2.03    0.05        -0.000       0.059
             |
legelec_dpi1 |      0.443       0.152     2.92    0.01         0.134       0.752
  maastricht |      0.366       1.055     0.35    0.73        -1.780       2.512
        infl |     -0.051       0.032    -1.60    0.12        -0.117       0.014
     dy_2002 |      0.848       0.296     2.86    0.01         0.245       1.450
     dy_2003 |      1.041       0.448     2.33    0.03         0.131       1.952
     dy_2004 |      0.335       0.574     0.58    0.56        -0.834       1.504
     dy_2005 |      0.585       0.401     1.46    0.15        -0.230       1.401
     dy_2006 |      0.293       0.425     0.69    0.50        -0.572       1.158
     dy_2007 |     -0.427       0.627    -0.68    0.50        -1.703       0.850
     dy_2008 |      1.527       0.725     2.10    0.04         0.051       3.002
     dy_2009 |      3.854       0.686     5.61    0.00         2.457       5.250
     dy_2010 |      2.126       1.377     1.54    0.13        -0.675       4.927
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_bad collapsed
    L(2/3).gap_tr_good collapsed
    L(1/2).L.caprexp_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp legelec_dpi1 maastricht infl good bad dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_bad collapsed
    DL.gap_tr_good collapsed
    D.L.caprexp_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.72  Pr > z =  0.085
Arellano-Bond test for AR(2) in first differences: z =   0.42  Pr > z =  0.672
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(6)    =   7.67  Prob > chi2 =  0.263
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(6)    =   4.16  Prob > chi2 =  0.655
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   2.90  Prob > chi2 =  0.408
    Difference (null H = exogenous): chi2(3)    =   1.26  Prob > chi2 =  0.738
  gmm(L.caprexp_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(3)    =   2.13  Prob > chi2 =  0.546
    Difference (null H = exogenous): chi2(3)    =   2.03  Prob > chi2 =  0.566
  gmm(gap_tr_good, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   1.06  Prob > chi2 =  0.786
    Difference (null H = exogenous): chi2(3)    =   3.09  Prob > chi2 =  0.378
  gmm(gap_tr_bad, collapse lag(2 3))
    Hansen test excluding group:     chi2(3)    =   1.70  Prob > chi2 =  0.636
    Difference (null H = exogenous): chi2(3)    =   2.45  Prob > chi2 =  0.484
```

Table 3.12 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp legelec_dpi1 maastricht
infl dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00         0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03        -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07        -0.001       0.017
             |
legelec_dpi1 |     -0.560      0.202    -2.78    0.01        -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00         0.259       1.071
        infl |      0.017      0.005     3.11    0.00         0.006       0.028
     dy_2002 |     -0.585      0.402    -1.45    0.16        -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73        -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86        -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34        -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89        -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33        -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02        -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00        -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14        -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43        -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.12 Column 2

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp legelec_dpi1 infl
dy_2002-dy_2010 if year>1998 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits (2 3)
collapse)  iv(L.debt2gdp legelec_dpi1 infl dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       372
Time variable : year                            Number of groups   =        33
Number of instruments = 19                      Obs per group: min =         5
F(14, 32)     =     44.03                                      avg =     11.27
Prob > F      =     0.000                                      max =        12
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.710      0.089     7.94    0.00        0.528       0.892
             |
      gap_tr |     -0.166      0.061    -2.72    0.01       -0.290      -0.042
             |
    debt2gdp |
         L1. |      0.004      0.004     1.05    0.30       -0.004       0.013
             |
legelec_dpi1 |     -0.689      0.201    -3.42    0.00       -1.099      -0.278
        infl |     -0.017      0.022    -0.75    0.46       -0.062       0.029
     dy_2002 |     -0.599      0.436    -1.37    0.18       -1.488       0.289
     dy_2003 |     -0.236      0.339    -0.70    0.49       -0.926       0.454
     dy_2004 |     -0.098      0.310    -0.32    0.75       -0.729       0.533
     dy_2005 |      0.152      0.295     0.51    0.61       -0.449       0.752
     dy_2006 |      0.015      0.230     0.06    0.95       -0.453       0.482
     dy_2007 |      0.464      0.442     1.05    0.30       -0.436       1.364
     dy_2008 |     -0.935      0.421    -2.22    0.03       -1.793      -0.077
     dy_2009 |     -2.060      0.514    -4.01    0.00       -3.106      -1.014
     dy_2010 |     -0.721      0.585    -1.23    0.23       -1.913       0.471
       _cons |      0.184      0.334     0.55    0.59       -0.496       0.864
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 infl dy_2002 dy_2003 dy_2004 dy_2005 dy_2006
    dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
```

```
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.06  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.72  Pr > z =  0.469
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  10.88  Prob > chi2 =  0.028
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   1.61  Prob > chi2 =  0.807
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   0.69  Prob > chi2 =  0.709
    Difference (null H = exogenous): chi2(2)    =   0.93  Prob > chi2 =  0.630
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.01  Prob > chi2 =  0.908
    Difference (null H = exogenous): chi2(3)    =   1.60  Prob > chi2 =  0.660
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   0.13  Prob > chi2 =  0.723
    Difference (null H = exogenous): chi2(3)    =   1.49  Prob > chi2 =  0.685
```

Table 3.12 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    444.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.066    10.61    0.00        0.564       0.832
             |
 gap_tr_eu17 |      0.020      0.120     0.17    0.87       -0.223       0.263
gap_tr_nms10 |     -0.180      0.043    -4.20    0.00       -0.267      -0.093
 gap_tr_see6 |     -0.270      0.061    -4.44    0.00       -0.393      -0.146
        eu17 |      0.213      0.477     0.45    0.66       -0.757       1.183
       nms10 |     -0.174      0.253    -0.69    0.50       -0.687       0.340
        see6 |      0.369      0.291     1.27    0.21       -0.222       0.960
             |
    debt2gdp |
         L1. |      0.002      0.006     0.36    0.72       -0.009       0.013
             |
legelec_dpi1 |     -0.489      0.190    -2.58    0.01       -0.875      -0.104
  maastricht |      0.832      0.352     2.36    0.02        0.116       1.547
        infl |      0.020      0.004     5.37    0.00        0.012       0.027
     dy_2002 |     -0.624      0.375    -1.66    0.11       -1.387       0.139
     dy_2003 |     -0.228      0.262    -0.87    0.39       -0.760       0.304
     dy_2004 |     -0.135      0.310    -0.43    0.67       -0.766       0.496
     dy_2005 |      0.192      0.314     0.61    0.54       -0.446       0.831
     dy_2006 |     -0.169      0.253    -0.67    0.51       -0.684       0.346
     dy_2007 |      0.133      0.441     0.30    0.76       -0.764       1.031
     dy_2008 |     -1.295      0.415    -3.12    0.00       -2.138      -0.451
     dy_2009 |     -2.151      0.455    -4.73    0.00       -3.076      -1.226
     dy_2010 |     -0.582      0.337    -1.73    0.09       -1.267       0.103
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.84  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.628
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  33.36  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   4.04  Prob > chi2 =  0.854
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.86  Prob > chi2 =  0.582
    Difference (null H = exogenous): chi2(4)    =   1.18  Prob > chi2 =  0.882
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.57  Prob > chi2 =  0.766
    Difference (null H = exogenous): chi2(3)    =   1.46  Prob > chi2 =  0.691
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.48  Prob > chi2 =  0.780
    Difference (null H = exogenous): chi2(3)    =   1.56  Prob > chi2 =  0.668
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.72  Prob > chi2 =  0.590
    Difference (null H = exogenous): chi2(3)    =   0.31  Prob > chi2 =  0.957
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.83  Prob > chi2 =  0.726
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
```

Table 3.12 Column 4

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl dy_1995-dy_2003 if year>1994
& year<2004 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10, laglimits (2 3)
collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)  iv(L.debt2gdp
legelec_dpi1  maastricht infl dy_1995-dy_2003 eu17 nms10 see6) two robust small
nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       236
Time variable : year                            Number of groups   =        31
Number of instruments = 28                      Obs per group: min =         1
F(19, 31)     =     44.91                                      avg =      7.61
Prob > F      =     0.000                                      max =         9
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.556      0.121     4.61    0.00         0.310       0.802
             |
 gap_tr_eu17 |     -0.030      0.095    -0.32    0.75        -0.225       0.164
gap_tr_nms10 |     -0.018      0.123    -0.15    0.88        -0.270       0.233
 gap_tr_see6 |     -0.656      0.264    -2.49    0.02        -1.194      -0.118
        eu17 |     -0.598      1.014    -0.59    0.56        -2.666       1.471
       nms10 |     -1.283      0.964    -1.33    0.19        -3.249       0.684
        see6 |     -2.216      1.339    -1.66    0.11        -4.947       0.515
             |
    debt2gdp |
         L1. |      0.007      0.009     0.78    0.44        -0.011       0.025
             |
legelec_dpi1 |     -0.297      0.277    -1.07    0.29        -0.862       0.267
  maastricht |      1.306      0.725     1.80    0.08        -0.173       2.785
        infl |      0.021      0.006     3.42    0.00         0.009       0.034
     dy_1995 |     -0.319      0.429    -0.74    0.46        -1.195       0.557
     dy_1996 |      0.667      0.406     1.64    0.11        -0.161       1.495
     dy_1997 |      0.425      0.590     0.72    0.48        -0.778       1.628
     dy_1998 |      0.506      0.544     0.93    0.36        -0.603       1.615
     dy_1999 |      1.181      0.877     1.35    0.19        -0.608       2.971
     dy_2000 |      1.688      0.855     1.97    0.06        -0.056       3.431
     dy_2001 |      0.760      0.880     0.86    0.39        -1.035       2.554
     dy_2002 |      0.242      0.928     0.26    0.80        -1.650       2.135
     dy_2003 |      0.565      0.740     0.76    0.45        -0.944       2.075
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl dy_1995 dy_1996 dy_1997 dy_1998
    dy_1999 dy_2000 dy_2001 dy_2002 dy_2003 eu17 nms10 see6)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl dy_1995 dy_1996 dy_1997 dy_1998
    dy_1999 dy_2000 dy_2001 dy_2002 dy_2003 eu17 nms10 see6
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.55  Pr > z =  0.011
Arellano-Bond test for AR(2) in first differences: z =   0.32  Pr > z =  0.751
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  10.61  Prob > chi2 =  0.225
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   7.33  Prob > chi2 =  0.502
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   3.88  Prob > chi2 =  0.423
    Difference (null H = exogenous): chi2(4)    =   3.45  Prob > chi2 =  0.485
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   4.05  Prob > chi2 =  0.542
    Difference (null H = exogenous): chi2(3)    =   3.28  Prob > chi2 =  0.351
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.88  Prob > chi2 =  0.719
    Difference (null H = exogenous): chi2(3)    =   4.45  Prob > chi2 =  0.217
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.71  Prob > chi2 =  0.336
    Difference (null H = exogenous): chi2(3)    =   1.62  Prob > chi2 =  0.654
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.94  Prob > chi2 =  0.313
    Difference (null H = exogenous): chi2(3)    =   1.39  Prob > chi2 =  0.707
```

Table 3.12 Column 5

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 infl dy_2004-dy_2010 if year>2003 &
year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10, laglimits (2 3)
collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)  iv(L.debt2gdp
legelec_dpi1 infl dy_2004-dy_2010 eu17 nms10 see6) two robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       228
Time variable : year                            Number of groups   =        33
Number of instruments = 25                      Obs per group: min =         5
F(16, 33)     =    153.44                                      avg =      6.91
Prob > F      =     0.000                                      max =         7
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.754      0.068    11.03    0.00         0.615       0.893
             |
 gap_tr_eu17 |      0.030      0.172     0.17    0.86        -0.321       0.381
gap_tr_nms10 |     -0.273      0.067    -4.11    0.00        -0.409      -0.138
 gap_tr_see6 |     -0.478      0.121    -3.96    0.00        -0.724      -0.233
        eu17 |     -0.488      0.680    -0.72    0.48        -1.873       0.896
       nms10 |     -0.334      0.528    -0.63    0.53        -1.409       0.740
        see6 |      0.229      0.542     0.42    0.68        -0.873       1.332
             |
    debt2gdp |
         L1. |      0.001      0.007     0.18    0.86        -0.013       0.015
             |
legelec_dpi1 |     -0.405      0.306    -1.32    0.19        -1.028       0.218
        infl |      0.072      0.073     1.00    0.33        -0.075       0.220
     dy_2004 |      0.227      0.464     0.49    0.63        -0.717       1.171
     dy_2005 |      0.541      0.435     1.24    0.22        -0.344       1.426
     dy_2006 |      0.469      0.518     0.91    0.37        -0.584       1.522
     dy_2007 |      1.076      0.900     1.20    0.24        -0.755       2.906
     dy_2008 |     -0.590      0.712    -0.83    0.41        -2.037       0.858
     dy_2009 |     -1.321      0.599    -2.21    0.03        -2.540      -0.102
     dy_2010 |     -0.504      0.387    -1.30    0.20        -1.292       0.285
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 infl dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010 eu17 nms10 see6)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
```

```
    L.debt2gdp legelec_dpi1 infl dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
    dy_2009 dy_2010 eu17 nms10 see6
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.54  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.24  Pr > z =  0.812
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  23.44  Prob > chi2 =  0.003
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   5.22  Prob > chi2 =  0.734
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   4.81  Prob > chi2 =  0.307
    Difference (null H = exogenous): chi2(4)    =   0.41  Prob > chi2 =  0.981
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   3.11  Prob > chi2 =  0.682
    Difference (null H = exogenous): chi2(3)    =   2.11  Prob > chi2 =  0.550
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   1.90  Prob > chi2 =  0.863
    Difference (null H = exogenous): chi2(3)    =   3.33  Prob > chi2 =  0.344
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.92  Prob > chi2 =  0.426
    Difference (null H = exogenous): chi2(3)    =   0.30  Prob > chi2 =  0.959
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.55  Prob > chi2 =  0.769
    Difference (null H = exogenous): chi2(3)    =   2.67  Prob > chi2 =  0.445
```

Table 3.13 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    444.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698      0.066    10.61    0.00         0.564       0.832
             |
 gap_tr_eu17 |      0.020      0.120     0.17    0.87        -0.223       0.263
gap_tr_nms10 |     -0.180      0.043    -4.20    0.00        -0.267      -0.093
 gap_tr_see6 |     -0.270      0.061    -4.44    0.00        -0.393      -0.146
        eu17 |      0.213      0.477     0.45    0.66        -0.757       1.183
       nms10 |     -0.174      0.253    -0.69    0.50        -0.687       0.340
        see6 |      0.369      0.291     1.27    0.21        -0.222       0.960
             |
    debt2gdp |
         L1. |      0.002      0.006     0.36    0.72        -0.009       0.013
             |
legelec_dpi1 |     -0.489      0.190    -2.58    0.01        -0.875      -0.104
  maastricht |      0.832      0.352     2.36    0.02         0.116       1.547
        infl |      0.020      0.004     5.37    0.00         0.012       0.027
     dy_2002 |     -0.624      0.375    -1.66    0.11        -1.387       0.139
     dy_2003 |     -0.228      0.262    -0.87    0.39        -0.760       0.304
     dy_2004 |     -0.135      0.310    -0.43    0.67        -0.766       0.496
     dy_2005 |      0.192      0.314     0.61    0.54        -0.446       0.831
     dy_2006 |     -0.169      0.253    -0.67    0.51        -0.684       0.346
     dy_2007 |      0.133      0.441     0.30    0.76        -0.764       1.031
     dy_2008 |     -1.295      0.415    -3.12    0.00        -2.138      -0.451
     dy_2009 |     -2.151      0.455    -4.73    0.00        -3.076      -1.226
     dy_2010 |     -0.582      0.337    -1.73    0.09        -1.267       0.103
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.84  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.628
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  33.36  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   4.04  Prob > chi2 =  0.854
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.86  Prob > chi2 =  0.582
    Difference (null H = exogenous): chi2(4)    =   1.18  Prob > chi2 =  0.882
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.57  Prob > chi2 =  0.766
    Difference (null H = exogenous): chi2(3)    =   1.46  Prob > chi2 =  0.691
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.48  Prob > chi2 =  0.780
    Difference (null H = exogenous): chi2(3)    =   1.56  Prob > chi2 =  0.668
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.72  Prob > chi2 =  0.590
    Difference (null H = exogenous): chi2(3)    =   0.31  Prob > chi2 =  0.957
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.83  Prob > chi2 =  0.726
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
```

Table 3.13 Column 2

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       467
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    139.35                                      avg =     14.15
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.724      0.083     8.72    0.00         0.555       0.893
             |
 gap_tr_eu17 |      0.185      0.134     1.38    0.18        -0.087       0.457
gap_tr_nms10 |     -0.020      0.044    -0.45    0.65        -0.110       0.070
 gap_tr_see6 |      0.007      0.055     0.12    0.91        -0.106       0.119
        eu17 |      0.467      0.563     0.83    0.41        -0.679       1.612
       nms10 |      0.161      0.346     0.46    0.65        -0.544       0.866
        see6 |      0.531      0.334     1.59    0.12        -0.149       1.211
             |
    debt2gdp |
         L1. |     -0.000      0.007    -0.02    0.98        -0.013       0.013
             |
legelec_dpi1 |     -0.506      0.222    -2.27    0.03        -0.958      -0.053
  maastricht |      0.852      0.395     2.16    0.04         0.049       1.655
        infl |      0.008      0.003     2.53    0.02         0.002       0.015
     dy_2002 |     -0.688      0.390    -1.77    0.09        -1.481       0.105
     dy_2003 |     -0.442      0.278    -1.59    0.12        -1.008       0.123
     dy_2004 |     -0.067      0.322    -0.21    0.84        -0.723       0.589
     dy_2005 |      0.266      0.360     0.74    0.46        -0.466       0.999
     dy_2006 |      0.052      0.263     0.20    0.84        -0.483       0.588
     dy_2007 |      0.171      0.466     0.37    0.72        -0.777       1.118
     dy_2008 |     -2.095      0.414    -5.06    0.00        -2.937      -1.252
     dy_2009 |     -4.304      0.456    -9.44    0.00        -5.231      -3.376
     dy_2010 |     -0.426      0.565    -0.75    0.46        -1.575       0.722
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.bal_pr2gdp collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.bal_pr2gdp collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.72  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.61  Pr > z =  0.539
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  37.89  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   6.56  Prob > chi2 =  0.585
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   4.93  Prob > chi2 =  0.295
    Difference (null H = exogenous): chi2(4)    =   1.63  Prob > chi2 =  0.803
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   4.65  Prob > chi2 =  0.460
    Difference (null H = exogenous): chi2(3)    =   1.91  Prob > chi2 =  0.591
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.08  Prob > chi2 =  0.406
    Difference (null H = exogenous): chi2(3)    =   1.48  Prob > chi2 =  0.686
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   4.90  Prob > chi2 =  0.428
    Difference (null H = exogenous): chi2(3)    =   1.66  Prob > chi2 =  0.646
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.16  Prob > chi2 =  0.396
    Difference (null H = exogenous): chi2(3)    =   1.40  Prob > chi2 =  0.707
```

Table 3.13 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2008 if
year>1994 & year<2009 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2008) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       399
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         3
F(18, 33)     =     36.44                                      avg =     12.09
Prob > F      =     0.000                                      max =        14
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.662      0.089     7.44    0.00         0.481       0.843
             |
 gap_tr_eu17 |      0.132      0.116     1.14    0.26        -0.104       0.368
gap_tr_nms10 |     -0.130      0.046    -2.81    0.01        -0.224      -0.036
 gap_tr_see6 |     -0.377      0.105    -3.61    0.00        -0.590      -0.165
        eu17 |      0.078      0.687     0.11    0.91        -1.319       1.476
       nms10 |     -0.417      0.423    -0.99    0.33        -1.278       0.443
        see6 |      0.234      0.755     0.31    0.76        -1.302       1.770
             |
    debt2gdp |
         L1. |      0.006      0.011     0.58    0.57        -0.015       0.028
             |
legelec_dpi1 |     -0.392      0.209    -1.88    0.07        -0.816       0.032
  maastricht |      0.834      0.343     2.43    0.02         0.136       1.531
        infl |      0.016      0.003     5.27    0.00         0.010       0.023
     dy_2002 |     -0.430      0.440    -0.98    0.33        -1.325       0.464
     dy_2003 |     -0.128      0.384    -0.33    0.74        -0.910       0.654
     dy_2004 |     -0.085      0.481    -0.18    0.86        -1.064       0.894
     dy_2005 |      0.240      0.402     0.60    0.56        -0.578       1.057
     dy_2006 |     -0.162      0.399    -0.41    0.69        -0.974       0.651
     dy_2007 |     -0.151      0.572    -0.26    0.79        -1.315       1.013
     dy_2008 |     -1.455      0.474    -3.07    0.00        -2.420      -0.490
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.33  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.09  Pr > z =  0.931
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  24.60  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =  11.84  Prob > chi2 =  0.159
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   6.65  Prob > chi2 =  0.156
    Difference (null H = exogenous): chi2(4)    =   5.19  Prob > chi2 =  0.268
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   6.15  Prob > chi2 =  0.292
    Difference (null H = exogenous): chi2(3)    =   5.68  Prob > chi2 =  0.128
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.39  Prob > chi2 =  0.371
    Difference (null H = exogenous): chi2(3)    =   6.45  Prob > chi2 =  0.092
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   6.04  Prob > chi2 =  0.303
    Difference (null H = exogenous): chi2(3)    =   5.80  Prob > chi2 =  0.122
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   6.71  Prob > chi2 =  0.243
    Difference (null H = exogenous): chi2(3)    =   5.13  Prob > chi2 =  0.163
```

Table 3.13 Column 4

```
xtabond2 bal_pr2gdp L.bal_pr2gdp gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2008 if
year>1994 & year<2009 & (eu27==1|see6==1), gmm(L.bal_pr2gdp, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse) gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2008) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       402
Time variable : year                            Number of groups   =        33
Number of instruments = 26                      Obs per group: min =         3
F(18, 33)     =     12.32                                      avg =     12.18
Prob > F      =     0.000                                      max =        14
------------------------------------------------------------------------------
             |              Corrected
  bal_pr2gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  bal_pr2gdp |
         L1. |      0.630      0.143     4.42    0.00         0.340        0.920
             |
 gap_tr_eu17 |      0.432      0.174     2.49    0.02         0.079        0.786
gap_tr_nms10 |      0.031      0.054     0.56    0.58        -0.080        0.141
 gap_tr_see6 |     -0.118      0.120    -0.99    0.33        -0.362        0.125
        eu17 |      0.073      0.832     0.09    0.93        -1.620        1.766
       nms10 |     -0.307      0.521    -0.59    0.56        -1.366        0.753
        see6 |      0.133      0.964     0.14    0.89        -1.829        2.095
             |
    debt2gdp |
         L1. |      0.009      0.012     0.73    0.47        -0.015        0.032
             |
legelec_dpi1 |     -0.459      0.226    -2.04    0.05        -0.918       -0.000
  maastricht |      1.025      0.370     2.77    0.01         0.273        1.778
        infl |      0.009      0.003     3.18    0.00         0.003        0.015
     dy_2002 |     -0.628      0.473    -1.33    0.19        -1.591        0.334
     dy_2003 |     -0.282      0.445    -0.63    0.53        -1.187        0.623
     dy_2004 |      0.109      0.524     0.21    0.84        -0.958        1.176
     dy_2005 |      0.307      0.479     0.64    0.53        -0.667        1.281
     dy_2006 |      0.076      0.443     0.17    0.86        -0.824        0.977
     dy_2007 |      0.041      0.632     0.06    0.95        -1.245        1.326
     dy_2008 |     -1.948      0.648    -3.01    0.01        -3.266       -0.630
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.bal_pr2gdp collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.bal_pr2gdp collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.24  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.34  Pr > z =  0.736
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  30.09  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =  13.15  Prob > chi2 =  0.107
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   7.21  Prob > chi2 =  0.125
    Difference (null H = exogenous): chi2(4)    =   5.94  Prob > chi2 =  0.203
  gmm(L.bal_pr2gdp, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =  11.06  Prob > chi2 =  0.050
    Difference (null H = exogenous): chi2(3)    =   2.10  Prob > chi2 =  0.552
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   6.33  Prob > chi2 =  0.275
    Difference (null H = exogenous): chi2(3)    =   6.82  Prob > chi2 =  0.078
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   5.43  Prob > chi2 =  0.366
    Difference (null H = exogenous): chi2(3)    =   7.73  Prob > chi2 =  0.052
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   7.03  Prob > chi2 =  0.218
    Difference (null H = exogenous): chi2(3)    =   6.12  Prob > chi2 =  0.106
```

Table 3.14 Column 1

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr, laglimits(2 3)
collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dy_2002-dy_2010) two
robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 20                      Obs per group: min =         5
F(15, 32)     =     79.39                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.691      0.074     9.30    0.00        0.539       0.842
             |
      gap_tr |     -0.153      0.068    -2.25    0.03       -0.292      -0.015
             |
    debt2gdp |
         L1. |      0.008      0.004     1.90    0.07       -0.001       0.017
             |
        infl |      0.017      0.005     3.11    0.00        0.006       0.028
legelec_dpi1 |     -0.560      0.202    -2.78    0.01       -0.970      -0.149
  maastricht |      0.665      0.199     3.34    0.00        0.259       1.071
     dy_2002 |     -0.585      0.402    -1.45    0.16       -1.404       0.235
     dy_2003 |     -0.107      0.311    -0.34    0.73       -0.740       0.526
     dy_2004 |     -0.052      0.295    -0.18    0.86       -0.652       0.549
     dy_2005 |      0.288      0.298     0.97    0.34       -0.319       0.896
     dy_2006 |      0.035      0.248     0.14    0.89       -0.470       0.539
     dy_2007 |      0.441      0.449     0.98    0.33       -0.474       1.356
     dy_2008 |     -1.053      0.413    -2.55    0.02       -1.895      -0.211
     dy_2009 |     -2.084      0.439    -4.75    0.00       -2.977      -1.191
     dy_2010 |     -0.679      0.451    -1.51    0.14       -1.597       0.240
       _cons |     -0.228      0.285    -0.80    0.43       -0.809       0.353
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dy_2002 dy_2003 dy_2004 dy_2005
    dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
```

```
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  17.45  Prob > chi2 =  0.002
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   2.23  Prob > chi2 =  0.694
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   1.74  Prob > chi2 =  0.419
    Difference (null H = exogenous): chi2(2)    =   0.49  Prob > chi2 =  0.783
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.95  Prob > chi2 =  0.331
    Difference (null H = exogenous): chi2(3)    =   1.28  Prob > chi2 =  0.733
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   1.86  Prob > chi2 =  0.173
    Difference (null H = exogenous): chi2(3)    =   0.37  Prob > chi2 =  0.946
```

Table 3.14 Column 2

```
jackknife _b _se, cluster(country) : xtabond2 capb_ngdp_tr L.capb_ngdp_tr
gap_tr L.debt2gdp legelec_dpi1 maastricht infl dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp legelec_dpi1 maastricht
infl dy_2002-dy_2010) two small robust
(running xtabond2 on estimation sample)

Jackknife replications (33)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
.................................

Jackknife results                               Number of obs      =       464
                                                Replications       =        33

                                (Replications based on 33 clusters in country)
------------------------------------------------------------------------------
             |              Jackknife
             |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
b            |
capb_ngdp_tr |
         L1. |      0.691      0.082     8.43    0.00         0.524       0.858
             |
      gap_tr |     -0.153      0.069    -2.22    0.03        -0.294      -0.012
             |
    debt2gdp |
         L1. |      0.008      0.006     1.30    0.20        -0.004       0.020
             |
legelec_dpi1 |     -0.560      0.208    -2.69    0.01        -0.983      -0.137
  maastricht |      0.665      0.242     2.75    0.01         0.172       1.158
        infl |      0.017      0.007     2.58    0.01         0.004       0.031
     dy_2002 |     -0.585      0.497    -1.18    0.25        -1.597       0.428
     dy_2003 |     -0.107      0.383    -0.28    0.78        -0.888       0.674
     dy_2004 |     -0.052      0.309    -0.17    0.87        -0.681       0.578
     dy_2005 |      0.288      0.338     0.85    0.40        -0.400       0.977
     dy_2006 |      0.035      0.289     0.12    0.91        -0.554       0.623
     dy_2007 |      0.441      0.497     0.89    0.38        -0.571       1.452
     dy_2008 |     -1.053      0.418    -2.52    0.02        -1.905      -0.202
     dy_2009 |     -2.084      0.477    -4.37    0.00        -3.055      -1.113
     dy_2010 |     -0.679      0.455    -1.49    0.15        -1.607       0.249
       _cons |     -0.228      0.372    -0.61    0.54        -0.987       0.531
-------------+----------------------------------------------------------------
se           |
capb_ngdp_tr |
         L1. |      0.074      0.027     2.75    0.01         0.019       0.129
             |
      gap_tr |      0.068      0.043     1.57    0.13        -0.020       0.156
             |
    debt2gdp |
         L1. |      0.004      0.002     2.59    0.01         0.001       0.007
             |
legelec_dpi1 |      0.202      0.067     3.03    0.00         0.066       0.337
  maastricht |      0.199      0.052     3.81    0.00         0.093       0.306
        infl |      0.005      0.036     0.15    0.88        -0.068       0.079
```

dy_2002	0.402	0.067	5.97	0.00	0.265	0.539
dy_2003	0.311	0.100	3.10	0.00	0.106	0.515
dy_2004	0.295	0.092	3.21	0.00	0.108	0.482
dy_2005	0.298	0.053	5.60	0.00	0.190	0.407
dy_2006	0.248	0.064	3.85	0.00	0.117	0.379
dy_2007	0.449	0.126	3.58	0.00	0.193	0.705
dy_2008	0.413	0.134	3.08	0.00	0.140	0.687
dy_2009	0.439	0.097	4.54	0.00	0.242	0.635
dy_2010	0.451	0.171	2.64	0.01	0.103	0.799
_cons	0.285	0.144	1.98	0.06	-0.009	0.579

Table 3.14 Column 3

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17
nms10 see6 L.debt2gdp legelec_dpi1 maastricht infl  dy_2002-dy_2010 if
year>1994 & year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2)
collapse) gmm(gap_tr_eu17, laglimits (2 3) collapse) gmm(gap_tr_nms10,
laglimits (2 3) collapse)  gmm(gap_tr_see6, laglimits (2 3) collapse)
iv(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002-dy_2010) two
robust small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       464
Time variable : year                            Number of groups   =        33
Number of instruments = 28                      Obs per group: min =         5
F(20, 33)     =    444.89                                      avg =     14.06
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.698       0.066    10.61    0.00        0.564       0.832
             |
 gap_tr_eu17 |      0.020       0.120     0.17    0.87       -0.223       0.263
gap_tr_nms10 |     -0.180       0.043    -4.20    0.00       -0.267      -0.093
 gap_tr_see6 |     -0.270       0.061    -4.44    0.00       -0.393      -0.146
        eu17 |      0.213       0.477     0.45    0.66       -0.757       1.183
       nms10 |     -0.174       0.253    -0.69    0.50       -0.687       0.340
        see6 |      0.369       0.291     1.27    0.21       -0.222       0.960
             |
    debt2gdp |
         L1. |      0.002       0.006     0.36    0.72       -0.009       0.013
             |
legelec_dpi1 |     -0.489       0.190    -2.58    0.01       -0.875      -0.104
  maastricht |      0.832       0.352     2.36    0.02        0.116       1.547
        infl |      0.020       0.004     5.37    0.00        0.012       0.027
     dy_2002 |     -0.624       0.375    -1.66    0.11       -1.387       0.139
     dy_2003 |     -0.228       0.262    -0.87    0.39       -0.760       0.304
     dy_2004 |     -0.135       0.310    -0.43    0.67       -0.766       0.496
     dy_2005 |      0.192       0.314     0.61    0.54       -0.446       0.831
     dy_2006 |     -0.169       0.253    -0.67    0.51       -0.684       0.346
     dy_2007 |      0.133       0.441     0.30    0.76       -0.764       1.031
     dy_2008 |     -1.295       0.415    -3.12    0.00       -2.138      -0.451
     dy_2009 |     -2.151       0.455    -4.73    0.00       -3.076      -1.226
     dy_2010 |     -0.582       0.337    -1.73    0.09       -1.267       0.103
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr_see6 collapsed
    L(2/3).gap_tr_nms10 collapsed
```

```
    L(2/3).gap_tr_eu17 collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp legelec_dpi1 maastricht infl eu17 nms10 see6 dy_2002 dy_2003
    dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr_see6 collapsed
    DL.gap_tr_nms10 collapsed
    DL.gap_tr_eu17 collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.84  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.48  Pr > z =  0.628
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(8)    =  33.36  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(8)    =   4.04  Prob > chi2 =  0.854
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    =   2.86  Prob > chi2 =  0.582
    Difference (null H = exogenous): chi2(4)    =   1.18  Prob > chi2 =  0.882
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(5)    =   2.57  Prob > chi2 =  0.766
    Difference (null H = exogenous): chi2(3)    =   1.46  Prob > chi2 =  0.691
  gmm(gap_tr_eu17, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.48  Prob > chi2 =  0.780
    Difference (null H = exogenous): chi2(3)    =   1.56  Prob > chi2 =  0.668
  gmm(gap_tr_nms10, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   3.72  Prob > chi2 =  0.590
    Difference (null H = exogenous): chi2(3)    =   0.31  Prob > chi2 =  0.957
  gmm(gap_tr_see6, collapse lag(2 3))
    Hansen test excluding group:     chi2(5)    =   2.83  Prob > chi2 =  0.726
    Difference (null H = exogenous): chi2(3)    =   1.21  Prob > chi2 =  0.752
```

Table 3.14 Column 4

```
jackknife _b _se, cluster(country) : xtabond2 capb_ngdp_tr L.capb_ngdp_tr
gap_tr_eu17 gap_tr_nms10 gap_tr_see6 eu17 nms10 see6 L.debt2gdp legelec_dpi1
maastricht infl  dy_2002-dy_2010 if year>1994 & year<2011 & (eu27==1|see6==1),
gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr_eu17, laglimits (2 3)
collapse) gmm(gap_tr_nms10, laglimits (2 3) collapse)  gmm(gap_tr_see6,
laglimits (2 3) collapse)  iv(L.debt2gdp legelec_dpi1 maastricht infl eu17
nms10 see6 dy_2002-dy_2010) two robust small nocons
(running xtabond2 on estimation sample)

Jackknife replications (33)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
.................................

Jackknife results                               Number of obs      =       464
                                                Replications       =        33

                                 (Replications based on 33 clusters in country)
------------------------------------------------------------------------------
             |              Jackknife
             |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
b            |
capb_ngdp_tr |
         L1. |      0.698      0.100     6.95    0.00        0.493       0.902
             |
 gap_tr_eu17 |      0.020      0.228     0.09    0.93       -0.445       0.485
gap_tr_nms10 |     -0.180      0.067    -2.67    0.01       -0.317      -0.043
 gap_tr_see6 |     -0.270      0.097    -2.77    0.01       -0.468      -0.071
        eu17 |      0.213      0.641     0.33    0.74       -1.092       1.518
       nms10 |     -0.174      0.333    -0.52    0.61       -0.853       0.505
        see6 |      0.369      0.373     0.99    0.33       -0.392       1.129
             |
    debt2gdp |
         L1. |      0.002      0.007     0.27    0.79       -0.013       0.017
             |
legelec_dpi1 |     -0.489      0.259    -1.89    0.07       -1.017       0.038
  maastricht |      0.832      0.455     1.83    0.08       -0.096       1.759
        infl |      0.020      0.041     0.48    0.63       -0.063       0.102
     dy_2002 |     -0.624      0.525    -1.19    0.24       -1.693       0.445
     dy_2003 |     -0.228      0.388    -0.59    0.56       -1.019       0.563
     dy_2004 |     -0.135      0.338    -0.40    0.69       -0.824       0.554
     dy_2005 |      0.192      0.356     0.54    0.59       -0.532       0.917
     dy_2006 |     -0.169      0.291    -0.58    0.57       -0.763       0.424
     dy_2007 |      0.133      0.598     0.22    0.83       -1.085       1.351
     dy_2008 |     -1.295      0.592    -2.19    0.04       -2.500      -0.089
     dy_2009 |     -2.151      0.660    -3.26    0.00       -3.496      -0.806
     dy_2010 |     -0.582      0.544    -1.07    0.29       -1.689       0.526
-------------+----------------------------------------------------------------
se           |
capb_ngdp_tr |
         L1. |      0.066      0.031     2.15    0.04        0.003       0.128
             |
 gap_tr_eu17 |      0.120      0.057     2.08    0.05        0.002       0.237
gap_tr_nms10 |      0.043      0.023     1.88    0.07       -0.004       0.089
```

gap_tr_see6	0.061	0.022	2.71	0.01	0.015	0.106
eu17	0.477	0.203	2.34	0.03	0.062	0.891
nms10	0.253	0.126	2.01	0.05	-0.004	0.509
see6	0.291	0.160	1.81	0.08	-0.036	0.617
debt2gdp						
L1.	0.006	0.003	1.88	0.07	-0.000	0.012
legelec_dpi1	0.190	0.065	2.92	0.01	0.058	0.322
maastricht	0.352	0.157	2.24	0.03	0.033	0.671
infl	0.004	0.043	0.09	0.93	-0.084	0.091
dy_2002	0.375	0.092	4.10	0.00	0.189	0.561
dy_2003	0.262	0.061	4.31	0.00	0.138	0.385
dy_2004	0.310	0.129	2.40	0.02	0.047	0.574
dy_2005	0.314	0.085	3.70	0.00	0.141	0.487
dy_2006	0.253	0.079	3.21	0.00	0.093	0.414
dy_2007	0.441	0.116	3.81	0.00	0.205	0.677
dy_2008	0.415	0.121	3.44	0.00	0.169	0.660
dy_2009	0.455	0.175	2.60	0.01	0.099	0.811
dy_2010	0.337	0.135	2.50	0.02	0.062	0.611

Appendix 3.4 - Stata printouts for additional tests related to Chapter 3

The effects of revenue decentralisation on fiscal outcomes in all EU member states (EU27)

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dec_rev dy_2002-dy_2010 if year>1994 & year<2011 &
(eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse) gmm(gap_tr,
laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1 maastricht dec_rev
dy_2002-dy_2010) two robust small
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 21                      Obs per group: min =        10
F(16, 26)     =    213.63                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.708      0.089     7.91    0.00        0.524       0.892
             |
      gap_tr |     -0.161      0.057    -2.84    0.01       -0.277      -0.044
             |
    debt2gdp |
         L1. |      0.010      0.004     2.42    0.02        0.002       0.019
             |
        infl |      0.020      0.005     4.03    0.00        0.010       0.030
legelec_dpi1 |     -0.603      0.249    -2.42    0.02       -1.114      -0.091
  maastricht |      0.409      0.175     2.34    0.03        0.050       0.768
     dec_rev |      0.013      0.008     1.55    0.13       -0.004       0.030
     dy_2002 |     -0.900      0.381    -2.36    0.03       -1.684      -0.117
     dy_2003 |     -0.414      0.232    -1.78    0.09       -0.892       0.063
     dy_2004 |     -0.241      0.332    -0.72    0.48       -0.924       0.442
     dy_2005 |      0.013      0.307     0.04    0.97       -0.617       0.644
     dy_2006 |     -0.041      0.198    -0.21    0.84       -0.448       0.365
     dy_2007 |      0.500      0.411     1.22    0.23       -0.344       1.345
     dy_2008 |     -0.861      0.331    -2.60    0.02       -1.542      -0.181
     dy_2009 |     -2.663      0.517    -5.15    0.00       -3.726      -1.600
     dy_2010 |     -1.102      0.496    -2.22    0.04       -2.121      -0.084
       _cons |     -0.600      0.411    -1.46    0.16       -1.443       0.244
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dec_rev dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010)
```

```
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dec_rev dy_2002 dy_2003 dy_2004
    dy_2005 dy_2006 dy_2007 dy_2008 dy_2009 dy_2010
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.52  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.16  Pr > z =  0.245
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  20.66  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.36  Prob > chi2 =  0.500
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   2.91  Prob > chi2 =  0.234
    Difference (null H = exogenous): chi2(2)    =   0.45  Prob > chi2 =  0.800
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   1.02  Prob > chi2 =  0.312
    Difference (null H = exogenous): chi2(3)    =   2.33  Prob > chi2 =  0.506
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.57  Prob > chi2 =  0.109
    Difference (null H = exogenous): chi2(3)    =   0.78  Prob > chi2 =  0.853
```

The effects of revenue decentralisation on fiscal outcomes in old and new EU member states (EU17 and NMS10)

```
xtabond2 capb_ngdp_tr L.capb_ngdp_tr gap_tr L.debt2gdp infl legelec_dpi1
maastricht dec_rev_eu17 dec_rev_nms10 eu17 nms10 dy_2002-dy_2010 if year>1994 &
year<2011 & (eu27==1|see6==1), gmm(L.capb_ngdp_tr, laglimits(1 2) collapse)
gmm(gap_tr, laglimits (2 3) collapse)  iv(L.debt2gdp infl legelec_dpi1
maastricht dec_rev_eu17 dec_rev_nms10 eu17 nms10 dy_2002-dy_2010) two robust
small nocons
Favoring speed over space. To switch, type or click on mata: mata set matafavor
space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: country                         Number of obs      =       414
Time variable : year                            Number of groups   =        27
Number of instruments = 23                      Obs per group: min =        10
F(19, 27)     =    844.49                                      avg =     15.33
Prob > F      =     0.000                                      max =        16
------------------------------------------------------------------------------
             |              Corrected
capb_ngdp_tr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
capb_ngdp_tr |
         L1. |      0.716      0.086     8.31    0.00        0.539       0.893
             |
      gap_tr |     -0.164      0.055    -3.00    0.01       -0.277      -0.052
             |
    debt2gdp |
         L1. |      0.007      0.005     1.42    0.17       -0.003       0.018
             |
        infl |      0.022      0.005     4.11    0.00        0.011       0.032
legelec_dpi1 |     -0.599      0.248    -2.42    0.02       -1.107      -0.090
  maastricht |      0.347      0.177     1.96    0.06       -0.016       0.710
dec_rev_eu17 |      0.012      0.009     1.34    0.19       -0.006       0.029
dec_rev_n~10 |      0.012      0.035     0.34    0.73       -0.060       0.084
        eu17 |     -0.307      0.470    -0.65    0.52       -1.272       0.658
       nms10 |     -0.658      1.088    -0.60    0.55       -2.891       1.574
     dy_2002 |     -0.886      0.379    -2.34    0.03       -1.664      -0.108
     dy_2003 |     -0.407      0.223    -1.83    0.08       -0.864       0.050
     dy_2004 |     -0.226      0.331    -0.68    0.50       -0.906       0.454
     dy_2005 |      0.026      0.309     0.08    0.93       -0.607       0.660
     dy_2006 |     -0.016      0.200    -0.08    0.94       -0.426       0.394
     dy_2007 |      0.524      0.409     1.28    0.21       -0.315       1.364
     dy_2008 |     -0.854      0.336    -2.54    0.02       -1.544      -0.164
     dy_2009 |     -2.635      0.513    -5.13    0.00       -3.689      -1.582
     dy_2010 |     -1.067      0.487    -2.19    0.04       -2.066      -0.068
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(L.debt2gdp infl legelec_dpi1 maastricht dec_rev_eu17 dec_rev_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    dy_2010)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).gap_tr collapsed
    L(1/2).L.capb_ngdp_tr collapsed
```

```
Instruments for levels equation
  Standard
    L.debt2gdp infl legelec_dpi1 maastricht dec_rev_eu17 dec_rev_nms10 eu17
    nms10 dy_2002 dy_2003 dy_2004 dy_2005 dy_2006 dy_2007 dy_2008 dy_2009
    dy_2010
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.gap_tr collapsed
    D.L.capb_ngdp_tr collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.57  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.17  Pr > z =  0.241
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(4)    =  20.59  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(4)    =   3.35  Prob > chi2 =  0.502
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    =   3.02  Prob > chi2 =  0.221
    Difference (null H = exogenous): chi2(2)    =   0.33  Prob > chi2 =  0.850
  gmm(L.capb_ngdp_tr, collapse lag(1 2))
    Hansen test excluding group:     chi2(1)    =   0.87  Prob > chi2 =  0.351
    Difference (null H = exogenous): chi2(3)    =   2.47  Prob > chi2 =  0.480
  gmm(gap_tr, collapse lag(2 3))
    Hansen test excluding group:     chi2(1)    =   2.62  Prob > chi2 =  0.105
    Difference (null H = exogenous): chi2(3)    =   0.72  Prob > chi2 =  0.868
```

Appendix 5.1 - Data sources and definitions for Chapter 5

In the construction of data for Chapter 5 (particularly fiscal data), we follow arguments and definitions in Alesina et al. (2002), Caldara and Kamps (2008) and particularly Beetsma et al. (2006), Beetsma and Giuliodori (2011) and Suyker (1999). We also rely on discussions regarding the calculation of output gaps and the cyclical adjustment of fiscal data in Chapter 2 and the application in Chapter 3 (including references therein).
In order to facilitate the exposition of formulas, here we first present variable names alongside their description and sources, and then the formulas to calculate the variables that are used in the empirical investigation in Chapter 5. For ease of exposition, here we abstract from the functional form in which variables enter in our empirical work, since this is already discussed in Chapter 5.

Variable names, description and source
Notes: unless noted otherwise, absolute amounts are in nominal terms; variables actually used in estimation in Chapter 5 are in bold; "ca" refers to cyclically-adjusted variables using trend GDP based on the Hodrick-Prescott filter; AMECO refers to the AMECO Database of the European Commission (May 2013).

Variable name	Variable description (Original titles for variables not calculated by formula)	Source
ca_gov_nt_real	**Real cyclically-adjusted net-taxes**	**Formula**
ca_gov_rev	Cyclically-adjusted government revenues	Formula
ca_gov_rev_real	Real cyclically-adjusted government revenues	Formula
ca_gov_tran	Cyclically-adjusted government transfers	Formula
ca_gov_tran_real	Real cyclically-adjusted government transfers	Formula
cit_dir	Share of corporate income tax in direct taxes	Formula
comp_avg	Nominal compensation per employee: total economy	AMECO
comp_avg_real	**Real wages**	**Formula**
comp_gg	Compensation of employees: general government :- ESA 1995	AMECO
comp_gg_cons	**Real government wage bill**	**Formula**
debt	General government consolidated gross debt :- Excessive deficit procedure (based on ESA 1995) and former definition (linked series)	AMECO
debt/ngdp	**Debt/GDP ratio**	**Formula**
def_gc	Price deflator total final consumption expenditure of general government, 2005=100	AMECO
def_gdp	**GDP deflator (Price deflator gross domestic product at market prices, 2005=100)**	**AMECO**
def_gfcf	Price deflator gross fixed capital formation: total economy, 2005=100	AMECO
el_cit	Elasticity of corporate income tax with respect to the output gap	EC, 2005)
el_dir	Elasticity of direct taxes with respect to the output gap	EC, 2005)
el_ind	Elasticity of indirect taxes with respect to the output gap	EC, 2005)
el_pit	Elasticity of personal income tax with respect to the output gap	EC, 2005)

el_prexp	Elasticity of current primary expenditures with respect to the output gap	EC, 2005)
el_soc	Elasticity of social contributions with respect to the output gap	EC, 2005)
empl	**Employment (Employees, persons: all domestic industries; National accounts)**	**AMECO**
expend_curr	Total current expenditure: general government :- ESA 1995	AMECO
expend_curr_pr	Current primary expenditures	Formula
gc	Final consumption expenditure of general government at current prices	AMECO
gc_cons	**Real government consumption**	**Formula**
gc_nw_cons	**Real government non-wage consumption**	**Formula**
gdp_cons	**Real GDP (Gross domestic product at 2005 market prices)**	**AMECO**
gdp_trend	Trend gross domestic product at 2005 market prices (based on the Hodrick-Prescott filter)	AMECO
gfcf_gg	Gross fixed capital formation at current prices: general government	AMECO
gfcf_gg_cons	**Real government investment**	**Formula**
gfcf_priv	Gross fixed capital formation at current prices: private sector	AMECO
gfcf_priv_cons	**Real private investments**	**Formula**
gov_spend_real	**Real government spending**	**Formula**
gov_tran	Government transfers	Formula
inter	Interest : general government :- ESA 1995	AMECO
ir_st	**Nominal short-term interest rates (Note: The series corresponds to nominal 3-month money market interest rates. It is used in decimal form, for easier interpretation: e.g. 0.045, not 4.5%)**	**AMECO (IMF IFS for a few early years for some EU new member states)**
ir_st_real	**Real short-term interest rates**	**Formula**
m	Imports of goods and services at current prices (National accounts)	AMECO
m_cons	**Real imports (Imports of goods and services at 2005 prices)**	**AMECO**
ngdp	Nominal GDP (Gross domestic product at current market prices)	AMECO
nx/gdp_cons	**Real net-exports/GDP**	**Formula**
open	Trade openness	Formula
pc_cons	**Real private consumption (Private final consumption expenditure at 2005 prices)**	**AMECO**
pit_dir	Share of personal income tax in direct taxes	EC, 2005)
prop_paid	Property income, payable	Eurostat
prop_rec	Property income, receivable	Eurostat
reer	**Real effective exchange rate (deflator: consumer price indices - 42 trading partners; 2005=100)**	**Eurostat**
rev_curr	Total current revenue: general government :- ESA 1995	AMECO
soc_ben_paid	Social benefits other than social transfers in kind: general government :- ESA 1995	AMECO
soc_rec	Social contributions received: general government :- ESA 1995	AMECO
subs	Subsidies: general government :- ESA 1995	AMECO
tax_dir	Current taxes on income and wealth (direct taxes): general government :- ESA 1995	AMECO

tax_ind	Taxes linked to imports and production (indirect taxes): general government :- ESA 1995	AMECO
trpg	Other current transfers paid by government	Formula
trrg	Other current transfers received by government	Formula
x	Exports of goods and services at current prices (National accounts)	AMECO
x_cons	**Real exports (Exports of goods and services at 2005 prices)**	**AMECO**

Formulas used to calculate variables that are used in Chapter 5

Expenditures

gov_spend_real=gc/def_gc*100 + gfcf_gg/def_gfcf*100
gc_cons = gc/def_gc*100
gfcf_gg_cons = gfcf_gg/def_gfcf*100
expend_curr_pr = expend_curr - inter

comp_gg_cons = comp_gg/def_gc*100
gc_nw_cons = (gc - comp_empl_gg)/def_gc*100

Revenues ("ca" refers to cyclically-adjusted variables using trend GDP based on the Hodrick-Prescott filter)

ca_gov_nt_real = ca_gov_rev_real - ca_gov_tran_real

ca_gov_rev_real = ca_gov_rev/def_gdp*100
ca_gov_tran_real = ca_gov_tran/def_gdp*100

ca_gov_rev = ca_tax_dir + ca_tax_ind + ca_soc_rec + ca_trrg
ca_tax_dir = tax_dir*(gdp_trend/gdp_cons)^el_dir
ca_tax_ind = tax_ind*(gdp_trend/gdp_cons)^el_ind
ca_soc_rec = soc_rec*(gdp_trend/gdp_cons)^el_soc
ca_trrg = trrg*(gdp_trend/gdp_cons)^(-1*el_prexp*trrg/expend_curr_pr)
trrg = rev_curr - prop_rec - tax_ind - tax_dir - soc_rec

ca_gov_tran = gov_tran*(gdp_trend/gdp_cons) ^(el_prexp* gov_tran/expend_curr_pr)
gov_tran = subs + soc_ben_paid + trpg
trpg = expend_curr + cons_fix_gg - gc - subs - soc_ben_paid - prop_paid

el_dir = el_pit * (pit_dir) + el_cit * (cit_dir)

Other variables

ir_st_real = (1+ir_st)/(1+infl_gdp/100)-1
infl_gdp = def_gdp/def_gdp$_{t-1}$ * 100 - 100

gfcf_priv_cons = gfcf_priv/def_gfcf*100

comp_avg_real = comp_avg/def_gdp*100

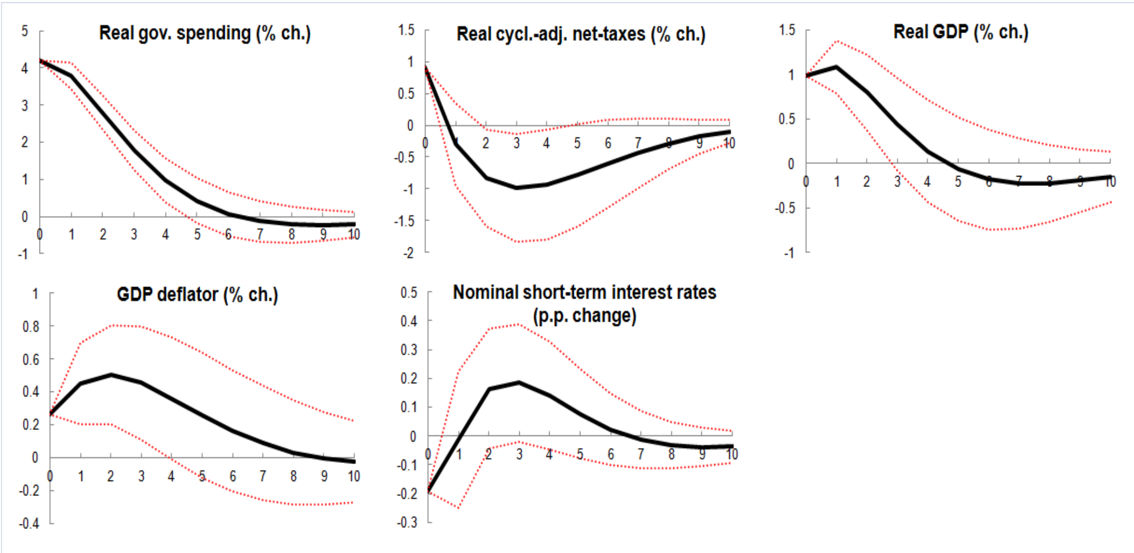
debt/ngdp = debt/ngdp

nx/gdp_cons = (x_cons-m_cons)/gdp_cons

open = ((x+m)/2)/ngdp

Appendix 5.2 - Detailed tables and graphs for Chapter 5

Figure 5.1 - Baseline specification



Specification details

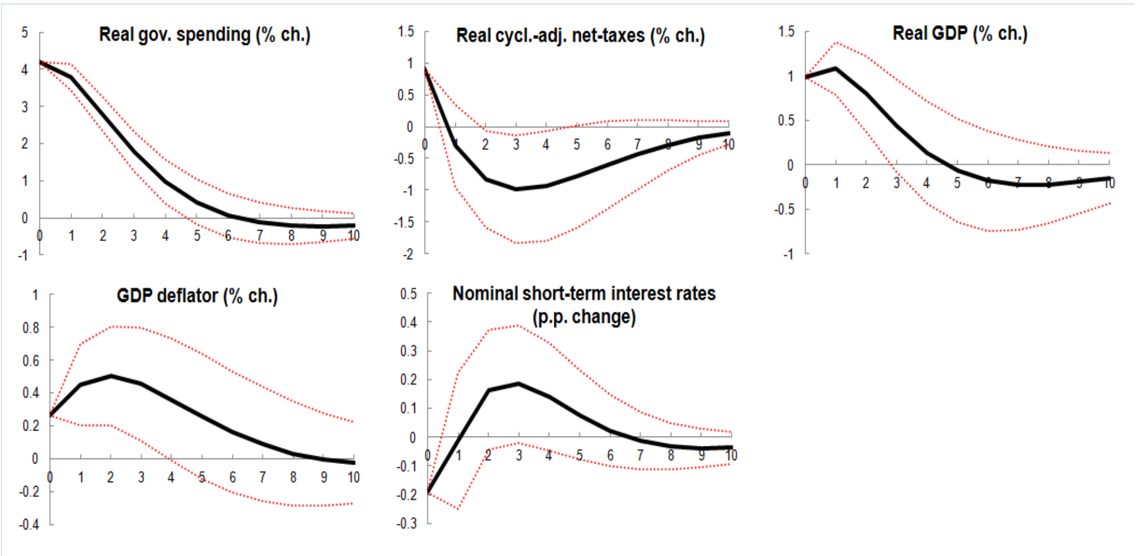
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.2 - Option 'FE + trend' (i.e. baseline specification)



Specification details

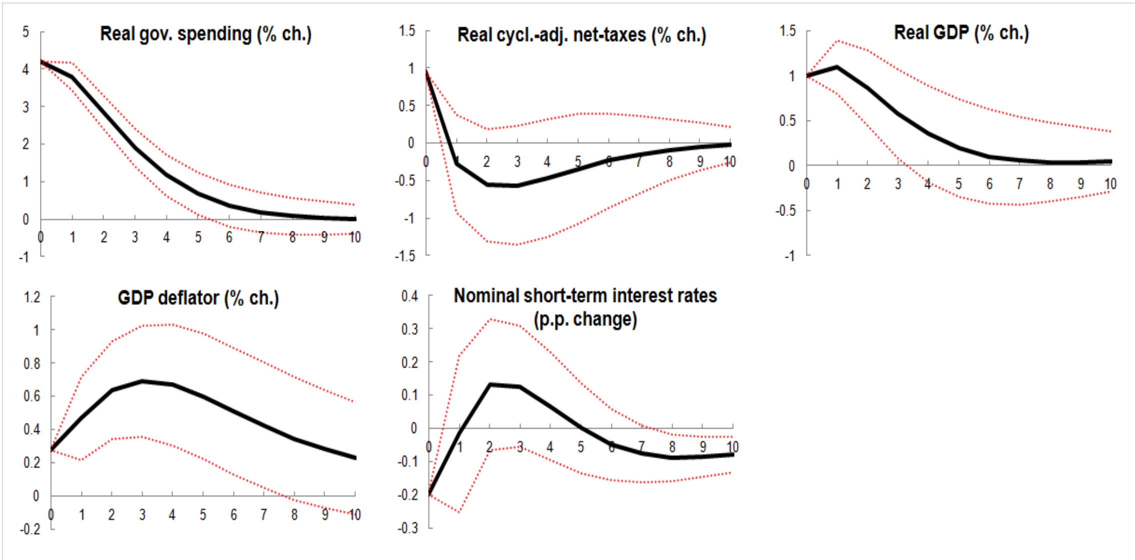
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1% , 5% and 10% level, respectively.

Figure 5.2 - Option 'FE, no trend'



Specification details

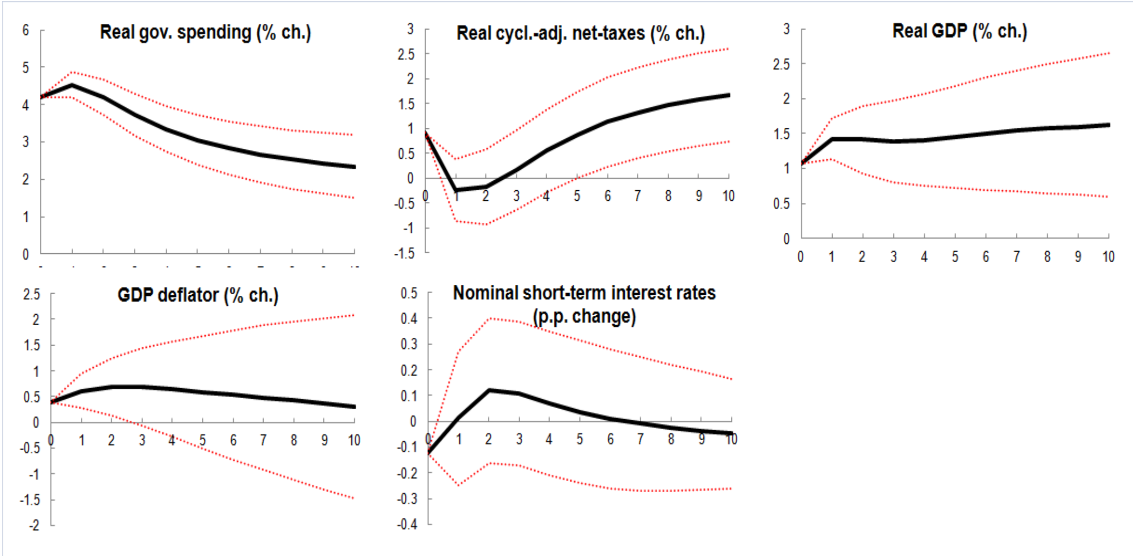
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		no	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.90***	0.68**
Real cycl.-adj. net-taxes	%	0.95***	-0.27	-0.57	-0.34
Real GDP	%	1.00***	1.09***	0.58**	0.19
GDP deflator	%	0.28***	0.47***	0.69***	0.60***
Nominal short-term interest rates	p.p.	-0.20***	-0.02	0.13	0.00

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.2 - Option 'trend, no FE'



Specification details

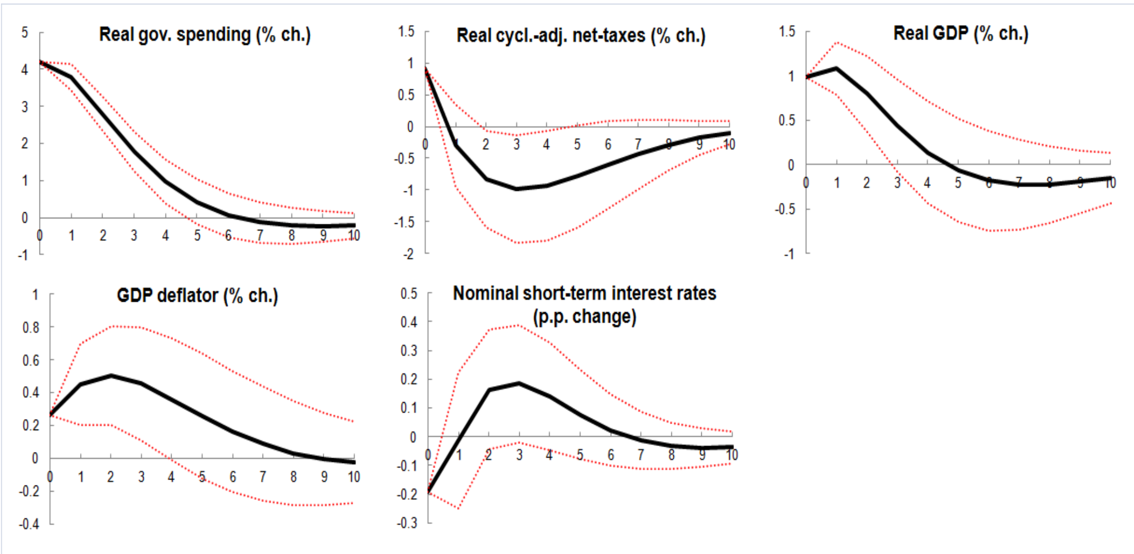
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		no	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	4.54***	3.73***	3.06***
Real cycl.-adj. net-taxes	%	0.91***	-0.23	0.17	0.88**
Real GDP	%	1.07***	1.43***	1.39***	1.45***
GDP deflator	%	0.38***	0.61***	0.68*	0.59
Nominal short-term interest rates	p.p.	-0.12***	0.01	0.11	0.04

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.3 - Option '2 lags' (i.e. baseline specification)



Specification details

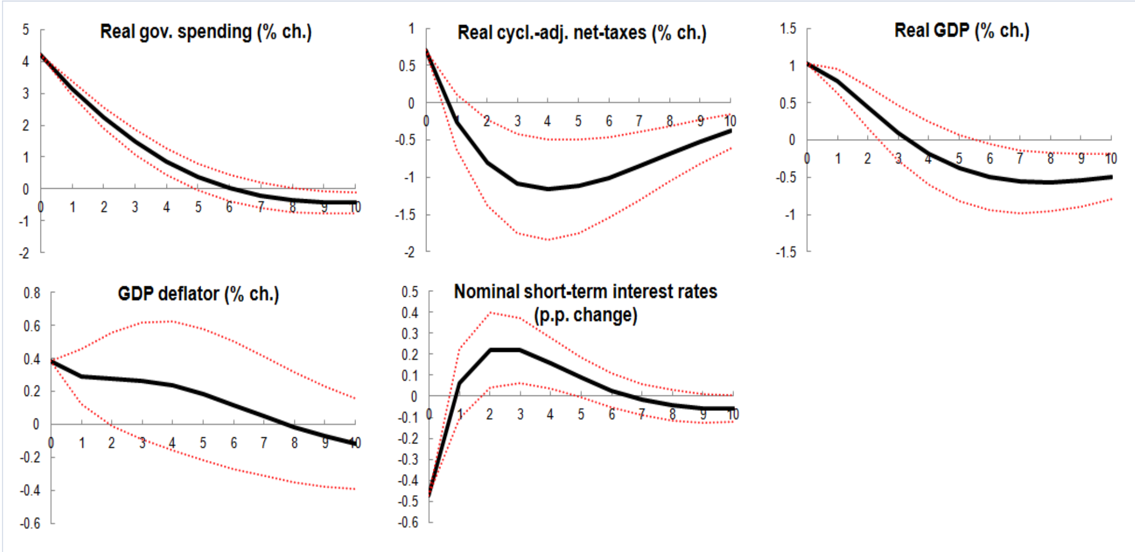
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.3 - Option '1 lag'



Specification details

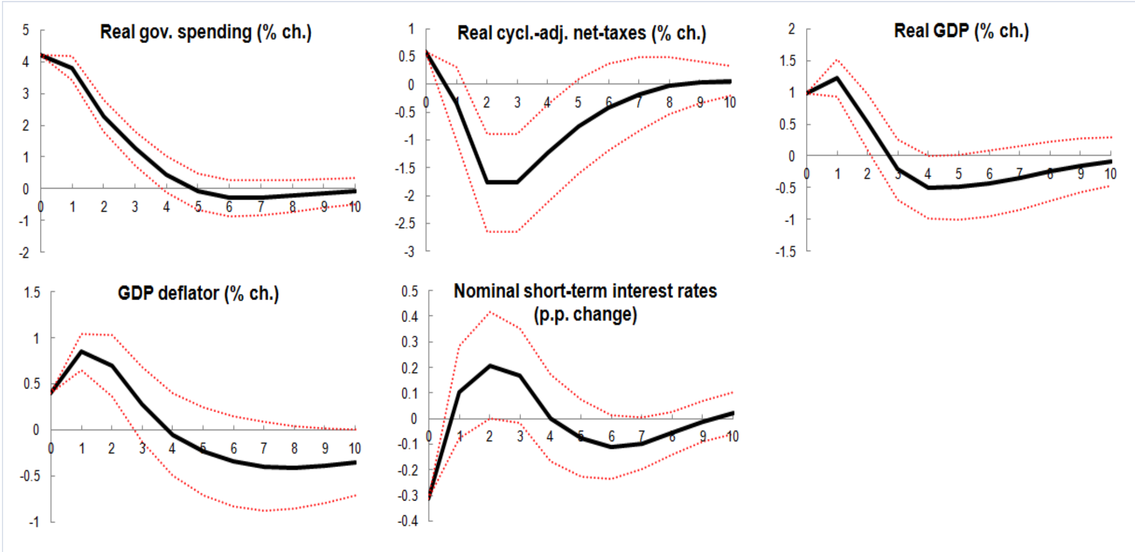
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	1
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.15***	1.47***	0.38*
Real cycl.-adj. net-taxes	%	0.70***	-0.26	-1.08***	-1.12***
Real GDP	%	1.03***	0.79***	0.10	-0.38*
GDP deflator	%	0.39***	0.29***	0.27	0.18
Nominal short-term interest rates	p.p.	-0.47***	0.06	0.22***	0.09*

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.3 - Option '3 lags'



Specification details

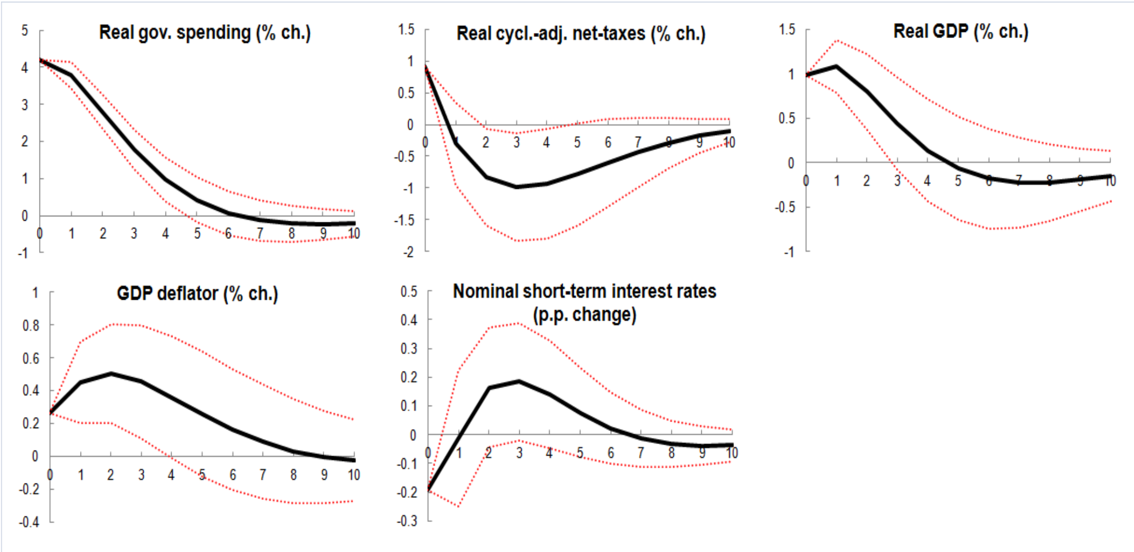
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	3
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.79***	1.27***	-0.09
Real cycl.-adj. net-taxes	%	0.60***	-0.35	-1.77***	-0.75*
Real GDP	%	0.98***	1.22***	-0.21	-0.49*
GDP deflator	%	0.40***	0.85***	0.28	-0.23
Nominal short-term interest rates	p.p.	-0.31***	0.10	0.17*	-0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.4 - Option 'spending first, net-taxes second' (i.e. baseline specification)



Specification details

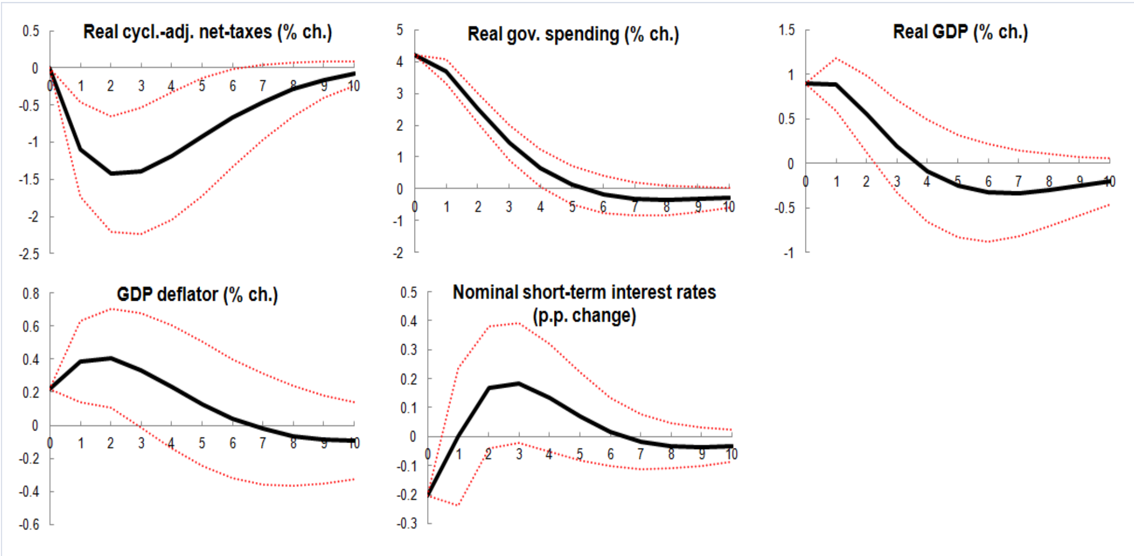
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.4 - Option 'spending second, net-taxes first'



Specification details

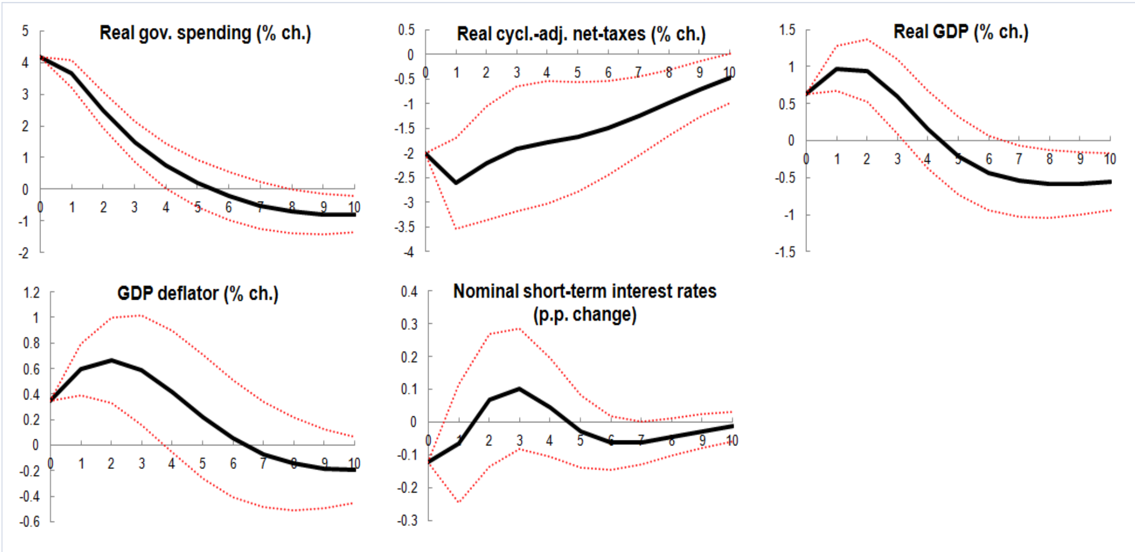
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real cycl.-adj. net-taxes	%	0.00	-1.10***	-1.39***	-0.93**
Real gov. spending	%	4.21***	3.69***	1.45***	0.12
Real GDP	%	0.90***	0.89***	0.19	-0.25
GDP deflator	%	0.22***	0.38***	0.33*	0.13
Nominal short-term interest rates	p.p.	-0.20***	0.00	0.18*	0.07

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.5 - Option 'EU17 (17 old EU member states)'



Specification details

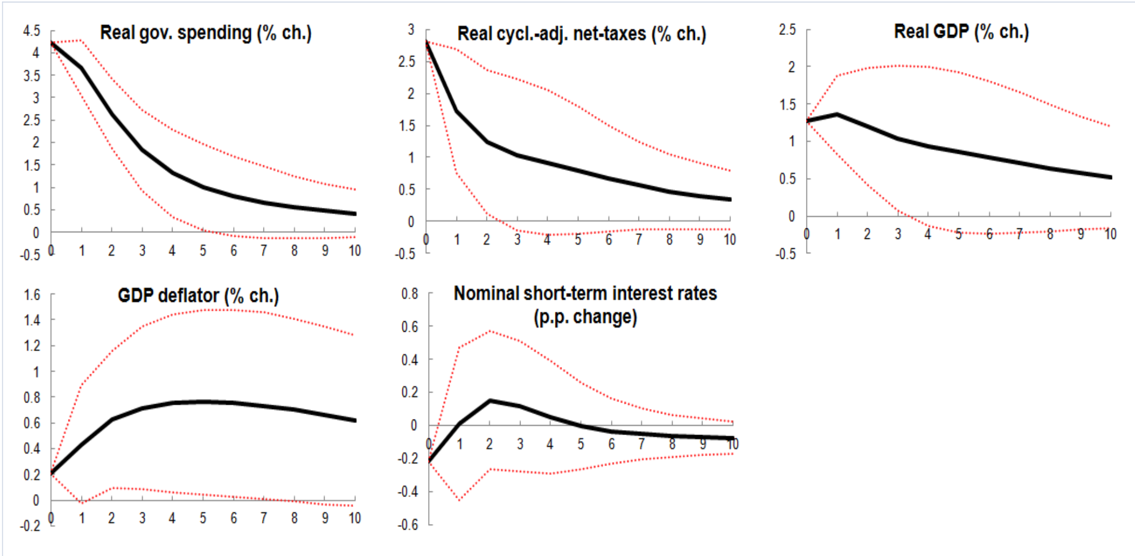
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.64***	1.49***	0.20
Real cycl.-adj. net-taxes	%	-2.00***	-2.61***	-1.92***	-1.67***
Real GDP	%	0.63***	0.98***	0.60**	-0.21
GDP deflator	%	0.34***	0.59***	0.59***	0.22
Nominal short-term interest rates	p.p.	-0.12***	-0.07	0.10	-0.03

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.5 - Option 'NMS10 (10 new EU member states)'



Specification details

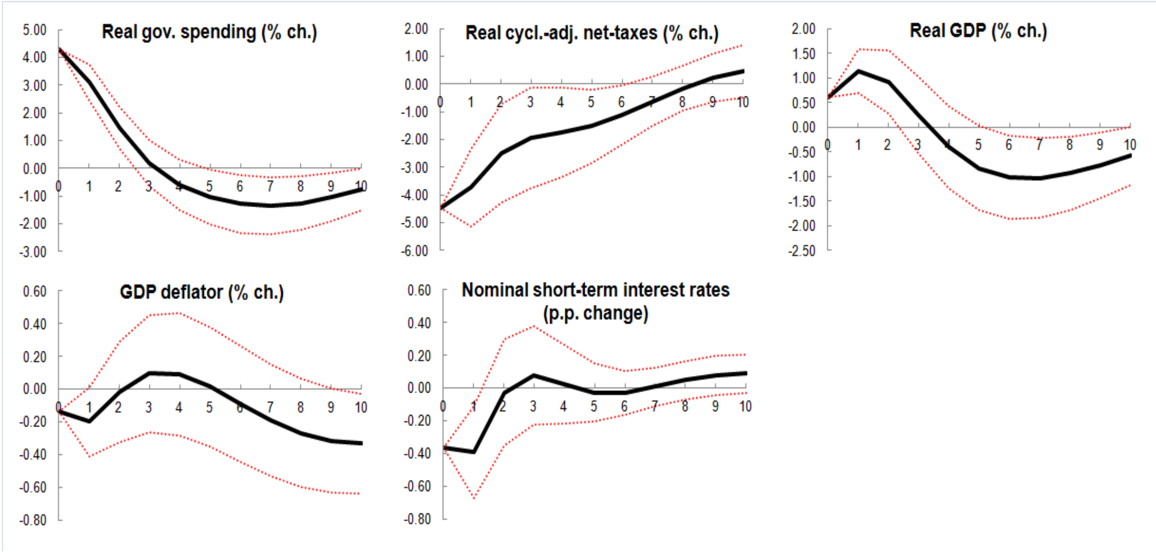
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.66***	1.83***	1.00**
Real cycl.-adj. net-taxes	%	2.81***	1.72***	1.03*	0.80
Real GDP	%	1.28***	1.36***	1.04**	0.86
GDP deflator	%	0.21***	0.43*	0.71**	0.76**
Nominal short-term interest rates	p.p.	-0.22***	0.01	0.12	0.00

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.6 - Option 'high debt (debt/GDP>60%)'



Specification details

Sample:	average public debt/GDP > 60%	Nr. of countries:	9
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2

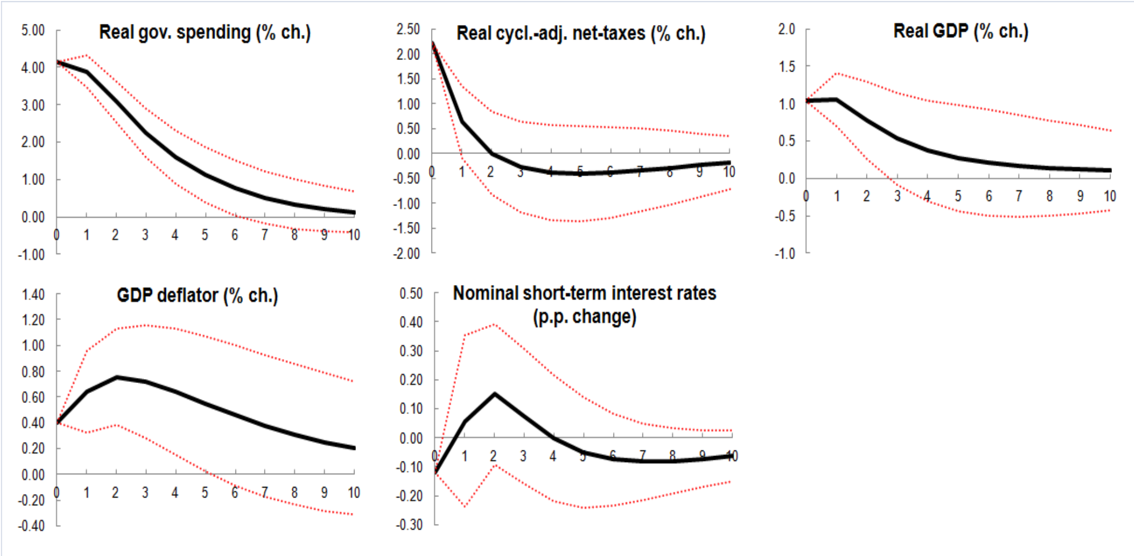
Fixed effects:	country FE
Common time trend:	yes

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.31***	3.10***	0.19	-1.04**
Real cycl.-adj. net-taxes	%	-4.45***	-3.73***	-1.94**	-1.53**
Real GDP	%	0.60***	1.13***	0.25	-0.83*
GDP deflator	%	-0.14***	-0.20*	0.09	0.01
Nominal short-term interest rates	p.p.	-0.36***	-0.39***	0.08	-0.03

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.6 - Option 'low debt (debt/GDP<60%)'



Specification details

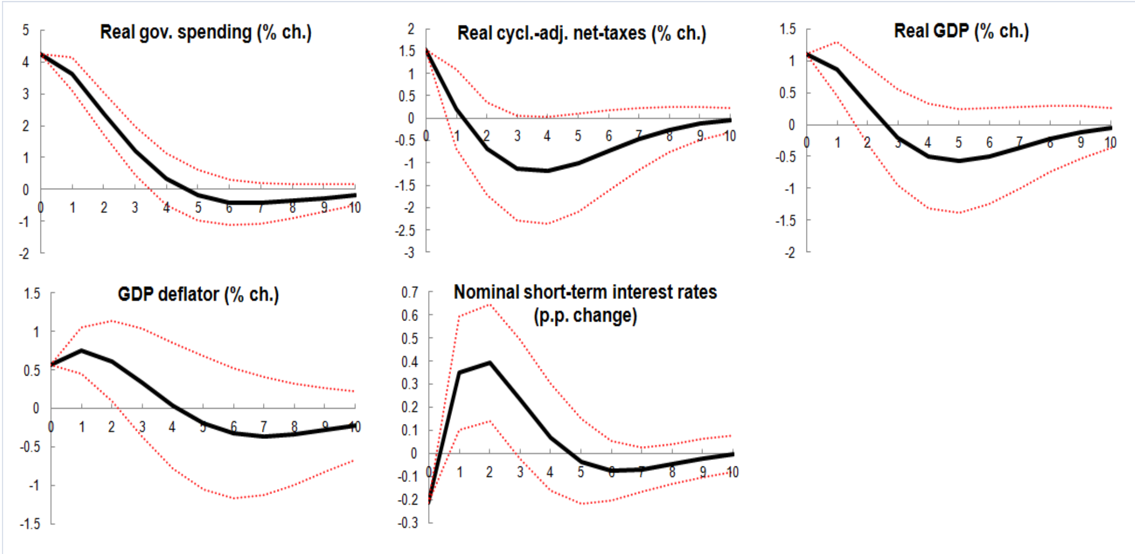
Sample:	average public debt/GDP < 60%	Nr. of countries:	18
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:	country FE		
Common time trend:	yes		

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.16***	3.89***	2.25***	1.12***
Real cycl.-adj. net-taxes	%	2.20***	0.63*	-0.28	-0.40
Real GDP	%	1.05***	1.06***	0.53*	0.27
GDP deflator	%	0.40***	0.64***	0.72***	0.55**
Nominal short-term interest rates	p.p.	-0.12***	0.06	0.08	-0.05

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.7 - Option 'more open (openness/GDP>50%)'



Specification details

Sample:	average trade openness > 50%	Nr. of countries:	14
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2

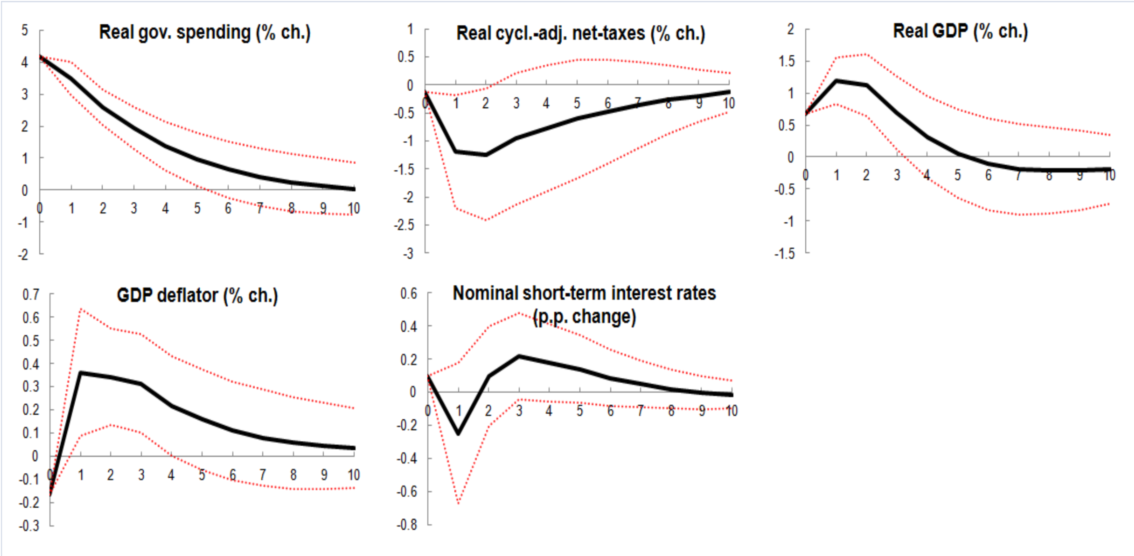
Fixed effects:	country FE
Common time trend:	yes

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.63***	1.20***	-0.18
Real cycl.-adj. net-taxes	%	1.54***	0.19	-1.12*	-0.99*
Real GDP	%	1.10***	0.87***	-0.20	-0.57
GDP deflator	%	0.57***	0.74***	0.34	-0.19
Nominal short-term interest rates	p.p.	-0.21***	0.35***	0.24*	-0.03

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.7 - Option 'less open (openness/GDP<50%)'



Specification details

Sample:	average trade openness < 50%	Nr. of countries:	13
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2

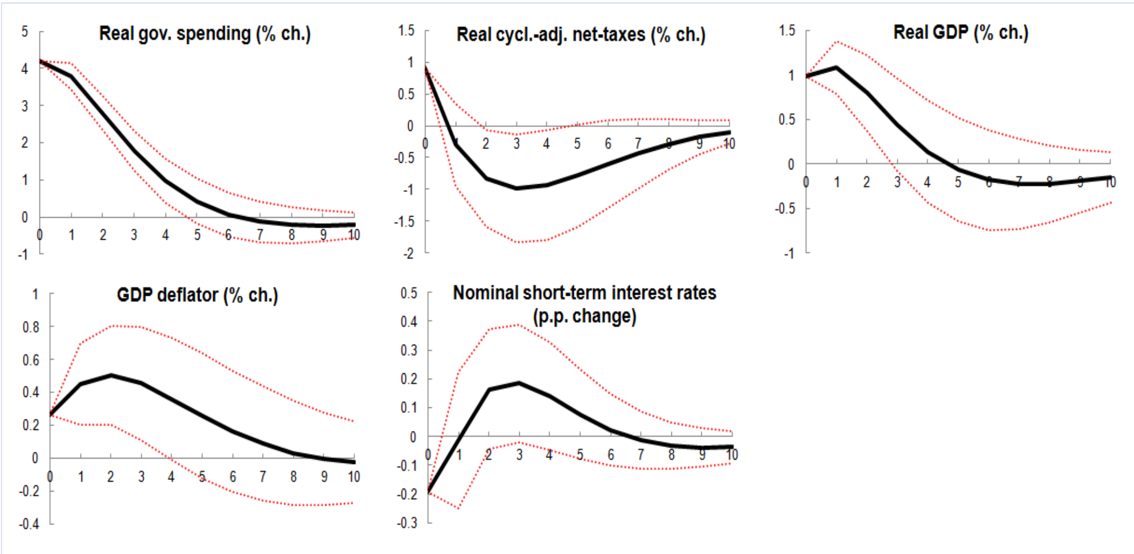
Fixed effects:	country FE
Common time trend:	yes

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.17***	3.48***	1.93***	0.97**
Real cycl.-adj. net-taxes	%	-0.13***	-1.19**	-0.96	-0.60
Real GDP	%	0.67***	1.19***	0.69**	0.05
GDP deflator	%	-0.16***	0.36**	0.31***	0.16
Nominal short-term interest rates	p.p.	0.10***	-0.25	0.22	0.14

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.8 - Option '1995-2012' (i.e. baseline specification)



Specification details

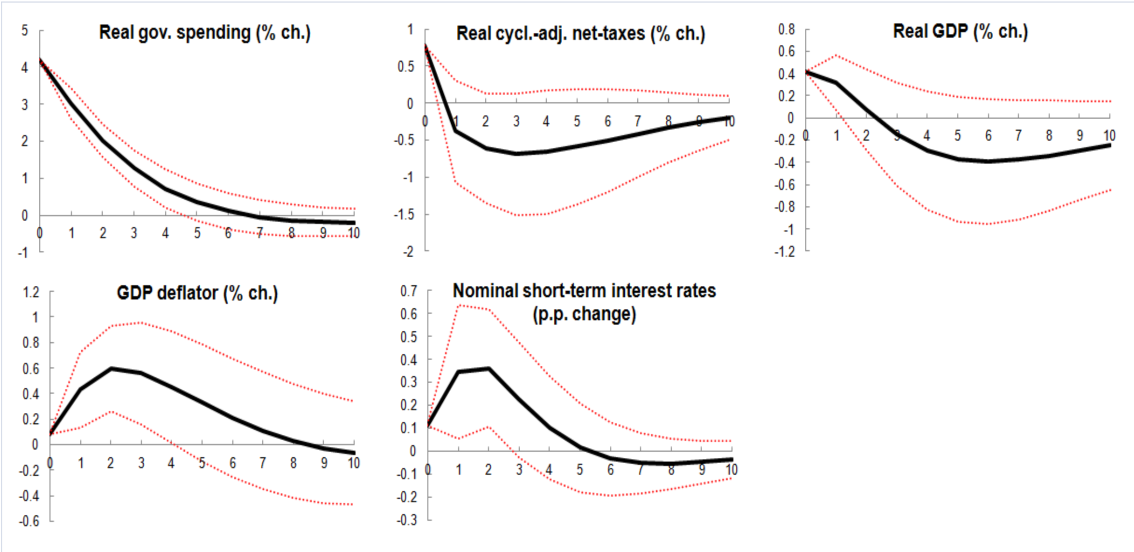
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.8 - Option 'pre-crisis (1995-2008)'



Specification details

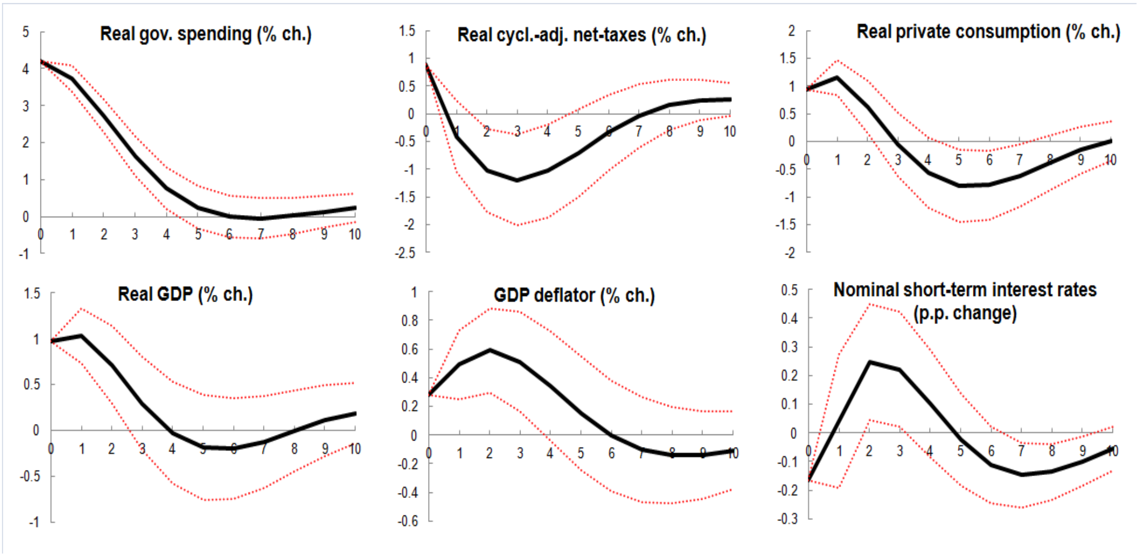
Sample:	EU27, pre-crisis	Nr. of countries:	27
Start:	1995	End:	2008
Nr. of years:	14	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.20***	3.01***	1.26***	0.35
Real cycl.-adj. net-taxes	%	0.78***	-0.38	-0.69*	-0.59
Real GDP	%	0.42***	0.32**	-0.15	-0.37
GDP deflator	%	0.08***	0.43***	0.56***	0.33
Nominal short-term interest rates	p.p.	0.11***	0.35**	0.23*	0.02

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.9 - Option 'baseline PVAR + real private consumption, EU27'



Specification details

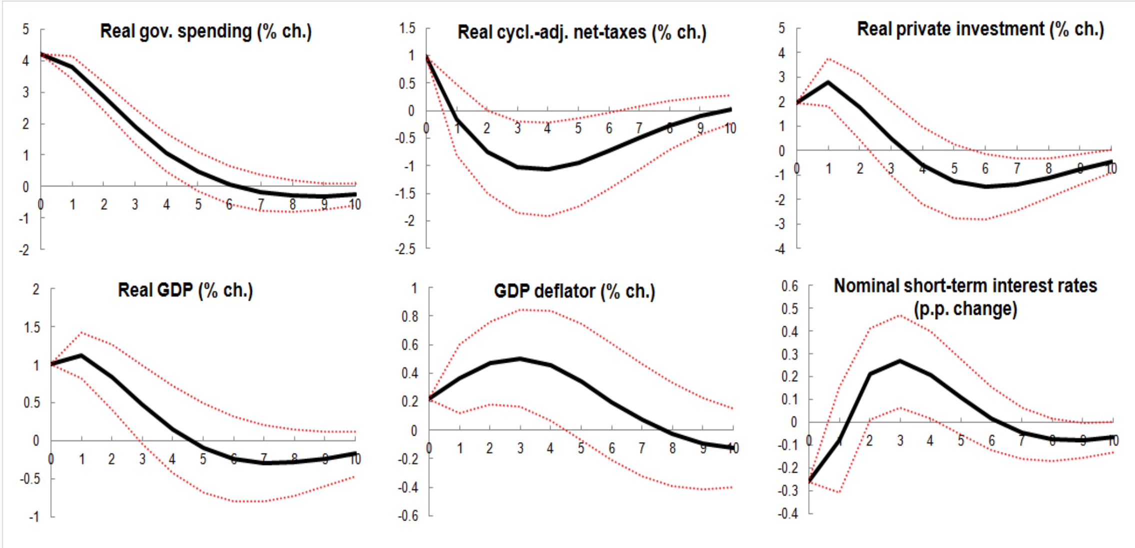
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.73***	1.63***	0.25
Real cycl.-adj. net-taxes	%	0.89***	-0.40	-1.19***	-0.70*
Real private consumption	%	0.93***	1.15***	-0.05	-0.80**
Real GDP	%	0.97***	1.03***	0.30	-0.19
GDP deflator	%	0.28***	0.49***	0.51***	0.15
Nominal short-term interest rates	p.p.	-0.17***	0.04	0.22**	-0.02

***, ** and * denote significance at the 1% , 5% and 10% level, respectively.

Figure 5.9 - Option 'baseline PVAR + real private investment, EU27'



Specification details

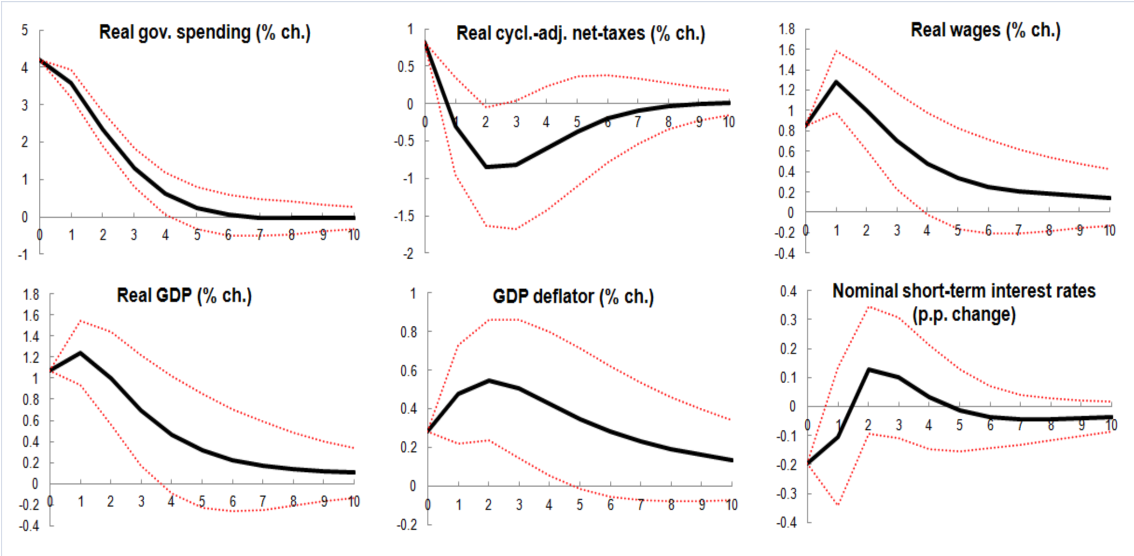
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.79***	1.90***	0.47
Real cycl.-adj. net-taxes	%	0.99***	-0.16	-1.02**	-0.94**
Real private investment	%	1.96***	2.79***	0.46	-1.25
Real GDP	%	1.01***	1.12***	0.48*	-0.10
GDP deflator	%	0.22***	0.36***	0.50***	0.34
Nominal short-term interest rates	p.p.	-0.26***	-0.08	0.27**	0.11

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.9 - Option 'baseline PVAR + real wages, EU27'



Specification details

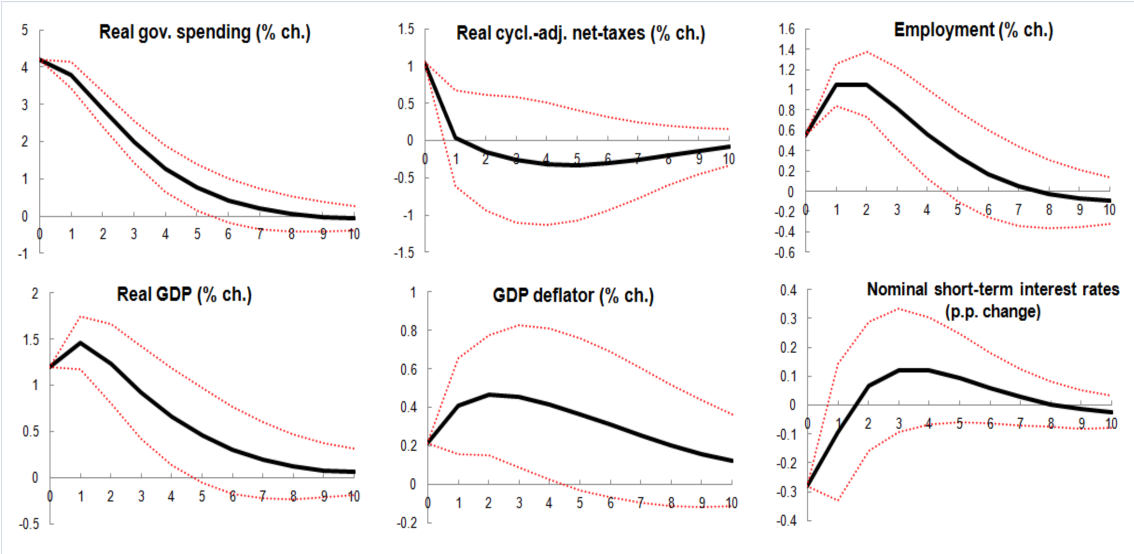
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.58***	1.31***	0.24
Real cycl.-adj. net-taxes	%	0.82***	-0.30	-0.82*	-0.37
Real wages	%	0.85***	1.28***	0.70***	0.33
Real GDP	%	1.07***	1.24***	0.69***	0.31
GDP deflator	%	0.28***	0.47***	0.50***	0.35*
Nominal short-term interest rates	p.p.	-0.20***	-0.10	0.10	-0.01

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.9 - Option 'baseline PVAR + employment, EU27'



Specification details

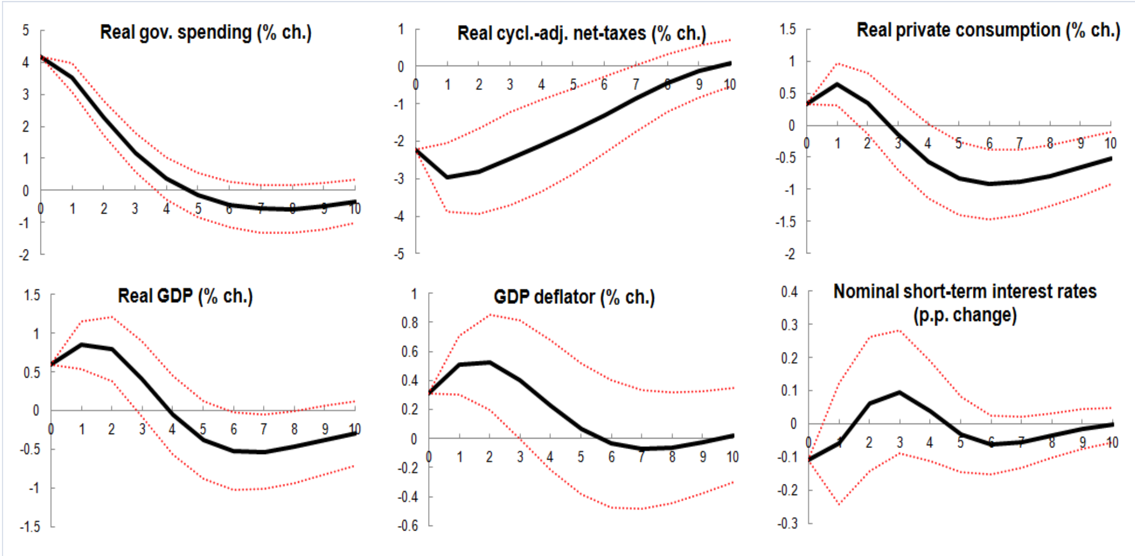
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.79***	1.99***	0.77**
Real cycl.-adj. net-taxes	%	1.05***	0.03	-0.26	-0.33
Employment	%	0.54***	1.05***	0.82***	0.34
Real GDP	%	1.20***	1.46***	0.93***	0.45*
GDP deflator	%	0.21***	0.41***	0.46**	0.36*
Nominal short-term interest rates	p.p.	-0.28***	-0.09	0.12	0.09

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real private consumption, EU17 (old EU)'



Specification details

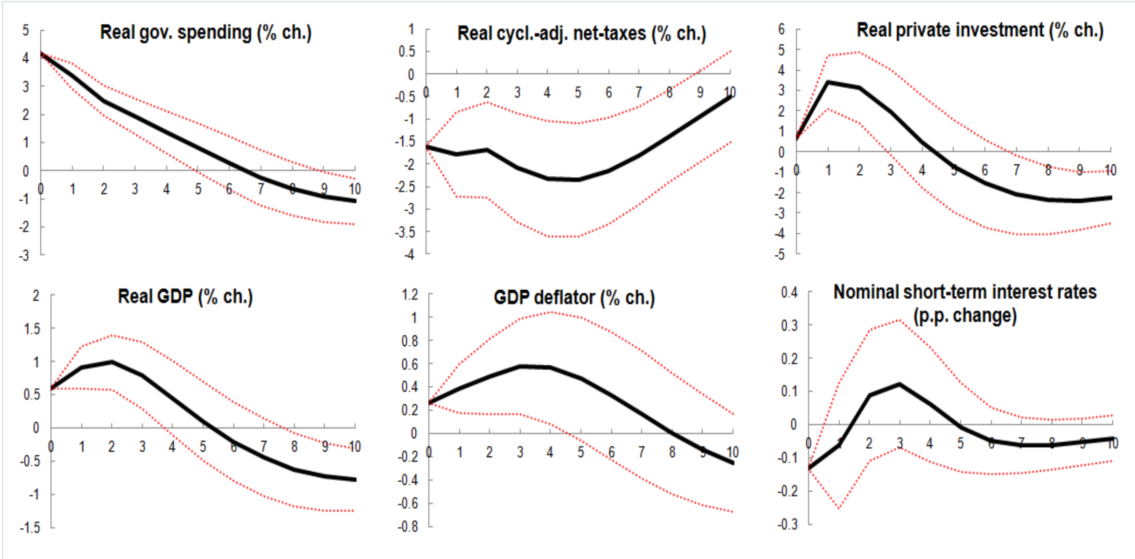
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.51***	1.17***	-0.13
Real cycl.-adj. net-taxes	%	-2.22***	-2.95***	-2.46***	-1.73***
Real private consumption	%	0.34***	0.64***	-0.14	-0.83***
Real GDP	%	0.59***	0.85***	0.41*	-0.38
GDP deflator	%	0.31***	0.51***	0.41*	0.07
Nominal short-term interest rates	p.p.	-0.11***	-0.06	0.10	-0.03

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real private investment, EU17 (old EU)'



Specification details

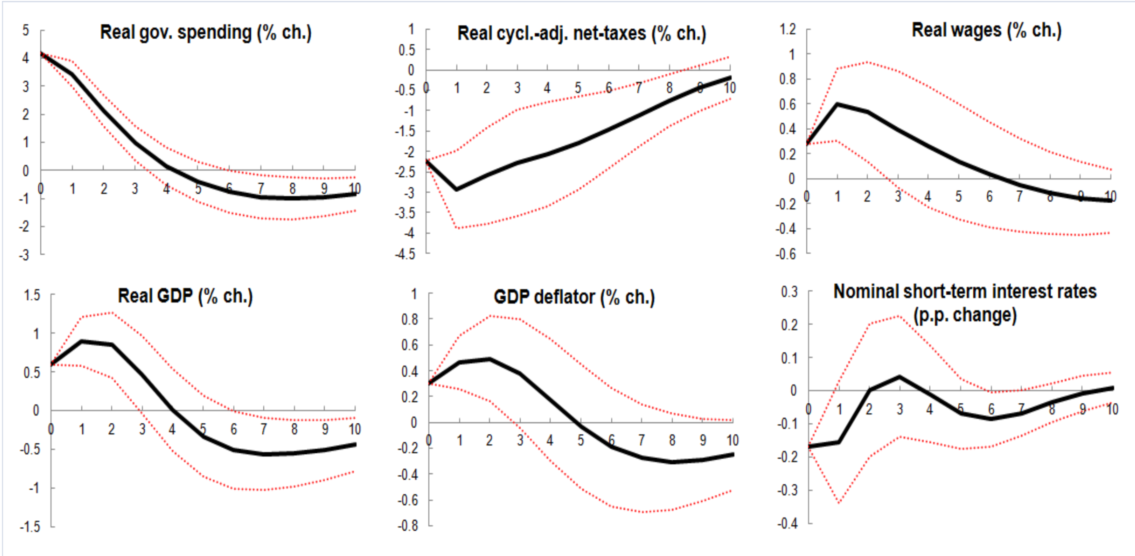
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.38***	1.91***	0.81*
Real cycl.-adj. net-taxes	%	-1.61***	-1.78***	-2.07***	-2.35***
Real private investment	%	0.65***	3.40***	1.91*	-0.71
Real GDP	%	0.60***	0.90***	0.79***	0.10
GDP deflator	%	0.26***	0.39***	0.58***	0.47*
Nominal short-term interest rates	p.p.	-0.13***	-0.06	0.12	-0.01

***, ** and * denote significance at the 1% , 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real wages, EU17 (old EU)'



Specification details

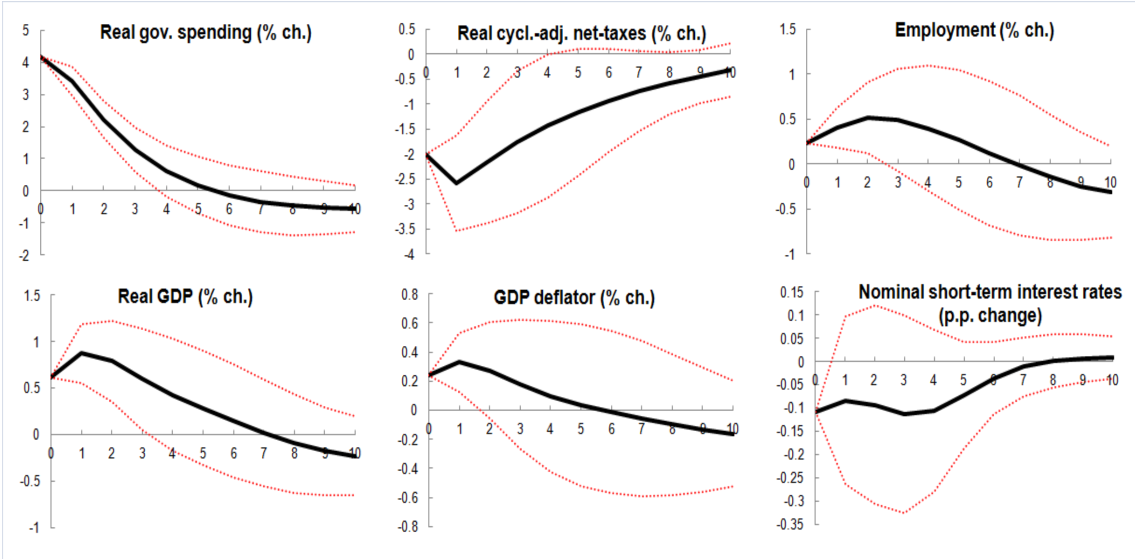
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.43***	0.97***	-0.40
Real cycl.-adj. net-taxes	%	-2.23***	-2.94***	-2.28***	-1.79***
Real wages	%	0.28***	0.59***	0.40*	0.14
Real GDP	%	0.59***	0.89***	0.46*	-0.33
GDP deflator	%	0.30***	0.46***	0.38*	-0.03
Nominal short-term interest rates	p.p.	-0.17***	-0.15*	0.04	-0.07

***, ** and * denote significance at the 1% , 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + employment, EU17 (old EU)'



Specification details

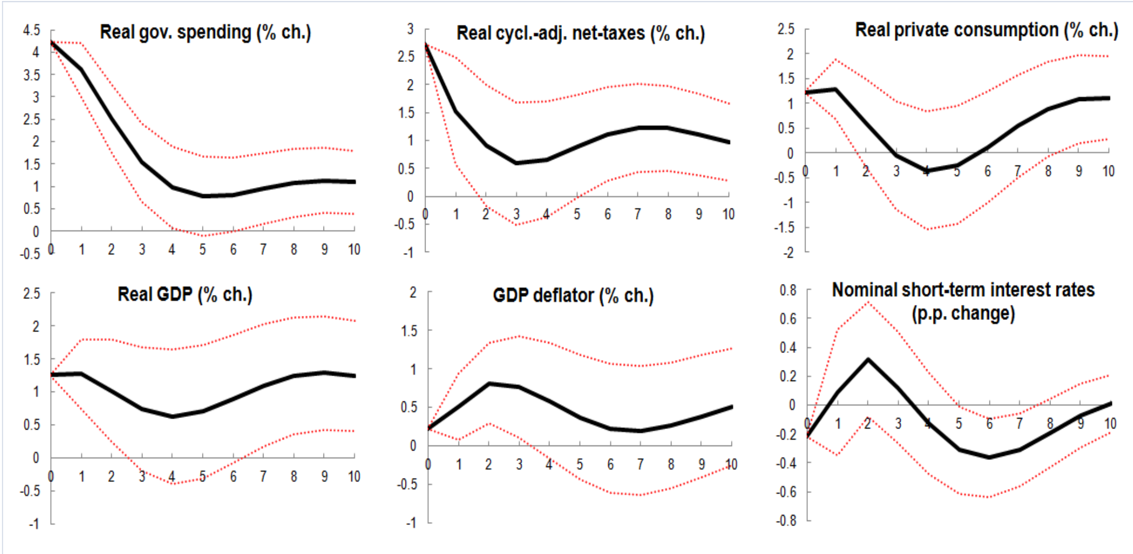
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.41***	1.29***	0.17
Real cycl.-adj. net-taxes	%	-2.00***	-2.58***	-1.76**	-1.16*
Employment	%	0.23***	0.41***	0.49*	0.26
Real GDP	%	0.62***	0.87***	0.60**	0.28
GDP deflator	%	0.24***	0.33***	0.18	0.04
Nominal short-term interest rates	p.p.	-0.11***	-0.08	-0.11	-0.07

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real private consumption, NMS10 (new EU)'



Specification details

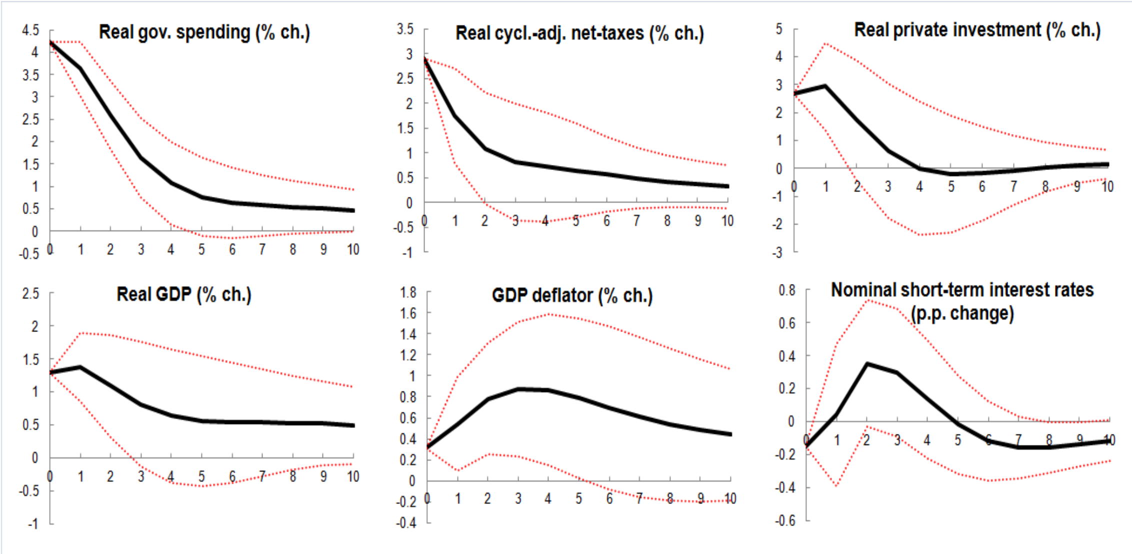
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.60***	1.54***	0.77*
Real cycl.-adj. net-taxes	%	2.72***	1.53***	0.59	0.89*
Real private consumption	%	1.23***	1.29***	-0.06	-0.24
Real GDP	%	1.25***	1.27***	0.74	0.70
GDP deflator	%	0.22***	0.51**	0.77**	0.37
Nominal short-term interest rates	p.p.	-0.22***	0.09	0.12	-0.31**

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real private investment, NMS10 (new EU)'



Specification details

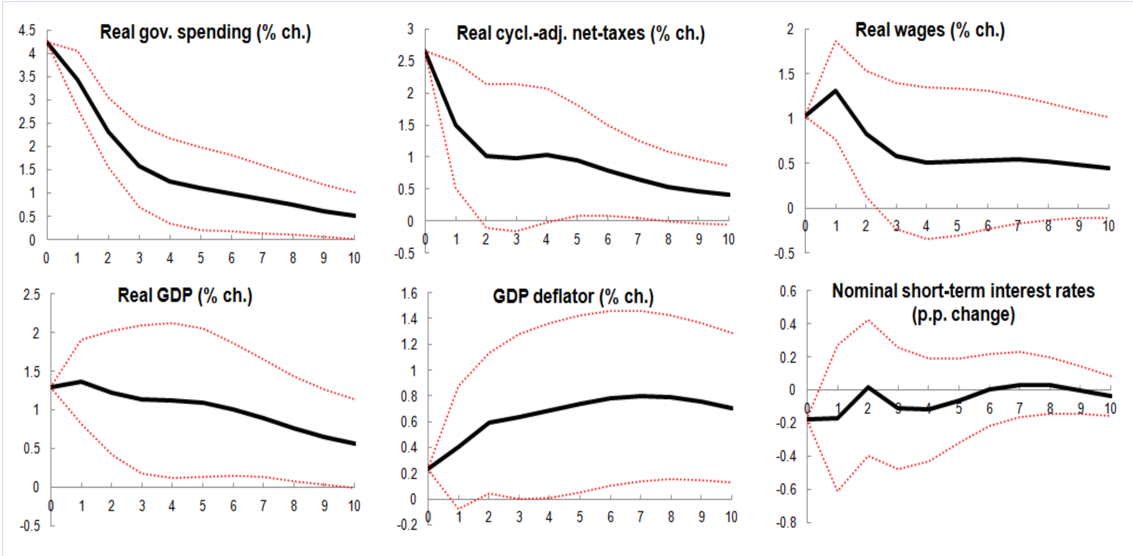
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.64***	1.65***	0.76*
Real cycl.-adj. net-taxes	%	2.90***	1.74***	0.82	0.65
Real private investment	%	2.69***	2.94***	0.62	-0.21
Real GDP	%	1.30***	1.37***	0.81*	0.56
GDP deflator	%	0.31***	0.54**	0.88***	0.79**
Nominal short-term interest rates	p.p.	-0.15***	0.04	0.29	-0.02

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + real wages, NMS10 (new EU)'



Specification details

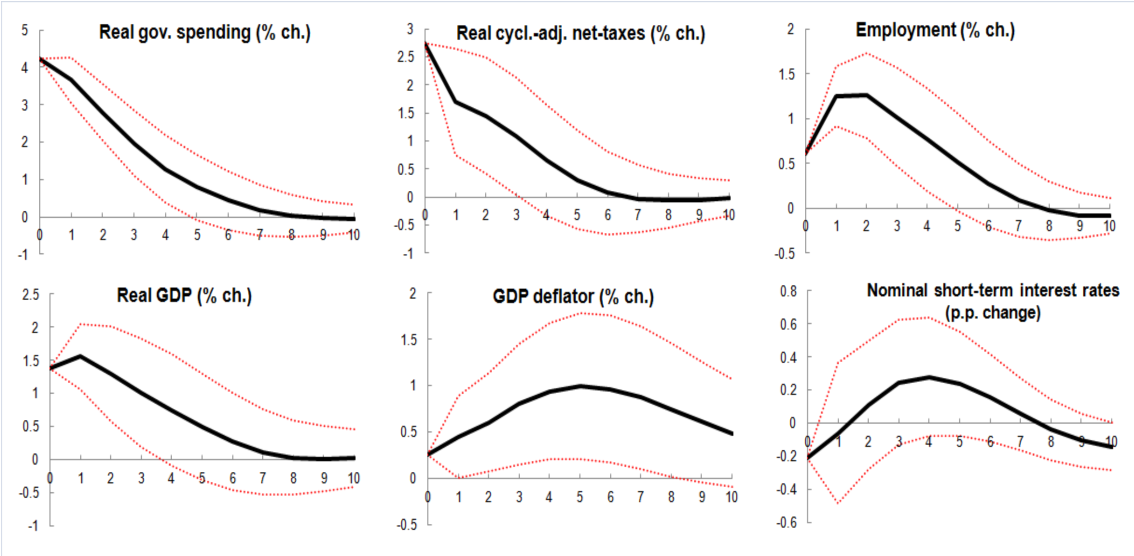
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.43***	1.59***	1.10**
Real cycl.-adj. net-taxes	%	2.66***	1.50***	0.99*	0.94**
Real wages	%	1.03***	1.31***	0.59	0.52
Real GDP	%	1.29***	1.36***	1.14**	1.09**
GDP deflator	%	0.23***	0.40*	0.64**	0.74**
Nominal short-term interest rates	p.p.	-0.18***	-0.17	-0.11	-0.07

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.10 - Option 'baseline PVAR + employment, NMS10 (new EU)'



Specification details

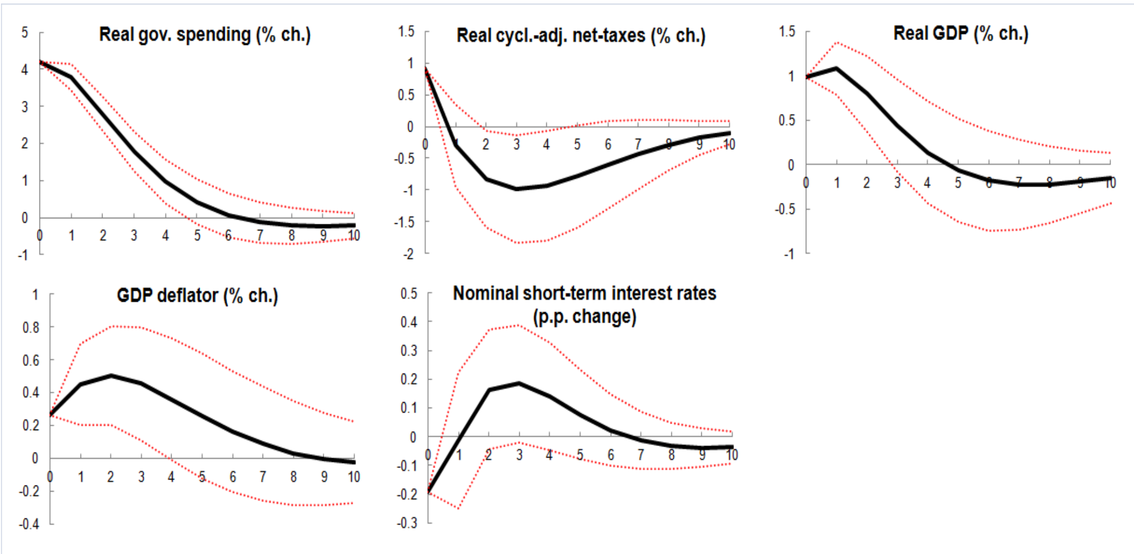
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.66***	1.96***	0.80*
Real cycl.-adj. net-taxes	%	2.75***	1.71***	1.09**	0.30
Employment	%	0.61***	1.25***	1.02***	0.51*
Real GDP	%	1.38***	1.55***	1.01**	0.49
GDP deflator	%	0.26***	0.45**	0.80**	1.00**
Nominal short-term interest rates	p.p.	-0.21***	-0.06	0.24	0.24

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.11 - Option 'Real government spending shock (i.e. baseline PVAR)'



Specification details

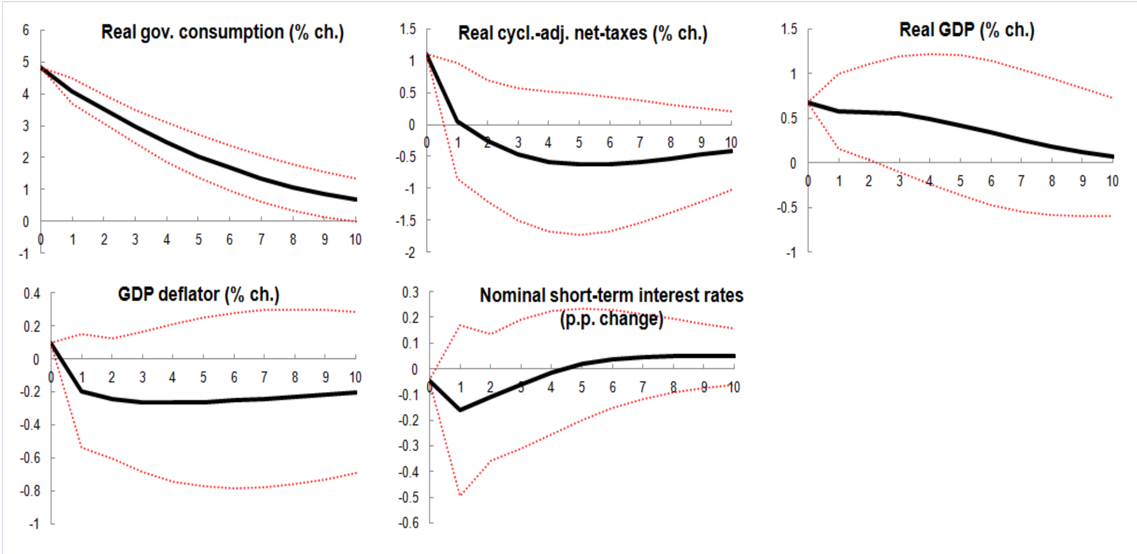
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.11 - Option 'Real government consumption shock'



Specification details

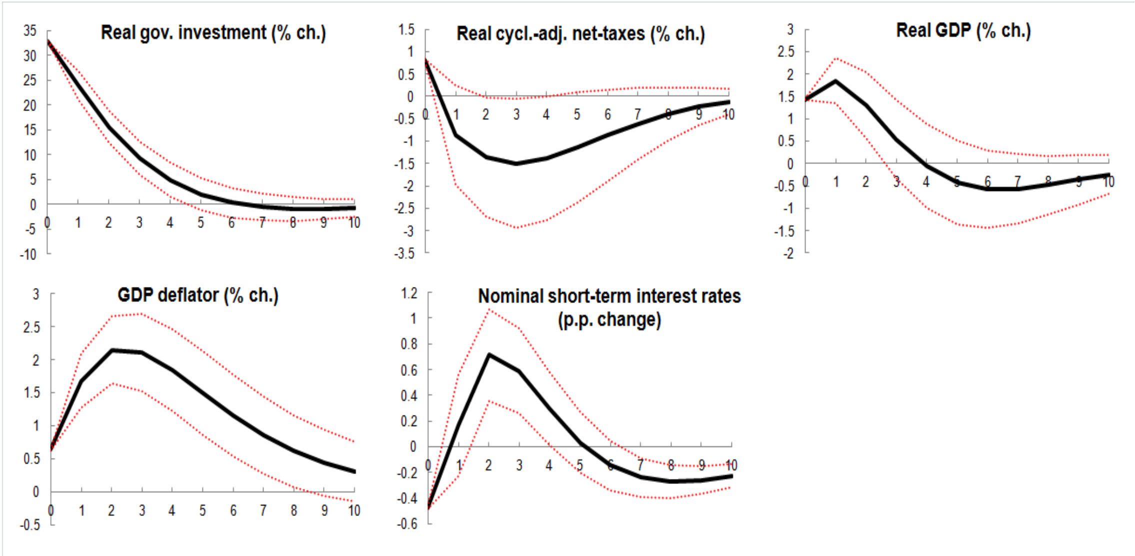
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government consumption shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. consumption	%	4.83***	4.09***	2.97***	2.05***
Real cycl.-adj. net-taxes	%	1.11***	0.06	-0.47	-0.62
Real GDP	%	0.68***	0.58***	0.55*	0.42
GDP deflator	%	0.10***	-0.19	-0.26	-0.26
Nominal short-term interest rates	p.p.	-0.05***	-0.16	-0.06	0.02

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.11 - Option 'Real government investment shock'



Specification details

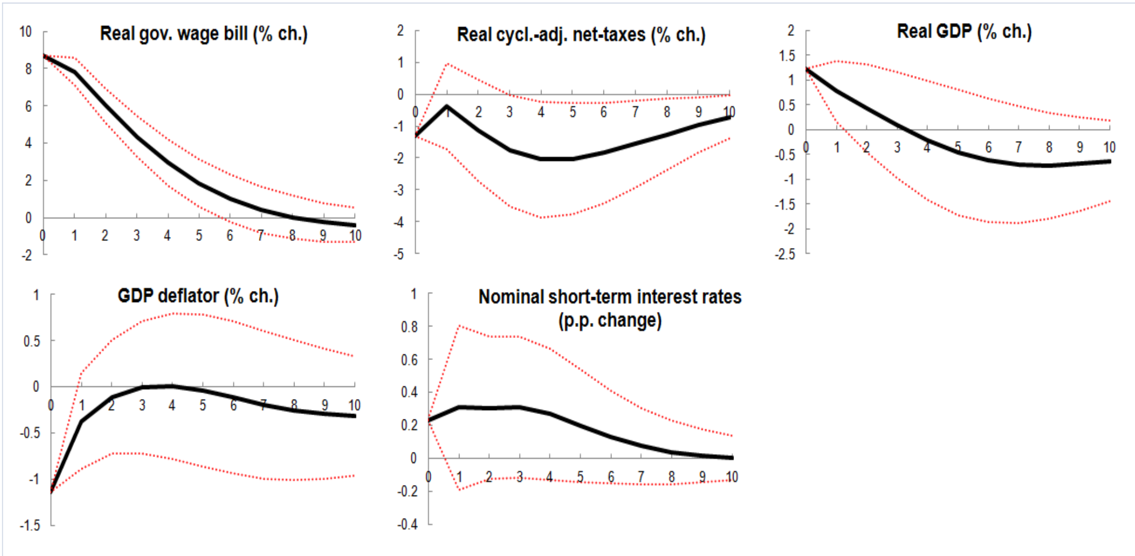
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government investment shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. investment	%	32.77***	23.95***	9.32***	2.05
Real cycl.-adj. net-taxes	%	0.81***	-0.87	-1.50**	-1.14*
Real GDP	%	1.43***	1.85***	0.54	-0.42
GDP deflator	%	0.64***	1.68***	2.11***	1.49***
Nominal short-term interest rates	p.p.	-0.48***	0.17	0.59***	0.03

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.11 - Option 'Real government wage bill shock'



Specification details

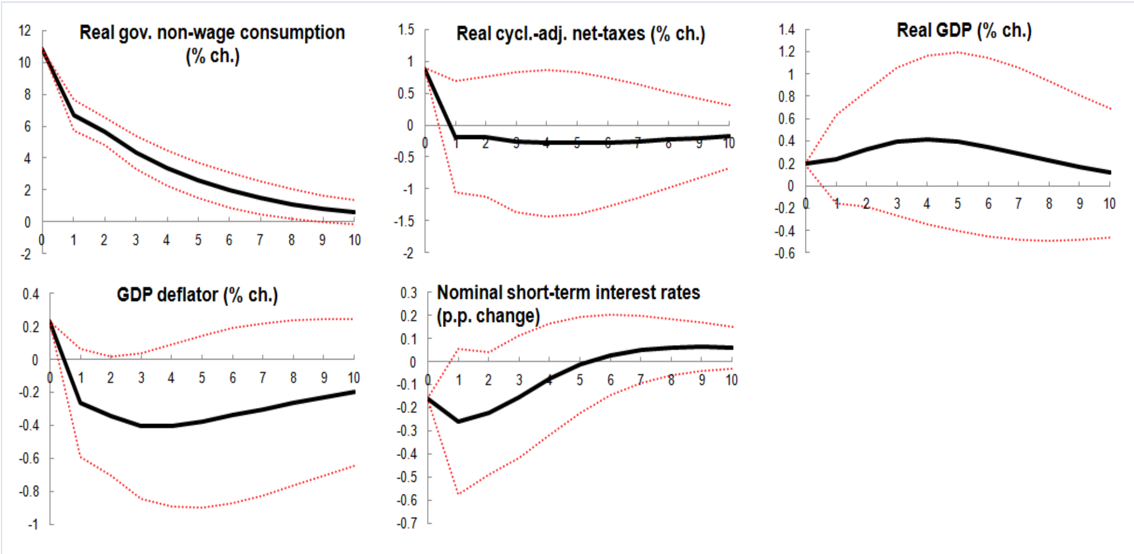
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government wage bill shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. wage bill	%	8.70***	7.84***	4.35***	1.86***
Real cycl.-adj. net-taxes	%	-1.32***	-0.38	-1.77**	-2.03**
Real GDP	%	1.22***	0.78**	0.09	-0.46
GDP deflator	%	-1.14***	-0.37	0.00	-0.04
Nominal short-term interest rates	p.p.	0.23***	0.31	0.31	0.20

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.11 - Option 'Real government non-wage consumption shock'



Specification details

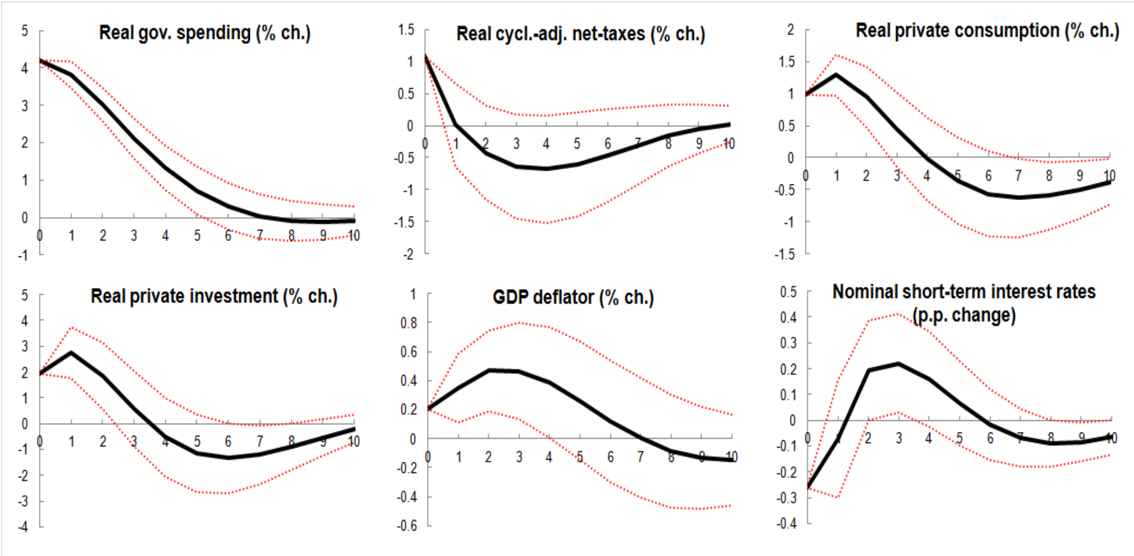
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government non-wage consumption shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. non-wage consumption	%	10.85***	6.68***	4.35***	2.61***
Real cycl.-adj. net-taxes	%	0.89***	-0.18	-0.27	-0.28
Real GDP	%	0.19***	0.24	0.39	0.39
GDP deflator	%	0.23***	-0.26	-0.40*	-0.38
Nominal short-term interest rates	p.p.	-0.16***	-0.26	-0.15	-0.01

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.12 - Option 'Real government spending shock'



Specification details

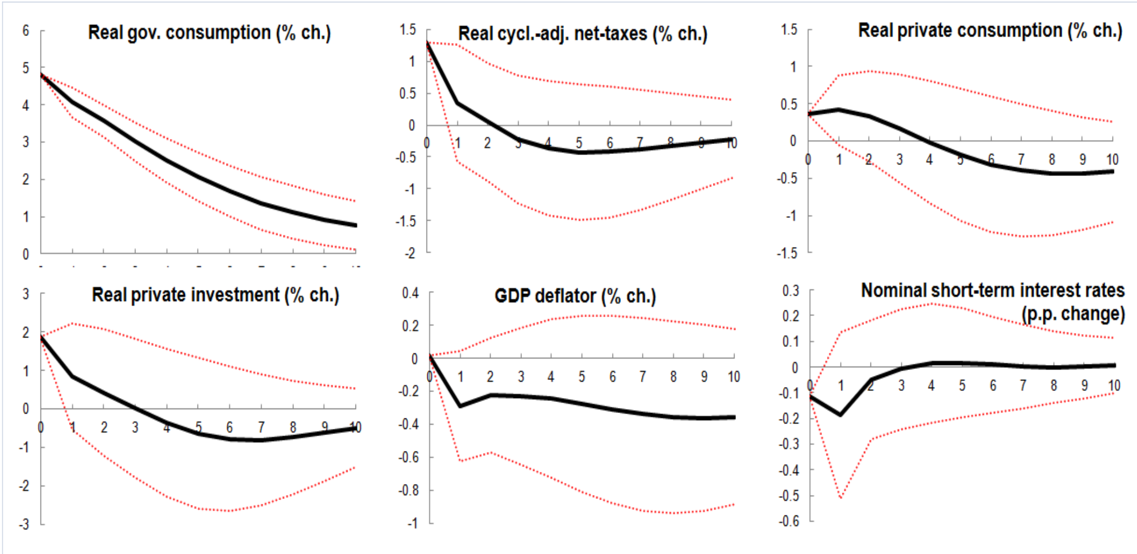
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.82***	2.12***	0.72**
Real cycl.-adj. net-taxes	%	1.10***	0.01	-0.64	-0.61
Real priv. consumption	%	0.99***	1.29***	0.44	-0.37
Real priv. investment	%	1.95***	2.74***	0.55	-1.14
GDP deflator	%	0.21***	0.35***	0.47***	0.26
Nominal short-term interest rates	p.p.	-0.26***	-0.07	0.22**	0.06

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.12 - Option 'Real government consumption shock'



Specification details

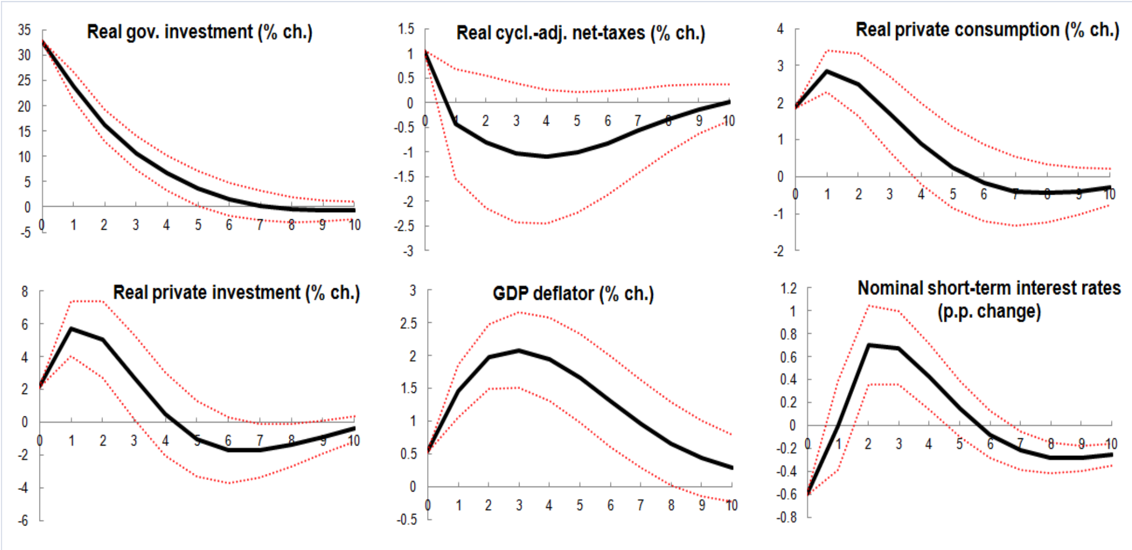
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government consumption shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. consumption	%	4.83***	4.07***	3.01***	2.06***
Real cycl.-adj. net-taxes	%	1.29***	0.35	-0.22	-0.42
Real priv. consumption	%	0.37***	0.42*	0.17	-0.19
Real priv. investment	%	1.86***	0.85	0.01	-0.64
GDP deflator	%	0.02***	-0.29*	-0.23	-0.28
Nominal short-term interest rates	p.p.	-0.11***	-0.19	-0.01	0.02

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.12 - Option 'Real government investment shock'



Specification details

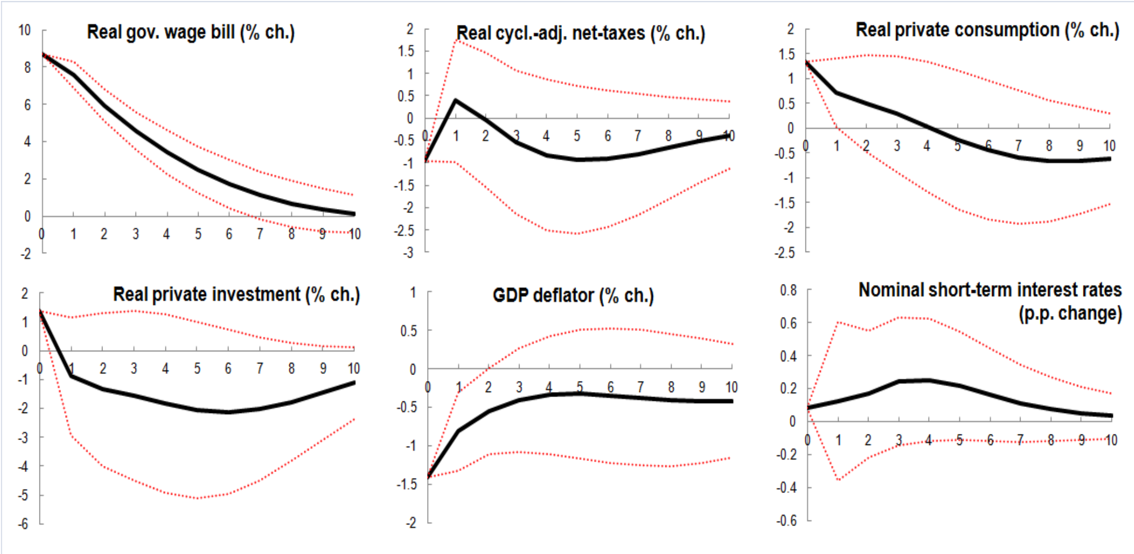
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government investment shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. investment	%	32.77***	23.74***	10.67***	3.70**
Real cycl.-adj. net-taxes	%	1.04***	-0.44	-1.02	-1.01
Real priv. consumption	%	1.86***	2.86***	1.69***	0.25
Real priv. investment	%	2.15***	5.73***	2.72**	-1.00
GDP deflator	%	0.54***	1.46***	2.08***	1.65***
Nominal short-term interest rates	p.p.	-0.60***	0.00	0.67***	0.14

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.12 - Option 'Real government wage bill shock'



Specification details

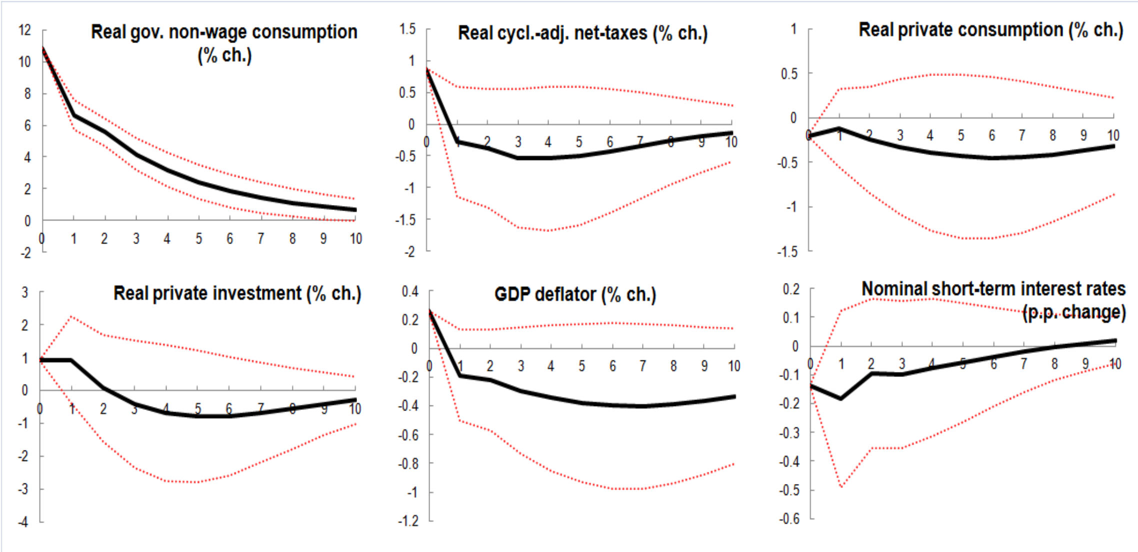
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government wage bill shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. wage bill	%	8.70***	7.60***	4.58***	2.48***
Real cycl.-adj. net-taxes	%	-0.95***	0.39	-0.54	-0.93
Real priv. consumption	%	1.35***	0.72**	0.29	-0.23
Real priv. investment	%	1.37***	-0.89	-1.56	-2.05
GDP deflator	%	-1.41***	-0.81***	-0.41	-0.32
Nominal short-term interest rates	p.p.	0.08***	0.12	0.25	0.21

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.12 - Option 'Real government non-wage consumption shock'



Specification details

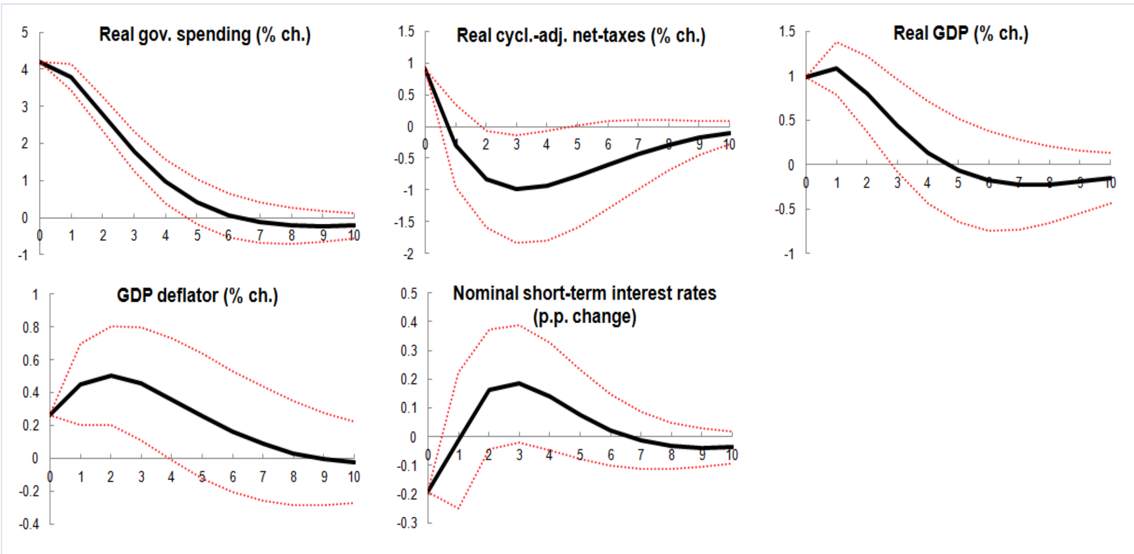
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government non-wage consumption shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. non-wage consumption	%	10.85***	6.65***	4.16***	2.43***
Real cycl.-adj. net-taxes	%	0.87***	-0.27	-0.53	-0.50
Real priv. consumption	%	-0.20***	-0.12	-0.32	-0.43
Real priv. investment	%	0.92***	0.93	-0.42	-0.79
GDP deflator	%	0.26***	-0.19	-0.3	-0.38
Nominal short-term interest rates	p.p.	-0.14***	-0.18	-0.10	-0.06

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.13 - Option 'Baseline specification, EU27'



Specification details

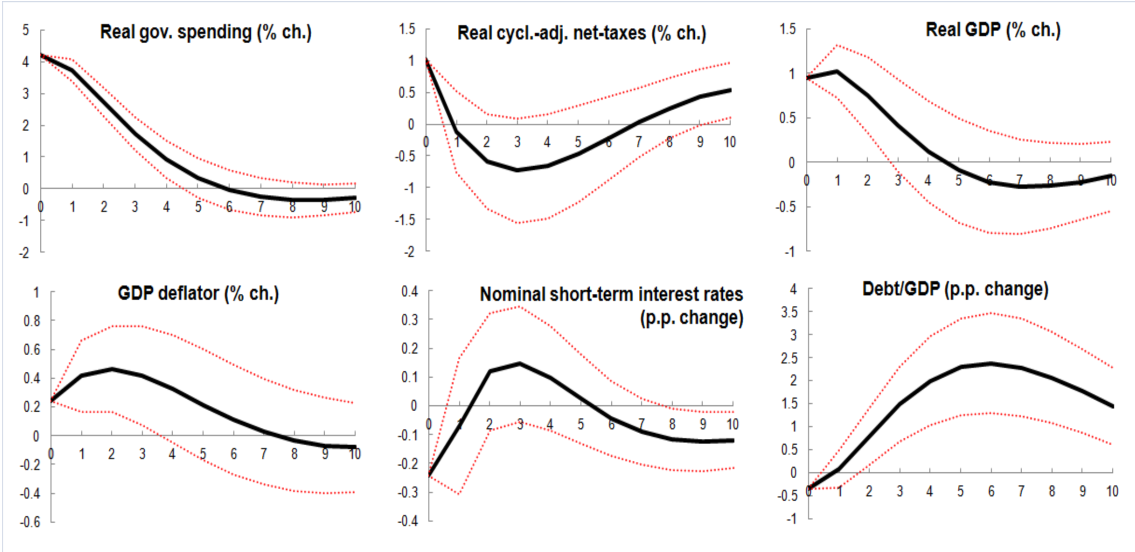
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.13 - Option 'Baseline specification + debt/GDP, EU27'



Specification details

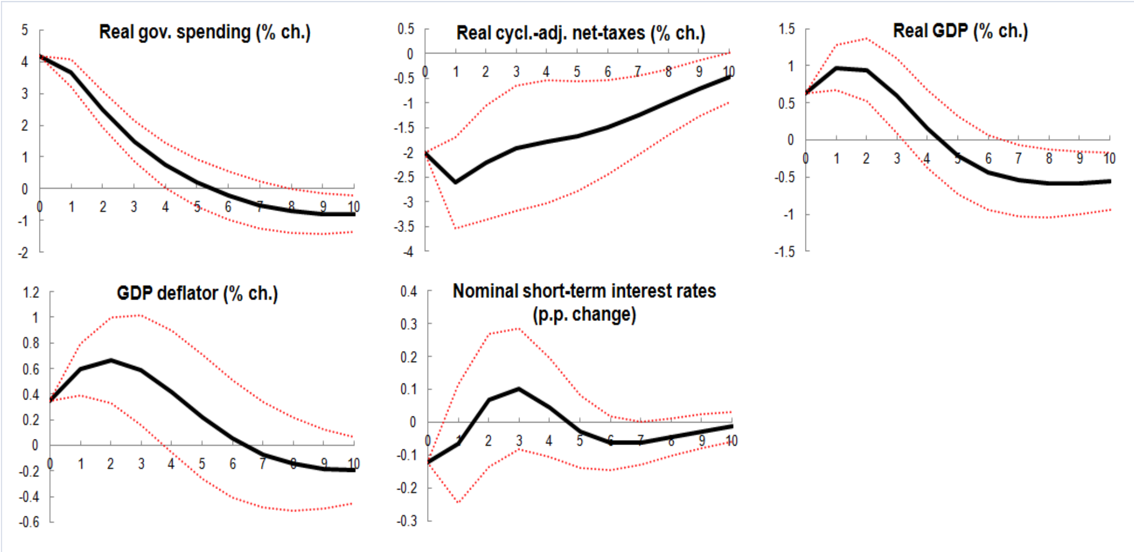
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.73***	1.73***	0.35
Real cycl.-adj. net-taxes	%	1.02***	-0.12	-0.73*	-0.47
Real GDP	%	0.95***	1.02***	0.42	-0.09
GDP deflator	%	0.24***	0.41***	0.42**	0.21
Nominal short-term interest rates	p.p.	-0.24***	-0.07	0.15	0.02
Debt/GDP	p.p.	-0.34***	0.08	1.49***	2.30***

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.14 - Option 'Baseline specification, EU17 (old EU)'



Specification details

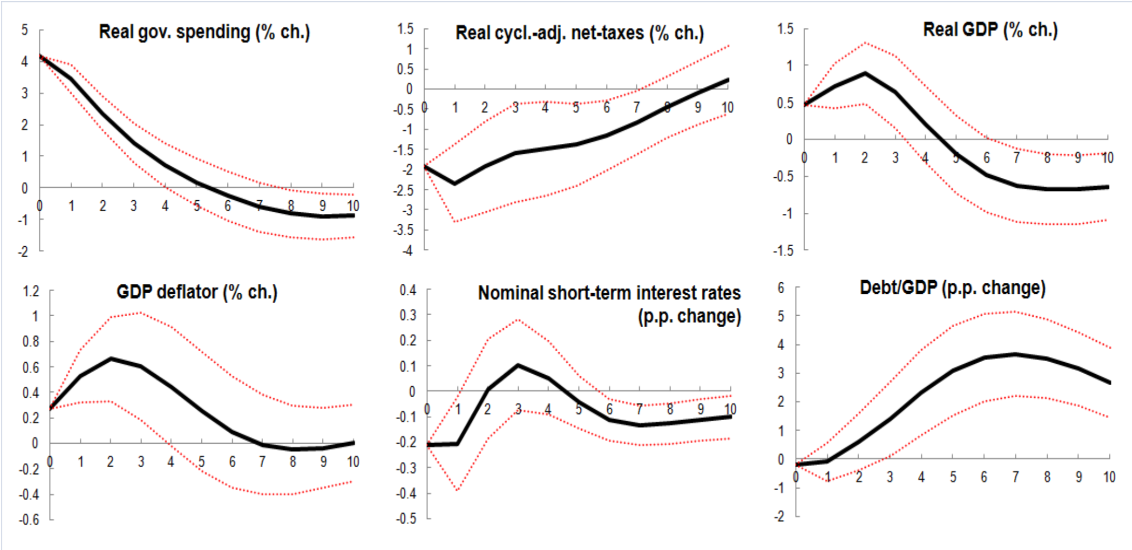
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.64***	1.49***	0.20
Real cycl.-adj. net-taxes	%	-2.00***	-2.61***	-1.92***	-1.67***
Real GDP	%	0.63***	0.98***	0.60**	-0.21
GDP deflator	%	0.34***	0.59***	0.59***	0.22
Nominal short-term interest rates	p.p.	-0.12***	-0.07	0.10	-0.03

***, ** and * denote significance at the 1% , 5% and 10% level, respectively.

Figure 5.14 - Option 'Baseline specification + debt/GDP, EU17 (old EU)'



Specification details

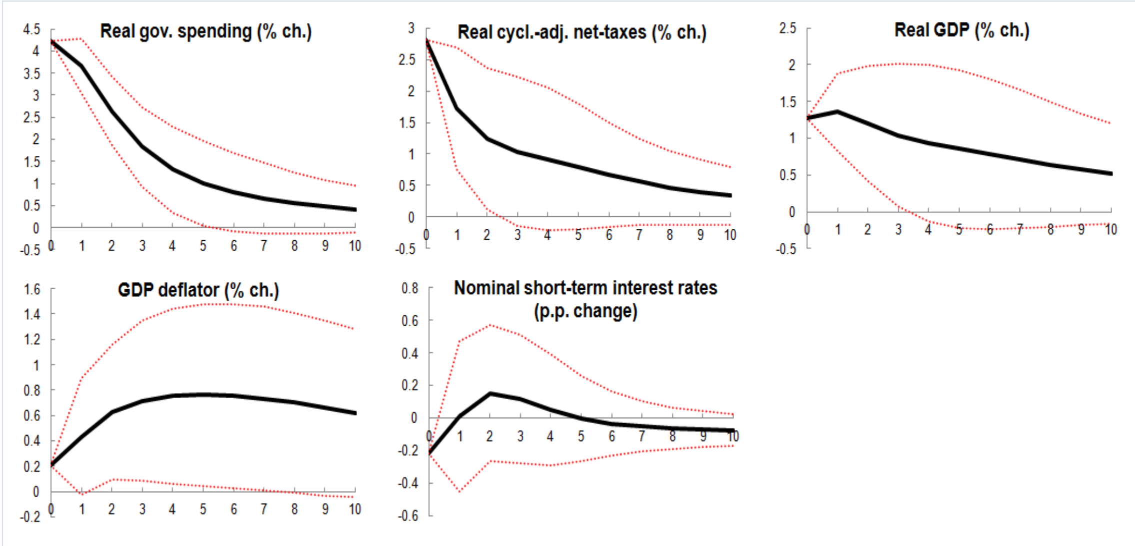
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.44***	1.41***	0.18
Real cycl.-adj. net-taxes	%	-1.91***	-2.35***	-1.60**	-1.38***
Real GDP	%	0.47***	0.72***	0.65***	-0.21
GDP deflator	%	0.27***	0.53***	0.61***	0.25
Nominal short-term interest rates	p.p.	-0.21***	-0.21**	0.10	-0.05
Debt/GDP	p.p.	-0.18***	-0.09	1.41**	3.08***

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.14 - Option 'Baseline specification, NMS10 (new EU)'



Specification details

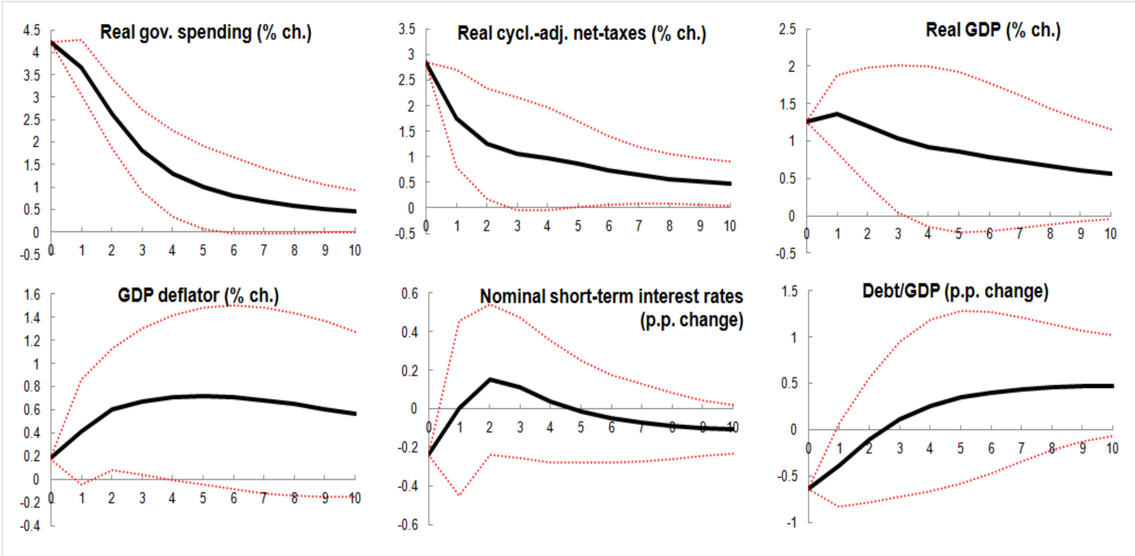
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.66***	1.83***	1.00**
Real cycl.-adj. net-taxes	%	2.81***	1.72***	1.03*	0.80
Real GDP	%	1.28***	1.36***	1.04**	0.86
GDP deflator	%	0.21***	0.43*	0.71**	0.76**
Nominal short-term interest rates	p.p.	-0.22***	0.01	0.12	0.00

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.14 - Option 'Baseline specification + debt/GDP, NMS10 (new EU)'



Specification details

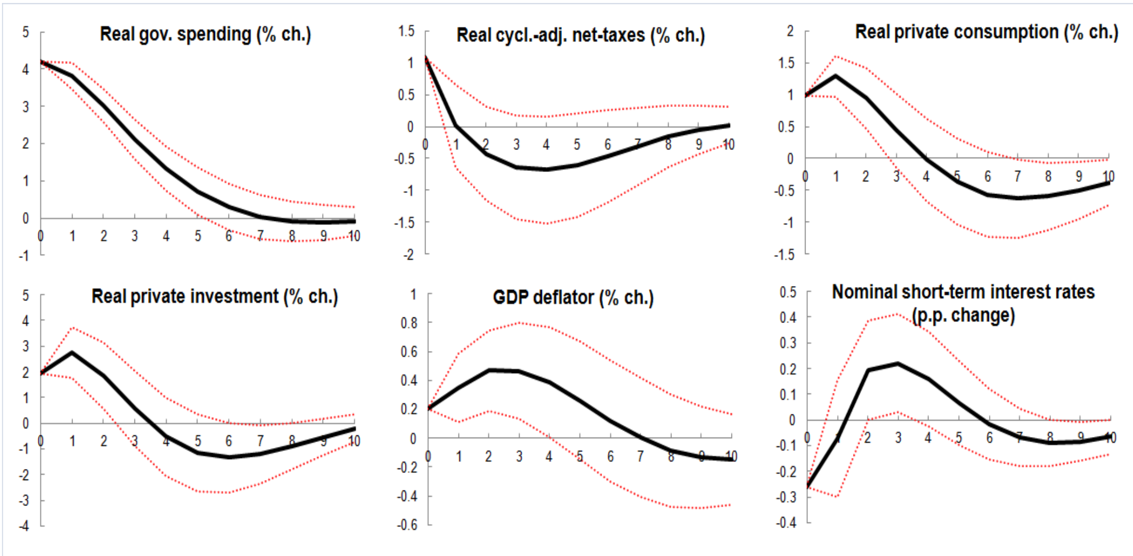
Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.67***	1.82***	1.00**
Real cycl.-adj. net-taxes	%	2.86***	1.76***	1.06*	0.86**
Real GDP	%	1.26***	1.36***	1.03**	0.85
GDP deflator	%	0.18***	0.41*	0.67**	0.72*
Nominal short-term interest rates	p.p.	-0.24***	0	0.11	-0.02
Debt/GDP	p.p.	-0.64***	-0.38*	0.11	0.35

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.15 - Option '6-variable PVAR'



Specification details

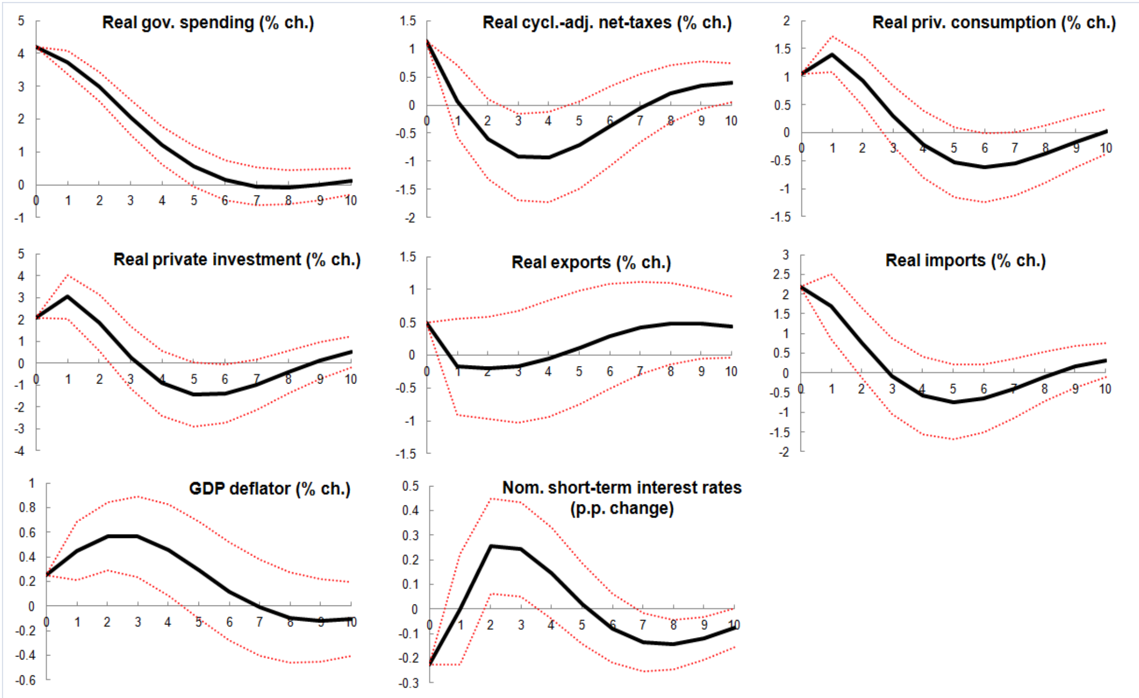
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.82***	2.12***	0.72**
Real cycl.-adj. net-taxes	%	1.10***	0.01	-0.64	-0.61
Real priv. consumption	%	0.99***	1.29***	0.44	-0.37
Real priv. investment	%	1.95***	2.74***	0.55	-1.14
GDP deflator	%	0.21***	0.35***	0.47***	0.26
Nominal short-term interest rates	p.p.	-0.26***	-0.07	0.22**	0.06

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.15 - Option '8-variable PVAR'



Specification details

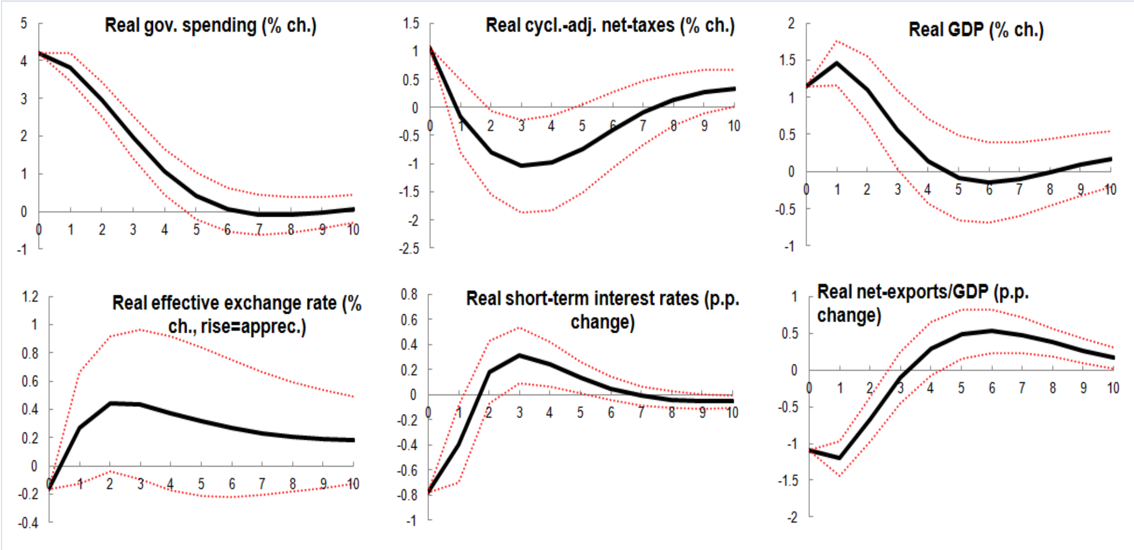
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.73***	2.05***	0.55*
Real cycl.-adj. net-taxes	%	1.13***	0.07	-0.92**	-0.70*
Real priv. consumption	%	1.04***	1.40***	0.30	-0.53*
Real priv. investment	%	2.10***	3.04***	0.25	-1.43*
Real exports	%	0.49***	-0.18	-0.18	0.12
Real imports	%	2.19***	1.69***	-0.08	-0.74
GDP deflator	%	0.25***	0.45***	0.56***	0.29
Nominal short-term interest rates	p.p.	-0.23***	0.00	0.24**	0.02

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.16 - Option 'Open economy specification, EU27'



Specification details

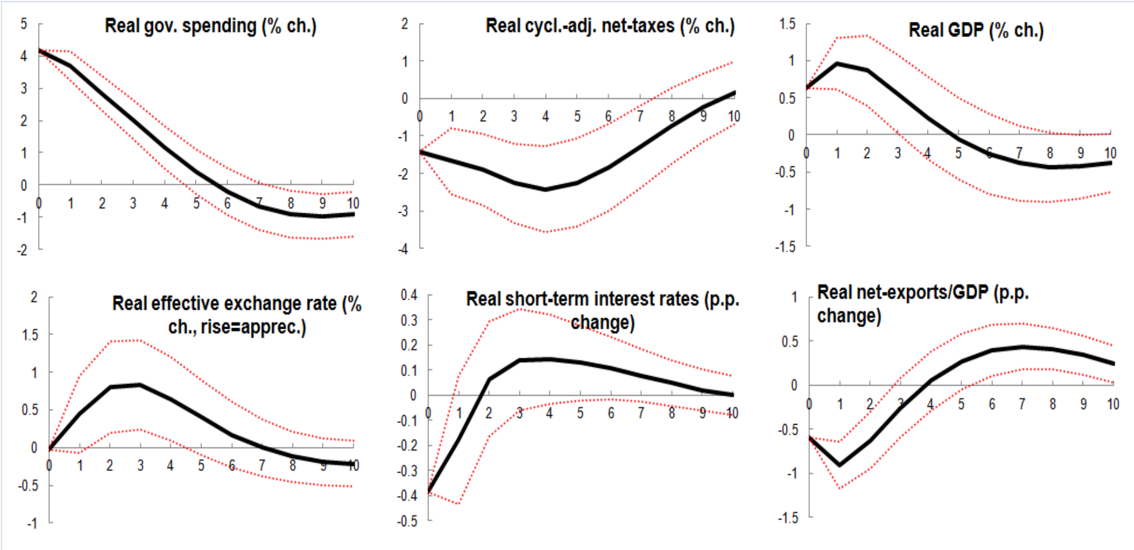
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.83***	1.96***	0.42
Real cycl.-adj. net-taxes	%	1.07***	-0.16	-1.04**	-0.73*
Real GDP	%	1.15***	1.46***	0.56**	-0.09
Real eff. exchange rate	%	-0.17***	0.27	0.44	0.31
Real short-term interest rates	p.p.	-0.78***	-0.40**	0.31***	0.14**
Real net-exports/GDP	p.p.	-1.10***	-1.20***	-0.10	0.49***

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.17 - Option 'Open economy specification, EU17 (old EU)'



Specification details

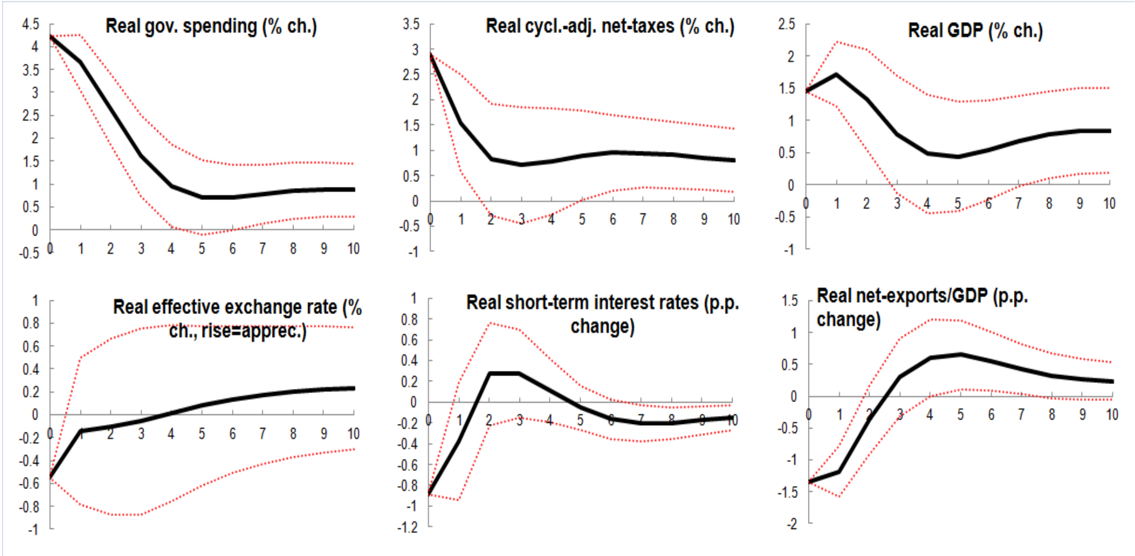
Sample:	EU17	Nr. of countries:	17
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.19***	3.70***	2.01***	0.41
Real cycl.-adj. net-taxes	%	-1.43***	-1.66***	-2.26***	-2.24***
Real GDP	%	0.63***	0.96***	0.55**	-0.05
Real eff. exchange rate	%	-0.03***	0.44*	0.84***	0.40
Real short-term interest rates	p.p.	-0.39***	-0.18	0.14	0.13*
Real net-exports/GDP	p.p.	-0.59***	-0.91***	-0.26	0.27*

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Figure 5.17 - Option 'Open economy specification, NMS10 (new EU)'



Specification details

Sample:	NMS10	Nr. of countries:	10
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

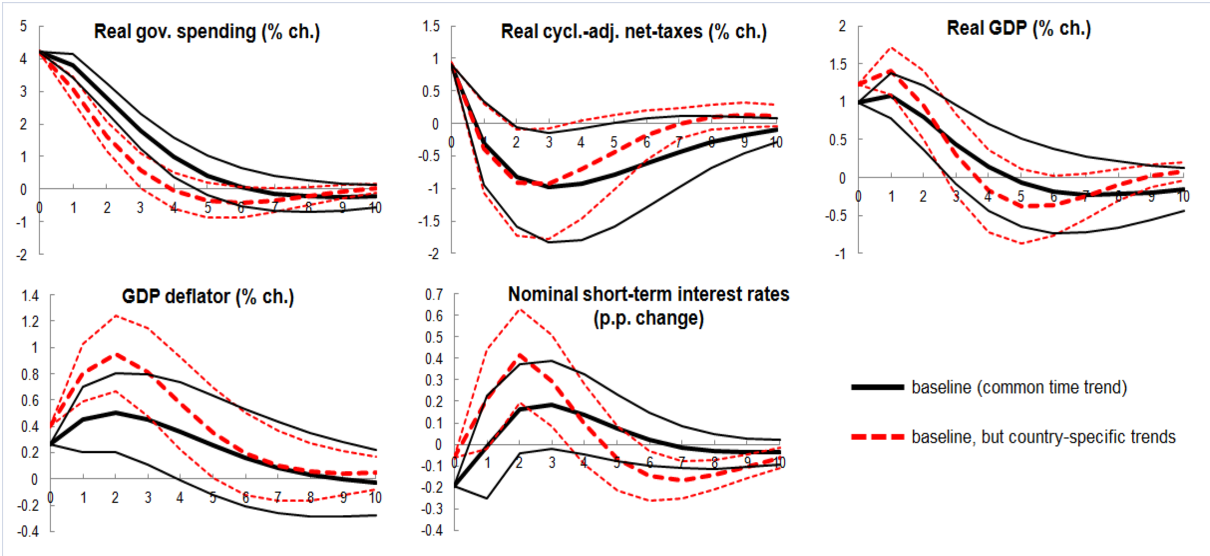
Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.24***	3.66***	1.61***	0.71*
Real cycl.-adj. net-taxes	%	2.91***	1.54***	0.71	0.90**
Real GDP	%	1.46***	1.72***	0.78*	0.44
Real eff. exchange rate	%	-0.55***	-0.14	-0.06	0.08
Real short-term interest rates	p.p.	-0.89***	-0.38	0.27	-0.05
Real net-exports/GDP	p.p.	-1.34***	-1.18***	0.30	0.65**

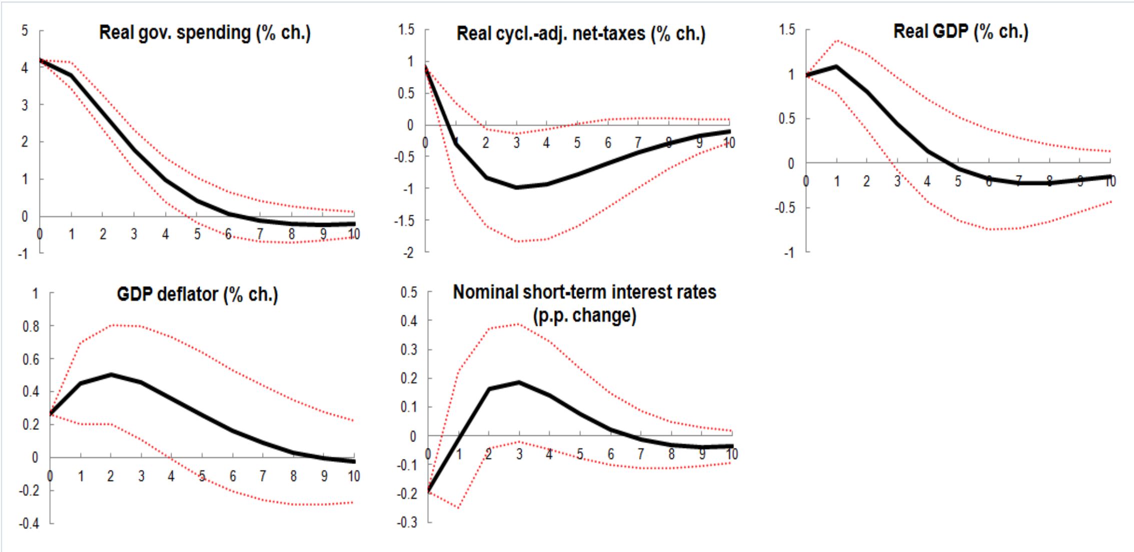
***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Appendix 5.3 - Additional tests related to Chapter 5

Comparison of impulse responses to a government spending shock of 1% of GDP - baseline specification (with common linear time trend) and the specification using country-specific linear time trends instead of the common time trend



Impulse responses to a government spending shock of 1% of GDP - baseline specification (with common linear time trend)



Specification details

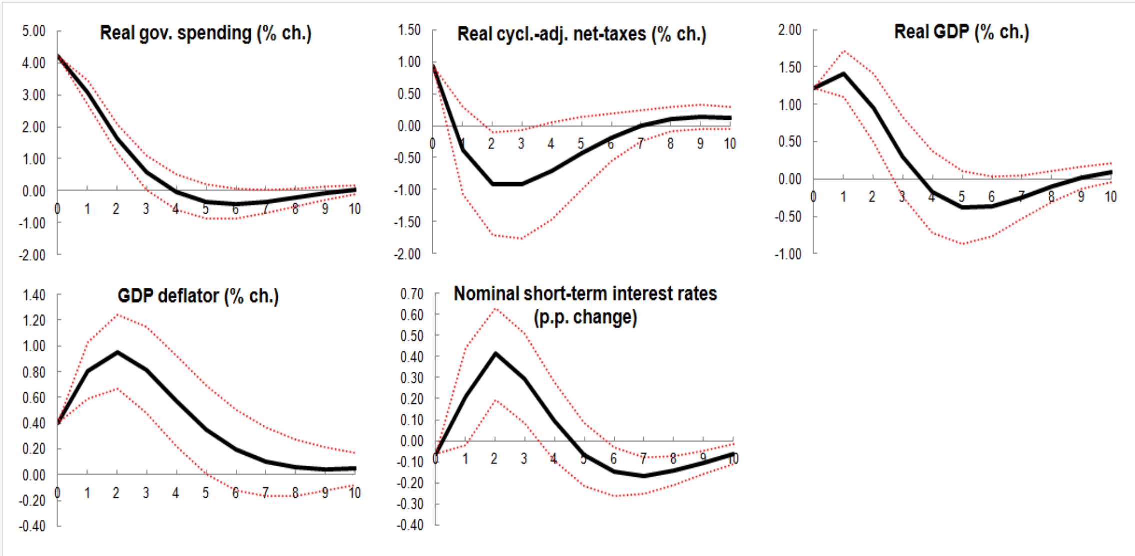
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Impulse responses to a government spending shock of 1% of GDP - the specification using country-specific linear time trends instead of the common time trend



Specification details

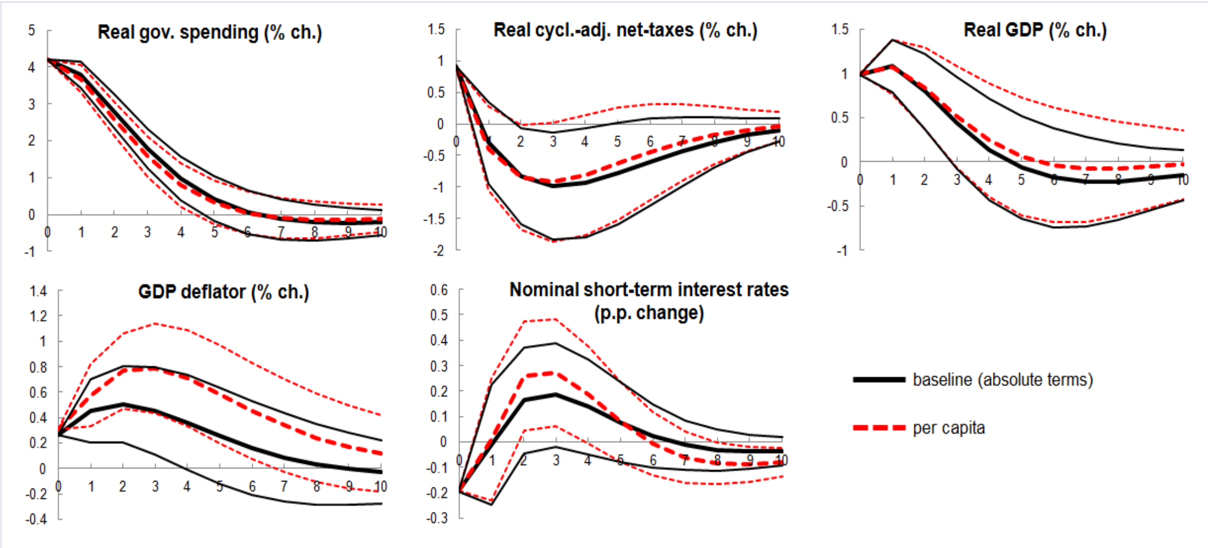
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		no, replaced with country-specific time trends	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

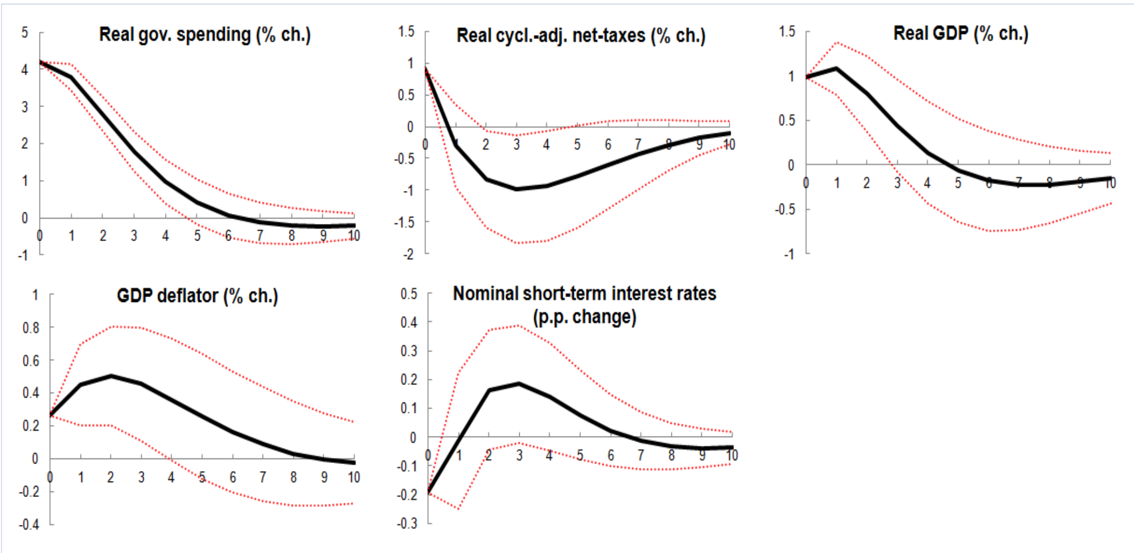
	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.08***	0.58**	-0.33
Real cycl.-adj. net-taxes	%	0.94***	-0.38	-0.92**	-0.43
Real GDP	%	1.22***	1.41***	0.30	-0.38
GDP deflator	%	0.40***	0.81***	0.81***	0.35**
Nominal short-term interest rates	p.p.	-0.06***	0.21*	0.30***	-0.07

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Comparison of impulse responses to a government spending shock of 1% of GDP - baseline specification (using absolute amounts) and the specification using per capita spending, net-taxes and GDP



Impulse responses to a government spending shock of 1% of GDP - baseline specification (using absolute amounts for spending, net taxes and GDP)



Specification details

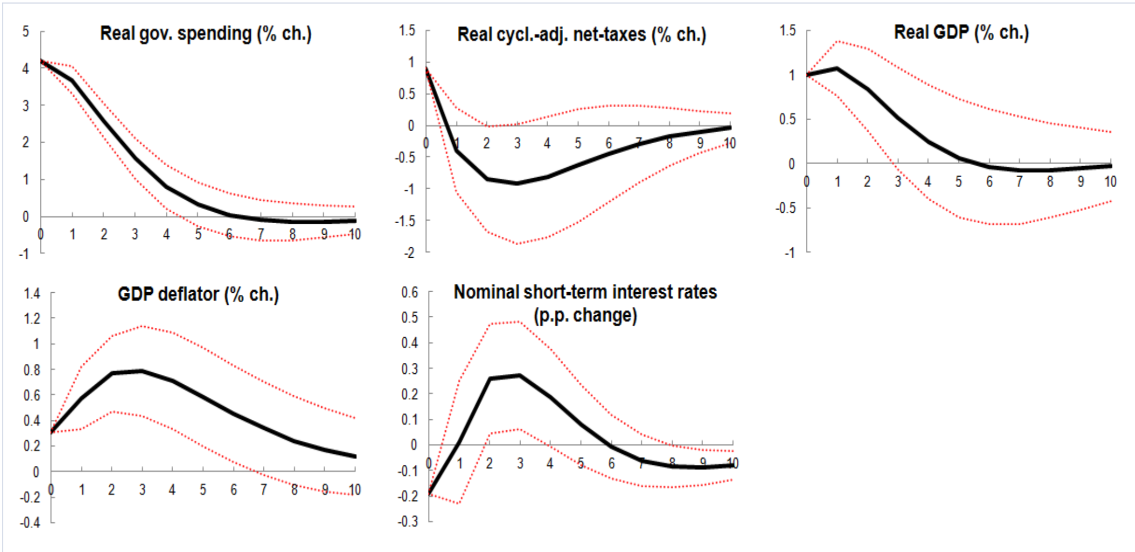
Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending	%	4.21***	3.80***	1.78***	0.42
Real cycl.-adj. net-taxes	%	0.91***	-0.30	-0.98**	-0.78*
Real GDP	%	0.99***	1.08***	0.44*	-0.07
GDP deflator	%	0.26***	0.45***	0.45**	0.26
Nominal short-term interest rates	p.p.	-0.19***	-0.01	0.19*	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Impulse responses to a government spending shock of 1% of GDP - the specification using per capita spending, net-taxes and GDP



Specification details

Sample:	EU27	Nr. of countries:	27
Start:	1995	End:	2012
Nr. of years:	18	Lags:	2
Fixed effects:		country FE	
Common time trend:		yes	

Responses to a government spending shock equal to 1% of GDP (shock at impact i.e. year zero)

	unit	At impact	After 1 year	After 3 years	After 5 years
Real gov. spending, per capita	%	4.21***	3.68***	1.56***	0.32
Real cycl.-adj. net-taxes, per capita	%	0.89***	-0.39	-0.92*	-0.63
Real GDP, per capita	%	1.00***	1.07***	0.51*	0.06
GDP deflator	%	0.31***	0.57***	0.79***	0.58***
Nominal short-term interest rates	p.p.	-0.19***	0.01	0.27**	0.08

***, ** and * denote significance at the 1%, 5% and 10% level, respectively.