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Highlights

- The paper is comparing the effect of currency board arrangements with other monetary/exchange rate regimes on the credibility of the monetary authority
- Answers to survey question about the expectations about the local currency stability are used as an indicator of the credibility of monetary authority
- The results suggest a positive effect of CBA on monetary author's credibility
- Additionally, the results imply that the positive effect of currency boards is greater the worse the expectations about economic prospects and the lower the trust in government

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An investigation into the credibility of currency board arrangements in Bosnia and Herzegovina and Bulgaria¹

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Abstract

Currency Boards are usually argued to increase the credibility of the monetary authority, although this effect ultimately depends on the economic, political and institutional circumstances in the specific country. Few studies have previously been able to address this issue empirically. Using a novel database, the analysis conducted in this paper finds that, other things being equal, the credibility of the monetary authority is likely to be higher in those European transition countries with currency board arrangements, namely Bosnia and Herzegovina and Bulgaria. The results also suggest that currency board arrangements are more likely to increase the credibility of the monetary authority in countries with a low level of trust in government and a weak economy. These findings imply that the maintenance of currency board arrangements in recent years in Bosnia and Herzegovina and Bulgaria may have been advantageous.

Keywords: currency board arrangement; credibility; trust in currency; trust in government

¹ The survey data used in this analysis are derived from the Austrian National Bank (OeNB) Euro Surveys which were provided by the OeNB solely for research purposes. These data were obtained under special contractual arrangements from the OeNB and are not available from the authors. The OeNB has no responsibility for the analysis and views expressed in this paper. We are grateful to the Austrian National Bank for making the survey data available for this research.

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1. Introduction

A currency board is an arrangement under which a country fixes its nominal exchange rate to some foreign currency and maintains 100 percent backing of its monetary base with foreign exchange. Under an orthodox currency board arrangement a central bank cannot implement monetary policy using traditional monetary policy instruments. These rules are typically embedded in law and therefore can be changed only if the law is altered, which makes the currency board a “tougher” regime than other monetary regimes with a fixed exchange rate. Currency board arrangements (CBA hereafter) were introduced in some countries in the process of transition to a market economy which needed to achieve and maintain monetary stability. Implementation of a currency board means that a country has no discretion in monetary policy, which is likely to result in an increase in the credibility of policy and greater confidence that the target(s) of the monetary authority will be achieved.³ Hence, it is expected to impose strict discipline on the monetary authorities regarding their management of domestic money. However, an increased level of credibility of the monetary authority under a CBA is not inevitable, since sustaining credibility depends on the state of the economy and the specific (political/institutional) circumstances in the country. The question as to whether “tougher” regimes result in a higher credibility of the monetary authority and, if so, under what circumstances, therefore needs to be answered by empirical analysis.

Credibility of a CBA has previously been investigated by estimating switches in the interest rate differentials between a CBA and its anchor currency country. In contrast, in this paper the hypothesised increased credibility of announced policy under a CBA is investigated by comparing the effect of different monetary/exchange rate regimes on citizens' expectations regarding the future stability of their local currency. The effect of CBA is also estimated conditional on the economic situation and level of trust in the government in a country. The estimations are conducted using survey data from ten European transition countries, two of which, Bosnia and Herzegovina (BH hereafter) and Bulgaria, operate a CBA. Due to restrictions imposed by CBA both BH's and the Bulgarian central bank have to hold at least 100% coverage of their monetary base in foreign assets and cannot finance their government or banks. Both banks deviate from the orthodox CBA by setting the reserve requirement rate for banks. However, the Bulgarian currency board deviates more from orthodox CBA. Namely, according to the Law on the Bulgarian National Bank (Article 33, Paragraphs 2 and 3), ‘upon emergence of a liquidity risk that may affect the stability of the banking system, the Bulgarian National Bank may extend to a solvent bank lev-denominated (i.e. in the domestic currency) credits with maturity no longer than three months, provided they are fully collateralized by gold, foreign currency or other such high-liquid assets. These credits may be extended solely up to the amount of the excess of the lev equivalent of the gross international reserves over the total amount of monetary liabilities of the Bulgarian National Bank’. The Central Bank of BH cannot act as a lender of last resort under any circumstances.

The degree of credibility has been argued to affect the stability and sustainability of a CBA

³ Bordo and Siklos (2015) do not address CBA but do maintain that the Gold Standard, also at the “tough” end of the spectrum of monetary arrangements, ‘improves central bank credibility’ (p.6).

regime, since the absence of credibility is likely to lead to a large-scale conversion of domestic currency into other currencies, which is likely to result in a currency crisis. The importance of credibility under a CBA and the rationale for using respondents' trust/confidence in the future stability of local currency as an indicator of the monetary policy's credibility is examined in the following section. The determinants of the credibility of the monetary authority/regime are appraised in Section 3. After presenting the survey data and its descriptive statistics in Section 4, estimation results are presented in Section 5. Finally, the main conclusions arising from the empirical analysis are discussed.

2. Credibility of a CBA

The credibility of the monetary regime is usually identified as its important feature, since economic policies are believed to be more effective if they are credible to private economic agents (Blackburn and Christensen, 1989). A high level of credibility of a monetary regime is expected not only to reduce the time-inconsistency problem and therefore to provide lower inflation expectations and consequently a lower inflation rate, but also to lessen speculative attacks, contribute to macroeconomic stability and attract foreign investments (although achieving these latter goals are likely to require a combination of additional policies as well). Mulino (2002) and Ledesma-Rodriguez et al. (2004) argued that low credibility might be a destabilising element and a source of future currency crises, especially in an economy with a CBA or fixed exchange rate.

Blackburn and Christensen (1989, p.2) provided the most general interpretation of credibility: 'the extent to which *beliefs* about the current and future course of economic policy are consistent with the program originally announced by policy makers' (emphasis added). In the context of a CBA we may argue that credibility refers to the public's expectations with respect to the commitment to maintain a fixed exchange rate (stable national currency against the anchor currency), since that is the announced policy.⁴ This proposition can be argued to apply to all the countries in this sample, given that all of them effectively peg against the euro. However, other things being equal, these expectations are likely to be firmer in countries with a CBA since it is harder to deviate from a fixed rate as the (fixed exchange rate) rule is embedded in law and the costs of changing legislation are argued to be high. However, achievement of a high level of credibility of the monetary authority under a CBA is not automatic, since sustaining credibility depends on the state of the economy (Drazen and Masson, 1994) and the specific (political/institutional) circumstances in the country (Blackburn and Christensen, 1989; Desquilbet and Nenovsky, 2007).

Studies which investigated the credibility of monetary/exchange rate regimes usually used the interest rate differential relative to the anchor-currency (Arestis and Mouratidis, 2005; Ho and

⁴ In CBA countries confidence in the local currency's future stability can be argued to be the main determinant of the credibility of the monetary authority, since the currency's stability is its primary target and this is specified in the central bank laws in all European transition countries that implement a CBA. This primarily refers to stability against the anchor currency, but since one of the criteria when choosing the anchor currency is its stability against other major world's currencies, it can be argued to refer to overall currency stability.

Ho, 2009), which is argued to be a good proxy for expected devaluation and credibility of fixed exchange rates. Interest rate differentials have also been used for estimating the credibility of the European Monetary System or comparable exchange rate regimes (Weber et al., 1991; Drazen and Masson, 1994; Ledesma-Rodriguez et al., 2005). In these studies a Markov-switching model is commonly used in determining switches in the money market interest rate differentials. However, Mulino (2002) and Feuerstein and Grimm (2006) emphasised that the gain in credibility should be represented/measured by the extent to which the targets/announced policies influence expectations about future policy. However, in the latter studies no empirical investigation, based on actual expectations, was conducted.

Since the beginning of the recent global crisis another group of studies have analysed levels of trust in the European Central Bank (ECB) (Fischer and Hahn, 2008; Gros and Roth, 2010; Bursian and Furth, 2012; Walti, 2012). In these studies trust in the ECB is used as an indicator of its credibility. Fischer and Hahn (2008) argued that the evidence suggested this trust was based on the achievement of the ECB's primary goal. In our analysis, responses to a survey question related to trust/confidence in a national currency are taken to reflect trust in the respective central bank. The question about trust in their currency can be considered "closer" to respondents than a question about the monetary authority, whose actions and policies they may or may not be familiar with. As argued by Bursian and Furth (2012), agents are bounded rationally and are unlikely to fully understand the mandate of the central bank. Trust in a currency can be argued to be more relevant since, based on this trust, residents make their decisions about using the national currency as a medium of exchange and store of value, which then affects the stability and sustainability of their national monetary and financial system as a whole. This approach directly utilises expectations without the need to use any proxies for expected (in)stability of the local currency. Bursian and Furth (2012) also emphasise the importance of the subjective component when estimating citizens' perceptions/expectations. Moreover, they emphasise that having a "tough" policy is not enough, but that *people have to trust that the policy really is and will remain "tough"* in order for the policy to have the expected effect. Therefore, when estimating the credibility of a monetary regime one should prefer subjective attitudes to observing changes in variables that are considered to be "good proxies". Finally, the analysis of subjective attitudes captured in survey responses draws support from Roth et al. (2012, p.14) who cite Banducci et al. (2009) to the effect that 'actual economic reality – as summarised in official economic statistics – does not necessarily agree with the perceived economic situation'.

In order to capture these subjective attitudes (answers to) questions from surveys conducted by the Austrian National Bank (OeNB) are used. Surveys were conducted in ten European transition countries (Albania, Bulgaria, Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Macedonia, Poland, Romania, and Serbia), two of which, namely Bosnia and Herzegovina and Bulgaria, operate under a CBA. This paper draws upon eight survey waves conducted from 2007 fall until 2011 spring (2 surveys per year) and the question related to the expectations about a currency's stability was included in all eight surveys. The precise question from the Austrian National Bank dataset used as an indicator of credibility is: '*Over the next five years, the [local currency] will be very stable and trustworthy*'. Bursian and

Furth (2012) emphasise that credibility and trust are closely related and in the following discussion these terms are used interchangeably.

Previously, Valev and Carlson (2007) have used public expectations regarding a currency's stability to assess the credibility of a CBA. However, this study focused on Bulgaria and sought to assess the possibility of a collapse of its CBA, with a sharp devaluation of the national currency, utilising only descriptive statistics. In our paper the expectations about the local currency's stability are the chosen indicator of a CBA's credibility and this can be assumed to be "closer" to respondents than a question about the probability of devaluation. In addition, the effect of CBA on credibility is compared with other regimes and investigated conditional on economic and political/institutional circumstances.

3. Determinants of the credibility of a monetary regime

In order to estimate the effect of a CBA on the credibility of the monetary authority a dummy variable is included and captures the difference between the effect of CBA and other monetary arrangements on credibility. Endogeneity, caused by simultaneity, is not likely to be an issue between the expectations of currency stability and the CBA, since there is no rationale for assuming that current expectations about currency stability affect the likelihood of a CBA being in operation/having a CBA (in both Bosnia and Herzegovina and Bulgaria the decision concerning the introduction of a CBA was taken and implemented long before our sample period). Beside the CBA dummy variable, it is necessary to control for other potentially relevant variables. However, there is no substantive theoretical or empirical research on the choice of determinants of trust/credibility. In order to assess what additional controls should be included in the model, in this section previous studies of a monetary regime's credibility are appraised.

The degree of credibility of the monetary authority/policy has been addressed in many studies starting with Barro and Gordon's paper from 1983 in which they developed a model of the incentives for a monetary authority to deceive. This model was subsequently developed to include other determinants of the monetary authority's credibility apart from time-(in)consistency considerations. Drazen and Masson (1994), Mulino (2002), and Castren et al. (2010) emphasised that a high unemployment rate may undermine the credibility of monetary policy under a fixed exchange rate (and CBA). Mulino (2002) argued that external shocks and/or speculative attacks might also reduce the CBA's credibility and result in recession. Feuerstein and Grimm (2006) noted that the credibility of the CBA itself is transient since its maintenance depends on the economic situation in a country. Bursian and Furth (2012) emphasise the importance of macroeconomic conditions, country specifics, as well as the political views of respondents, in the trust-building process. Ehrmann et al. (2010) argue that public trust in the ECB during the crisis can be explained by the economic situation, trust in the overall European project and financial and banking sector (in)stability. In their empirical analysis they also control for respondents' political orientation and trust in the European Commission, implying the importance of controlling for political circumstances. Valev and Carlson (2007) also argued that the political affiliation of respondents should be taken into

account. Walti (2012) emphasise the importance of controlling for trust in economic institutions, especially in a period of crisis when uncertainty is increased. Walti also underlines the importance of controlling for social loss functions (proxied by movements in inflation and unemployment), as well as other country-specific developments and time specifics. Beside ‘picking up’ unobservable time-invariant country heterogeneity, Walti (2012) notes that inclusion of country fixed effects also controls for a possible time-invariant framing effect characteristic of surveys. Country and time fixed effects are also included in the empirical analysis conducted by Gros and Roth (2010) and Bursian and Furth (2012), although the latter include time dummies only for the years of crisis. Based on suggestions from these studies, the characteristics of the countries in our sample and the specific question used as an indicator of credibility of CBA, the preferred specification of the model is now addressed.

Since subjective attitudes are used as the dependent variable, it is important to control for respondents’ socio-demographic characteristics. In this analysis age, gender, level of education completed and employment status are used as controls. We also control for the economic situation and political circumstances in each country, as well as membership of a country-group and time specifics (see Figure 1).

Insert Figure 1 around here

The economic situation in a country can be captured by either using the actual macroeconomic variables or respondents’ perceived values. Since economic theory is based on the proposition that economic agents respond to reality as they experience and perceive it, we prefer a model utilising the expectations (perceptions about the future) of the economic situation in a country as a control variable to a model with the actual (official) macroeconomic variables. Moreover, since we use respondents’ expectations about their currency as the dependent variable it is more appropriate to use their expectations about their country’s macroeconomic performance as a control, since it is more likely that people base their expectations about a currency on their own expectations about the economic situation. As emphasised by Uslander (2010, p.112) ‘trust depends on information and experience’. Moreover, using one variable for the economic situation enables us to estimate the effect of CBA on credibility conditional on the economic situation (by using interaction terms; this is explained below in more detail). Using a set of macroeconomic variables would be more complex, for both estimation and interpretation. Moreover, collinearity is likely to be more pronounced in a model with actual macroeconomic variables, since the same value for the same macroeconomic variable would have to be attached to all respondents that come from the same country and are interviewed in the same year. Accordingly, using the actual macroeconomic variables would dictate a small sample (10 countries, 3 years), while the number of observations from the survey is much larger (10 countries, approximately 1,000 respondents per country per survey, 6 survey waves). This means a difference in potential sample sizes of three orders of magnitude. Therefore, even where underlying relationships are

present in the data, a model using official macroeconomic variables is not likely to yield precise estimates, whereas the preferred model where all the variables used are derived from survey data can give more precise estimates. Another reason for preferring subjective measures of the economic performance over the official macroeconomic data is that the official statistics, especially in the less developed countries, are usually argued to be limited and unreliable (Sanfey and Teksoz, 2005). Finally, as argued by Ho (2001) (as cited in Desquilbet and Nenovsky, 2007, p.9) ‘human behaviour is an immediate source of a possible crisis’ and we may assume that any such behaviour is reflected in residents’ expectations. Therefore, our preferred model is one in which subjective attitudes are used.

The precise question from the surveys used as an indicator of the economic situation in the preferred model specification is: ‘*Over the next five years, the economic situation of [my country] will improve*’. As noted above, it is important to control for the political circumstances as well. This is especially relevant for the countries in our sample, since Bosnia and Herzegovina and Bulgaria have had a relatively high degree of political uncertainty. The survey question regarding the political circumstances in a country from the surveys is: ‘*I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you tend to trust it or tend not to trust it: 1. Government/cabinet of ministers.*’ It might be expected that the better the expectations about the economic situation and the higher the level of trust in government then the more stable and trustworthy the local currency is expected to be. From the review of previous studies, we may conclude that, even after controlling for the economic situation and the level of trust in government, the ultimate effect of CBA on the credibility of monetary policy depends on the state of the economy and the level of trust in government. Besides including the economic situation and level of trust as independent variables, it follows that these should also be interacted with the CBA variable in order to estimate/observe the effect of CBA conditional on different economic situations and different levels of trust in government. Indeed, Blackburn and Christensen (1989, p.4) argued that: ‘In general, credibility of monetary policy will depend not just upon monetary policy alone but rather upon the perceived coherence of the overall macroeconomic program, together with the intellectual and political consensus on the economic theory being used and the objectives and conduct of economic policy.’

Desquilbet and Nenovsky (2007) argued that in CBA countries a source of trust in the local currency is trust in the anchor currency (in our case the euro). Therefore, we control for the effect of trust in the anchor currency, by using answers to another question from the survey: ‘*Over the next five years, the euro will be a very stable and trustworthy currency*’. Since the local currencies in both CBA countries were pegged to the euro in the observed period it might be expected that confidence in the local currency is highly determined by the degree of trust in the euro.⁵ To control for any shocks that are common for all countries we include time

⁵ Although closely related, confidence in the stability of the local currency and the euro are not likely to be jointly determined since the stability of the euro depends on its exchange rate with other currencies such as the dollar, but not significantly on the national currencies of Bosnia and Herzegovina and Bulgaria. In contrast trust in their local currency is likely to depend on factors such as the economic situation and political circumstances in the CBA country which have no effect on the level of confidence in the euro.

(wave) fixed effects. This is especially important given that the period observed was a period of global financial crisis. However, given the interest in the effect of CBA, due to perfect collinearity we include country-group dummies instead of country dummies. Namely, BH's and a Bulgarian country dummies and a CBA dummy cannot be included in the same regressions, since the first two sum to the second.

In order to observe the effect of a CBA we need a CBA dummy, without country dummies, that will compare the joint effect of Bulgaria and BH to all other countries. The CBA variable captures what is unique to BH and Bulgaria compared to all the other countries (i.e. what distinguishes them from the other countries). Based on the comparison of macroeconomic variables and world development indicators⁶ we can conclude that the only outstanding similarity between BH and Bulgaria is a CBA and that there are no other characteristics common to those two but different from those of the other countries in our sample. For example, the aggregate EBRD index on progress in transition averaged for 1998-2012 for BH was 2.72; for Bulgaria 3.55. Finally, with respect to recent history, ethnic composition and relationship with the European Union there are substantial differences between BH and Bulgaria: BH recently experienced war, while Bulgaria had not in the recent past; BH is a multinational country, while this ethnic diversity is not so pronounced in Bulgaria; BH is not an EU member, Bulgaria is. To our knowledge, there is no set of economic, political or historical characteristics that define these countries as a distinct group. Therefore, it is a reasonable presumption to believe that the CBA dummy variable is capturing the effect of CBA rather than some other set of common characteristic(s) of these countries.

However, by not including country dummies we are neglecting time-invariant country specifics and so run the risk that their influence may be picked up by other variables in the model, including the CBA dummy. In order to partially control for country specifics we include the expectations about the economic situation in a country and trust in government. Moreover, although we cannot include individual county dummies, three country-group dummies are included. Fisher (2010) argued for the inclusion of geographic region dummies for groups of countries 'sufficiently similar to share common socio-economic traits, possibly caused by imitation effects, exchange of population and other types of spill-over across neighbouring countries' (p.16,17) and that estimates will not be biased by the omission of country fixed effects if regional/country-group effects are controlled for. Therefore, we control for EU membership; for Ex-Yugoslav member countries; and for the level of development. Inclusion of the EU dummy variable (which is 1 for Bulgaria, Czech Republic, Hungary, Poland, and Romania for the whole sample period) is based on the assumption that those who entered the EU have more rigid rules regarding their inflation rate, exchange rate etc., which may (positively) affect expectations about both the local currency and the economic situation in a country. The inclusion of the Ex-Yugoslav dummy (which is set to 1 for BH, Croatia, Macedonia and Serbia) is based on a geographical and historical rationale. Namely, these countries have different experiences from other countries in the sample. These ex-Yugoslav countries share the same experience of loss of monetary unity and specific

⁶ A detailed comparison of trends in macroeconomic variables and government indicators between transition countries is available from the authors upon request.

political disturbances after the break-up of Yugoslavia (in the early 1990s), which can still affect the credibility of their individual/national monetary authorities (formed after the break-up). Finally, the level of development is controlled for by identifying the group of countries with a GDP per capita higher than \$10,000 (Croatia, Czech Republic, Hungary and Poland). This group of countries also has the highest scores for the world development indicators (rule of law, control of corruption, regulatory quality, political stability, voice and accountability). People in countries with a higher level of development might expect the situation in their countries, and therefore their local currencies, to be more stable than those in less developed countries.

4. Descriptive analysis of the survey data

As noted in the previous sections, answers to questions from the Austrian National Bank surveys are used in the analysis. These surveys were exclusively made available for this research by the Austrian National Bank and have not previously been used outside the Bank or for this kind of research. For each survey, face-to-face interviews were conducted in ten countries from 2007 to 2011 (two survey waves per year), with approximately 1,000 respondents (which are different in each survey wave) per country and wave. The question about trust in government was not included in the first three survey waves so the preferred specification is estimated on a dataset with approximately 40,000 observations. Additionally, as a robustness check, estimations are conducted on a larger dataset, where all available data is used, but the trust in government variable is excluded. The sample was selected via a multi-stage stratified random sample procedure, with the exception of Bulgaria, where quota sampling was applied. Respondents can be considered to be representative of their respective population structure, since all countries' regions are represented, except in Poland where the population of only the ten largest cities was sampled.⁷ Therefore, respondents are broadly representative of different countries' regions, genders, ages, level of education and employment status.

In several recent studies the importance of controlling for survey design characteristics when using survey data in estimations has been emphasised (Chromy and Abeyasekera, 2005; Kreuter and Valliant, 2007; Pitblado, 2009). These studies argue the need to control for four features usually involved in sample surveys, which may have 'potentially significant consequences for estimations' (Kreuter and Valliant, 2007, p.2). These features are: weights; stratification (stratum/strata); clustering (primary sampling units (PSUs)); and finite sample population (FSP). These can be controlled for by defining these features in the "svyset" (available in Stata12) and specifying a "svy" option before the estimation command. In the case of our survey data there are differences in the sampling frames and approaches to sampling between the countries and it is more complicated to control for survey design in cross-section analysis. Moreover, the survey database only contains full data on weights. It

⁷ Further details can be found on the Austrian National Bank website:
http://www.oenb.at/en/geldp_volksw/zentral_osteuropa/Eurosurvey/Survey/survey.jsp .

does not contain data for the “strata” variable and contains a primary sampling unit (PSU) variable that is incomplete and therefore cannot be used to control for the clustering effect, i.e. common unobservable features between individuals in the same PSU, which are not shared (at least, not to the same extent) with individuals in other PSUs – which correspondingly adjusts standard errors. However, standard errors that control for clustering should be obtained, if clustering is present (Cameron and Trivedi, 2010).

Alternatively, as suggested by Cameron and Trivedi (2010, p.175), ‘a conservative approach is to use non-survey methods and obtain standard errors that cluster on a variable that subsumes the PSUs, for example, a geographic region such as a state’. Therefore, we conduct inference using robust standard errors (SEs) clustered on region, as a locational variable, since the question about the expectations concerning the economic situation (which is used as the independent variable) might depend on the region of the respondent. Namely, those coming from less developed regions of the country may be more likely to expect the economic situation to be worse than those who live in the capital city region where production and industry are more developed and the level of employment is usually higher. Therefore, we estimated the specifications using robust SEs clustered on region. Nicholas and Schaffer (2007) argued that the cluster-robust standard error estimator converges to the true standard error as the number of clusters, not the number of observations, approaches infinity and that ‘at higher levels the number of clusters will be smaller, so the asymptotic results for the estimator are less likely to hold’. Since quota sampling⁸, in which the sample is chosen to be representative of the population, is applied only in Bulgaria, the *weights* are taken into account, since it enables us to apply estimates not only to the sample but also to the full population (Kreuter and Valliant, 2007, p.2). However, since there is a debate in the literature on how and whether to use weights in econometric analysis, both weighted and unweighted results are reported. However, estimation with the available survey design controls does not suggest any big difference in the results, which is an indicator of the stability of the model.

Two countries from the sample, Bosnia and Herzegovina and Bulgaria, have a CBA. Therefore, one fifth of respondents are from the countries with a CBA. In order to generate initial insights about any differences, the responses related to the credibility of the monetary policy between respondents in the CBA and those in non-CBA countries are compared. According to the descriptive statistics presented in Figure 2, answers to questions related to the assessment of the future stability of (and trust in) the local currency indicate higher currency trustworthiness in CBA compared to non-CBA countries. According to the chi2 test, these differences are statistically significant at all conventional levels of significance, which

⁸ As noted in Saunders et al. (2009, p.235): ‘Quota sampling is entirely non-random and is normally used for interview surveys. It is based on the idea that your sample will represent the population, as the variability in your sample for various quota variables is the same as that in the population’.

suggest that it is likely that there is some relationship between these expectations and the presence of a CBA.⁹

Insert Figure 2 around here

Regarding economic sentiments, approximately 50 percent in non-CBA and 60 percent in CBA countries did not expect that the economic situation in their country would improve over the next five years (Figure 3). According to the statistical tests, these differences are statistically significant at all conventional levels of significance. Approximately 25 percent of respondents answered that they trust the government and the answers are quite similar between CBA and non-CBA countries (Figure 4). For this question, beside “do not know” answers there are also “neither trust nor distrust” answers with a high percentage of respondents (approximately 20 percent for the “trust in government” question) answering this in both groups of countries.

Insert Figure 3 around here

Insert Figure 4 around here

There are a number of “do not know” answers to all questions in the surveys. Since these answers cannot be rated/ordered in the main estimations these answers are excluded. It might be argued that by excluding these answers additional information is lost, though there are never more than 14 percent of these answers and the number of remaining observations is high. However, in the sensitivity analysis these answers are included as a control, by creating a dummy variable for them and including this as an independent variable. These answers for the dependent variable may also be included by creating a separate category of the dependent variable and estimating the model with multinomial probit, since this estimator allows more than two non-ordinal categories of the dependent variable. However, since we have interaction terms in our preferred model, the interpretation of the results from this estimator is very complicated (Williams, 2012) and therefore we prefer the probit estimator. However, in the robustness check multinomial probit, with “do not know” answers included, is estimated. The effect of CBA on credibility is now explored using the model specified in Section 3.

5. Empirical analysis

⁹ Beside the ‘chi2’ test, ‘gamma’ and ‘taub’ tests are also performed, since these have been suggested or testing association between ordinal variables (Torres, 2007). These tests generated the same results as the ‘chi2’ test.

Since the respondents are different in different waves, we cannot use panel estimation. Therefore, in order to get as many observations as possible, we utilise a pooled cross-section. This strategy is preferred over cross-section analysis as it produces higher variability in the data given the ability to capture variation in both (time and space) dimensions simultaneously (Podesta, 2002). On the other hand, in pooled cross-sections there is a potential problem of errors being correlated across time (serial correlation) and countries (for additional advantages and disadvantages of using a pooled cross-section see Podesta, 2002). In our analysis, we address these issues by the inclusion of time and country-group dummy variables, these dummies should remove any country-group time invariant characteristics from the error term, while wave dummies should remove all time-specific country-group invariant characteristics. Additionally, we report cluster-robust standard errors, which are inflated to take account of the loss of information associated with error correlation.

As explained in Section 3, the question: ‘*Over the next five years, the [local currency] will be very stable and trustworthy*’ is used as the dependent variable. There are seven categories offered, as noted in Figure 2. Since it is argued that interpretation of the results when the dependent variable includes many scales is complicated (see Long and Freese, 2001; Wooldridge, 2002), especially when interaction terms are included in the regression (Williams, 2012), the answers are aggregated into two categories: “agree” (which combines the answers “strongly agree”, “agree”, “somewhat agree”); and “disagree” (which combines the answers “somewhat disagree”, “disagree”, “strongly disagree”). The latter is used as the base (omitted) category. Do not know answers are excluded. In all specifications the dummy variable for CBA is included, which is 1 for countries with a CBA and 0 otherwise. The variable for the expectations about the future euro stability ($ExpECS_{agree_i}$), for which the answers are aggregated in “agree” and “disagree” categories (the same way as for the dependent variable, with the “disagree” category used as a base), is included. The trust in government variable ($Gtrust_i$) has five categories of answers (from 1 to 5, respectively: “I trust completely”, “I somewhat trust”, “I neither trust nor distrust”, “I somewhat distrust” and “I do not trust at all” (the first category is used as a base). The variable for the economic situation expectations ($ExpES_i$) has the same categories as the dependent variable (“strongly agree” is used as a base and, in the first analysis, we exclude “do not know” answers). Moreover, we assume that the effect of CBA is also conditional on the level of trust in government and expectations about the economic situation. It has been argued that any finding of interaction in a model without a product term is unreliable (Nagler, 1991, Brambor et al., 2006) and, accordingly, the interaction term between CBA and trust in government ($CBA * Gtrust_i$), on the one hand, and CBA and the economic situation ($CBA * ExpES_i$), on the other, are included in the preferred specification. As noted in Section 3 we control for socio-demographic characteristics (SDC_{1-8}), time and country-group fixed effects (γ_t , β_{cd} , respectively). Hence, our first model is:

$$ExpCS_{agree_i} = \alpha_0 + \alpha_1 CBA_c + \alpha_2 Gtrust_i + \alpha_3 CBA_c * Gtrust_i + \alpha_4 ExpES_i + \alpha_5 CBA_c * ExpES_i + \alpha_6 ExpECS_{agree_i} + \alpha_7 SDC_{1-8} + \gamma_t + \beta_{cd} + \varepsilon_i. \quad (1)$$

The correlation matrix does not suggest that any pair of variables are highly correlated. Since the preferred specification includes interaction terms, in order to get the appropriate estimate of the variable of interest (CBA), which is also part of all interaction terms, the marginal effects are estimated after probit estimation and presented in Table 1¹⁰.

Insert Table 1 around here

The effect of CBA is highly significant and positive. Only marginal effects are reported, since the sign, magnitude and significance of coefficients reported in the probit results may be misleading when interaction terms are included (Ai and Norton, 2003; Williams, 2012). The marginal effects take into account that the CBA is part of the interaction terms (since these are included in the regression prior to the calculation of the marginal effects), even though the marginal effect of the interaction term cannot be observed separately from the “margins” results¹¹. Regarding the effect of the trust in government variable on its own, the results imply that, as expected, the lower is trust the larger the negative effect it has on the expectations about the local currency’s stability. The effect of expectations about the economic situation is that the worse the expectations about the economic situation in a country then the larger the negative effect on the expectations about the local currency’s stability. Only the effect of the “somewhat trust” and “neither trust not distrust” categories compared to “trust completely” for the question about trust in government are statistically insignificant, across the estimates.

In order to investigate conditionality between CBA and trust in government, and CBA and the economic situation/improvement, the marginal effects of CBA conditional on respectively the level of trust and economic state are estimated. These are estimated by calculating the average marginal effect of CBA on the probability of expecting the local currency to be stable and trustworthy at different levels of trust in government and economic situation expectations (calculated after probit estimation of the preferred model). According to the results, the lower the trust in government and the worse the expectations about the future economic situation in a country, the larger is the positive effect of CBA on expectations about the local currency’s future stability (Figures 5 and 6 respectively).

Insert Figure 5 around here

Insert Figure 6 around here

¹⁰ The full regression outputs are available from the authors upon request.

¹¹ The command “margins” (introduced in STATA11) does not report the marginal effects of the interaction terms, since, as stated in Williams (2012, p.329): ‘The value of the interaction term cannot change independently of the values of the component terms, so you cannot estimate a separate effect for the interaction.’

The test for the significance of the differences in the size of effect of CBA between different levels of trust in government and different expectations about the economic situation indicate that differences between different groups and the base category are significant.

Expectations about the stability of the euro also significantly affect the expectations of the stability of the local currency: people who expect the euro to be stable are more likely to expect their local currency to be stable as well. This is expected, since all countries from the sample are current or likely future EU members and their currencies are directly or indirectly connected to the euro. The results on country-group dummies indicate that people in countries from Ex-Yugoslavia and those with a higher level of development are more likely to expect their currencies to be stable than are people from countries that were not members of Ex-Yugoslavia and which are at a lower level of development. The results further indicate that most of the socio-demographic variables are insignificant; the only significant variable is “retired” (when unweighted results are observed) indicating that those retired are more likely to agree with the statement that the local currency will be stable in future than those employed. All time dummy variables (except the one for fall 2009) are significant and indicate that the expectations about the local currency became more stable after spring 2009.

Sensitivity analysis is conducted by estimating equation 1 using the logit instead of probit estimator and including “do not know” answers for the independent variables. The results of these analyses are consistent with those of the preferred model specification/estimator (see Table 2). The results of specification in which “do not know” answers for the independent variable are included suggest that the effect of the CBA for those who answered “do not know” to the question about trust in government is the same as for those who distrust it completely, while for those that provided this answer to the question about the economic situation it is similar to those that somewhat disagree. Next, the model without interaction terms is estimated and again the results do not suggest any major differences. Moreover, multinomial probit (where all categories of answers for the dependent variable are included) is conducted. The results of this robustness check imply that the preferred results are unlikely to be biased since the effect of the variable of interest in the “do not know” category is insignificant, while it is still significant and positive when the “agree” (trust in the local currency) category is compared to the “disagree” (distrust) category. However, these results are only indicative since marginal effects in these cases are difficult to compute and we had to exclude interaction terms in order to interpret the effect. Next, the model without the trust in government variable, which enabled use of all available data, is estimated. Results of this specification again suggest that the CBA has highly significant and positive effect on expectations about the future stability of the local currency. The results are similar to those of the preferred model specification, in all other respects as well.

Insert Table 2 around here

Although it would be informative to compare survey responses before and after the introduction of CBA in order to observe its stabilisation effect this could not be undertaken since there is no data available before the introduction of CBA: the surveys used in this paper were not conducted before 2007. Additionally, we cannot investigate whether beliefs about CBA stability become stronger the longer it exists. A CBA was introduced in the same year in BH and Bulgaria and therefore we cannot include a tenure variable to test for the difference in the effect of CBA conditional on the length of its operation. Moreover, the period for which the survey data is available is too short to capture the effect of CBA through time by introducing an interaction between CBA and time dummy variables.

6. Conclusion

Enhanced credibility is usually emphasised as a main feature of a CBA's sustainability, in this paper this is empirically investigated for Bosnia and Herzegovina and Bulgaria. Since credibility can be defined as the public's beliefs in the announced policy, and under a CBA the announced policy is maintenance of a stable local currency (against the anchor currency), expectations about the local currency's stability and trustworthiness have been used as the indicator of a CBA's credibility. Using survey data from ten European transition countries, two of which have CBA, the effect of CBA on expectations about the local currency stability and trustworthiness was investigated. To our knowledge, expectations about the local currency's stability have not previously been used as an indicator of credibility under a CBA.

A further novelty of this paper is that the credibility of the CBA has been analysed in comparison with the credibility of other monetary/exchange rate regimes. Since the dependent variable is based on respondents' expectations we control for the economic situation and political/institutional circumstances in the sample countries also using respondents' expectations. Previous studies that investigated the credibility of a central bank utilised actual (official) macroeconomic data, but we prefer controls based on respondents' subjective attitudes, since orthodox economic theory is based on the proposition that economic agents respond to reality as they perceive and experience it. A particular contribution is that we have investigated not only the monetary authority's credibility under a CBA but also the circumstances under which the CBA is most important for the credibility of monetary policy. Namely, the model is specified to control for the effect of CBA conditional on the economic situation and trust in government.

The results of the empirical analysis suggest that the effect of CBA on expectations about the local currency stability and trustworthiness is positive and significant. Moreover, we find that the positive effect of CBA is greater the worse the expectations about economic prospects and the lower the trust in government. The survey evidence reported earlier suggests that respondents from countries with currency boards are systematically less optimistic/more pessimistic about their country's medium term economic prospects (Figure 3, above) and about as trusting/distrusting in government (Figure 4, above) as are respondents from transition economies with other monetary regimes. This suggests that the maintenance of CBAs in Bosnia and Herzegovina and Bulgaria has been advantageous, a conclusion given

increased importance by the severity and persistence of the current global financial crisis. Other estimations were conducted and the findings were very similar, suggesting that our findings are robust to different model specifications and estimation strategies. Hence, our conclusion is that CBAs in Bosnia and Herzegovina and Bulgaria have contributed to the credibility of the monetary authorities and consequently assisted overall macroeconomic stability.

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Table 1. Marginal effects from probit estimation of Model 1

Question used for the dependent variable: Over the next five years, the [LOCAL CURRENCY] will be very stable and trustworthy, ExpCSagree is dependent variable (1="Strongly agree", "Agree" and "Somewhat agree", 0="Strongly disagree", "Disagree" and "Somewhat disagree")	Unweighted	Weighted
CBA	0.0986***	0.101***
1=CBA is implemented	-0.0367	-0.0363
<i>Base category: CBA not implemented</i>		
Trust in Government		
Gtrust2	0.00938	0.0181
"I somewhat trust"	-0.0175	-0.0179
Gtrust3	-0.0375*	-0.0316
"I neither trust nor distrust"	-0.0201	-0.0197
Gtrust4	-0.0778***	-0.0715***
"I somewhat distrust"	-0.0206	-0.0207
Gtrust5	-0.0911***	-0.0869***
"I do not trust at all"	-0.0175	-0.0177
<i>Base category: Trust in Government: "I trust completely"</i>		
Future economic situation in a country is very good:		
ExpES2	-0.0566***	-0.0489**
"Agree"	-0.0216	-0.0225
ExpES3	-0.183***	-0.178***
"Somewhat agree"	-0.0211	-0.0232
ExpES4	-0.414***	-0.417***
"Somewhat disagree"	-0.0179	-0.0194
ExpES5	-0.537***	-0.535***
"Disagree"	-0.0188	-0.0201
ExpES6	-0.580***	-0.580***
"Strongly disagree"	-0.0198	-0.0212
<i>Base category: "Strongly Agree"</i>		
ExpECSagree	0.136***	0.134***
Future euro stability; 1="Strongly agree", "Agree" and "Somewhat agree"	-0.0121	-0.0123
<i>Base category: "Strongly disagree", "Disagree" and "Somewhat disagree"</i>		
EU	0.0191	0.0234
1 if country is a member of EU in the observed period	-0.0325	-0.0348
ExYu	0.121***	0.122***
1 if country was a member of Ex Yugoslavia	-0.0419	-0.0439
high_lev_dev	0.0704**	0.0684**
1 if country has GDPpc higher than 10,000\$	-0.0296	-0.0299
Socio-demographic (SDC) variables included	Yes	Yes
Wave dummies included	Yes	Yes
Observations	37,526	37,526

Cluster-robust standard errors (clustered on region) reported below the marginal effects

*** p<0.01, ** p<0.05, * p<0.1

The full sets of results (with socio-demographic variables and wave dummies) are available from the authors upon request.

Table 2. Marginal effects from sensitivity analyses

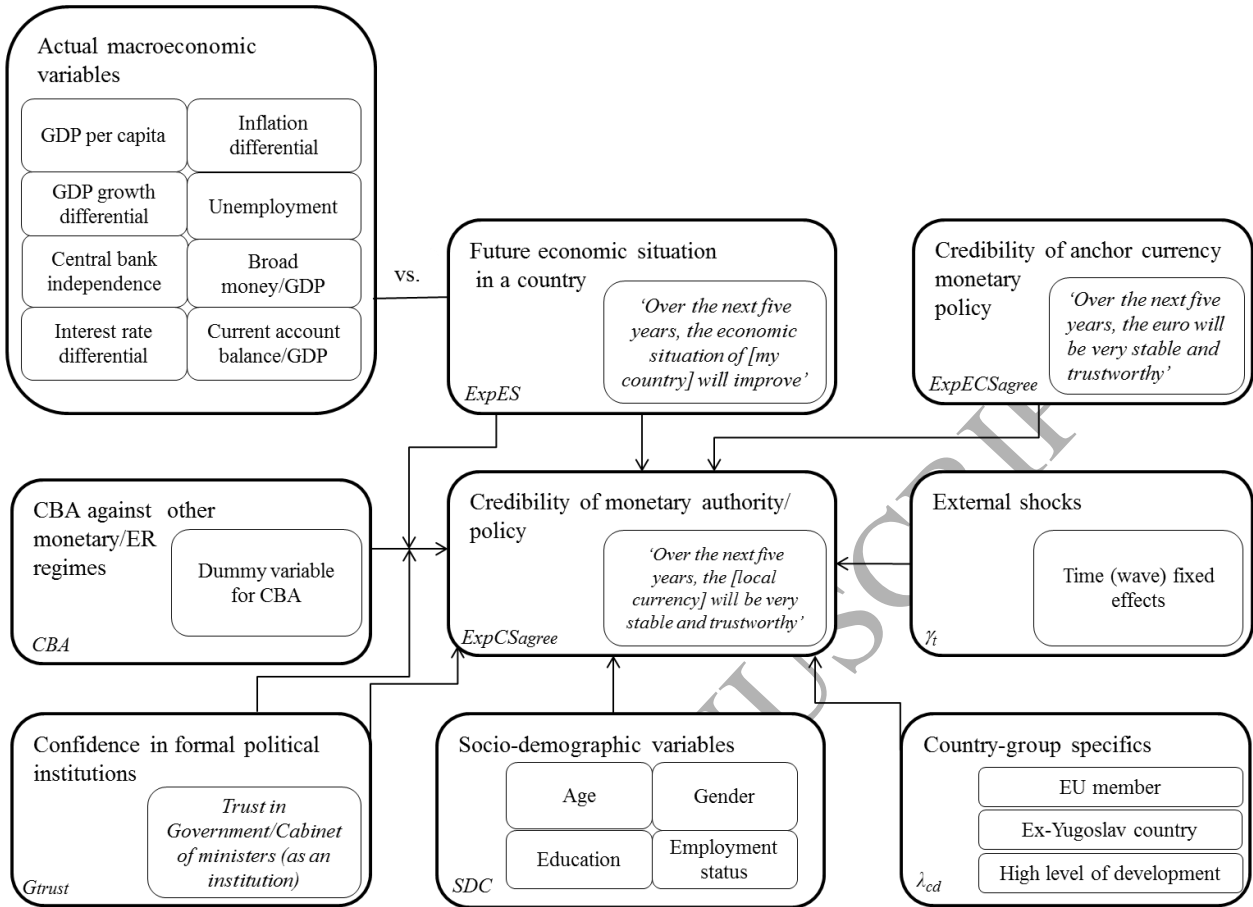
Question used for the dependent variable: Over the next five years, the [LOCAL CURRENCY] will be very stable and trustworthy, ExpCSagree is dependent variable (1="Strongly agree", "Agree" and "Somewhat agree", 0="Strongly disagree", "Disagree" and "Somewhat disagree")	Logit	Do not know answers for independent variables included	Interaction terms excluded	Large dataset (trust in government variable excluded)
CBA	0.101***	0.101***	0.112***	0.0757**
1=CBA is implemented	-0.0369	-0.0366	-0.0366	-0.0312
<i>Base category: CBA not implemented</i>				
Trust in Government				
Gtrust2	0.0172	0.0169	0.0224	
"I somewhat trust"	-0.0182	-0.0176	-0.0183	
Gtrust3	-0.0316	-0.0326*	-0.0276	
"I neither trust nor distrust"	-0.02	-0.0196	-0.0204	
Gtrust4	-0.0704***	-0.0732***	-0.0682***	
"I somewhat distrust"	-0.0208	-0.0205	-0.0217	
Gtrust5	-0.0871***	-0.0888***	-0.0821***	
"I do not trust at all"	-0.0178	-0.0174	-0.0194	
Gtrustdnk		-0.106***		
"Do not know"		-0.0319		
<i>Base category: Trust in Government: "I trust completely"</i>				
Future economic situation in a country is very good:				
ExpES2	-0.0497**	-0.0496**	-0.0404*	-0.0392***
"Agree"	-0.023	-0.0219	-0.0224	-0.013
ExpES3	-0.180***	-0.180***	-0.169***	-0.172***
"Somewhat agree"	-0.0234	-0.0227	-0.0248	-0.015
ExpES4	-0.418***	-0.419***	-0.414***	-0.427***
"Somewhat disagree"	-0.0196	-0.019	-0.0206	-0.0156
ExpES5	-0.536***	-0.536***	-0.530***	-0.563***
"Disagree"	-0.0203	-0.0196	-0.0213	-0.0157
ExpES6	-0.582***	-0.582***	-0.566***	-0.621***
"Strongly disagree"	-0.0217	-0.0208	-0.0246	-0.0167
ExpEsdnk		-0.372***		
"Do not know"		-0.0311		
<i>Base category: "Strongly Agree"</i>				
ExpECSagree	0.137***	0.135***	0.136***	0.137***
Future euro stability; 1="Strongly agree", "Agree" and "Somewhat agree"	-0.0123	-0.0126	-0.013	-0.0126
<i>Base category: "Strongly disagree", "Disagree" and "Somewhat disagree"</i>				
EU	0.0266	0.02	0.0129	-0.012
1 if country is a member of EU	-0.036	-0.0338	-0.036	-0.0277
ExYu	0.126***	0.118***	0.112**	0.102***
1 if country was a member of Ex-Yugoslavia	-0.0446	-0.0433	-0.045	-0.0348
high_lev_dev	0.0695**	0.0716**	0.0722**	0.0722***
1 if country has GDPpc higher than 10,000\$	-0.0304	-0.03	-0.0305	-0.0274

Socio-demographic variables (SDC) included	Yes	Yes	Yes	Yes
Wave dummies included	Yes	Yes	Yes	Yes
Observations	37,526	38,914	37,526	59,292

*** p<0.01, ** p<0.05, * p<0.1

Marginal effects reported with cluster-robust standard errors (clustered on region) and weighted
The full sets of results (with socio-demographic variables and wave dummies) are available from the authors upon request.

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Figure 1. Determinants of the credibility of a monetary authority

Source: Authors' illustration

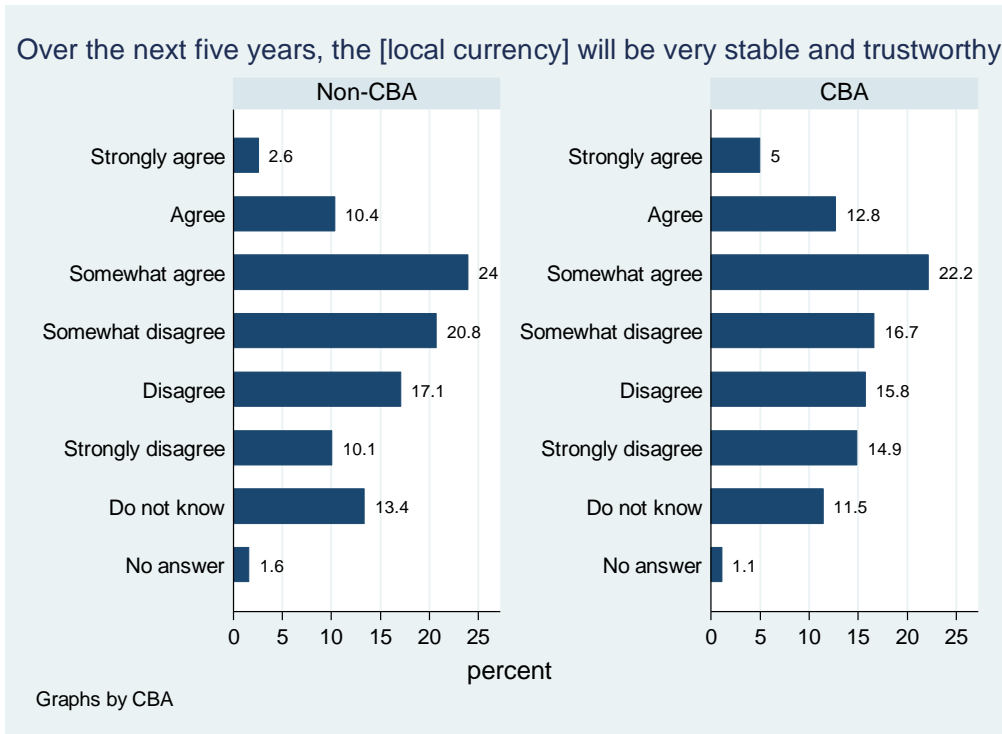
Figure 2. Expectations about the local currency's stability in CBA and non-CBA countries

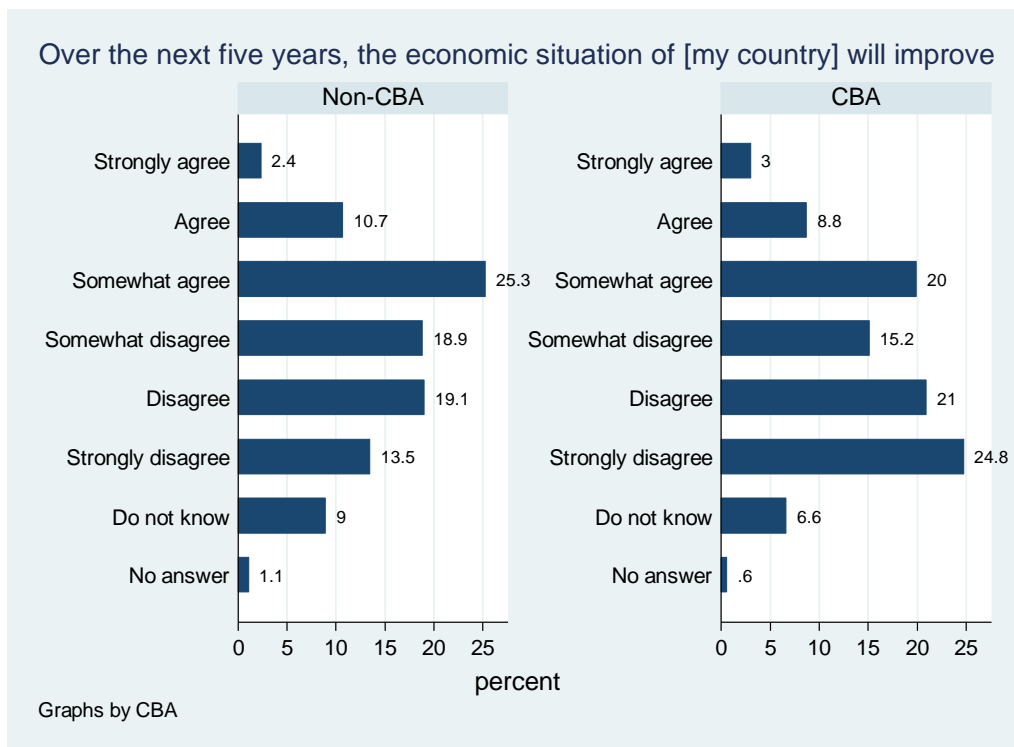
Figure 3. Expectations about the economic situation in CBA and non-CBA countries

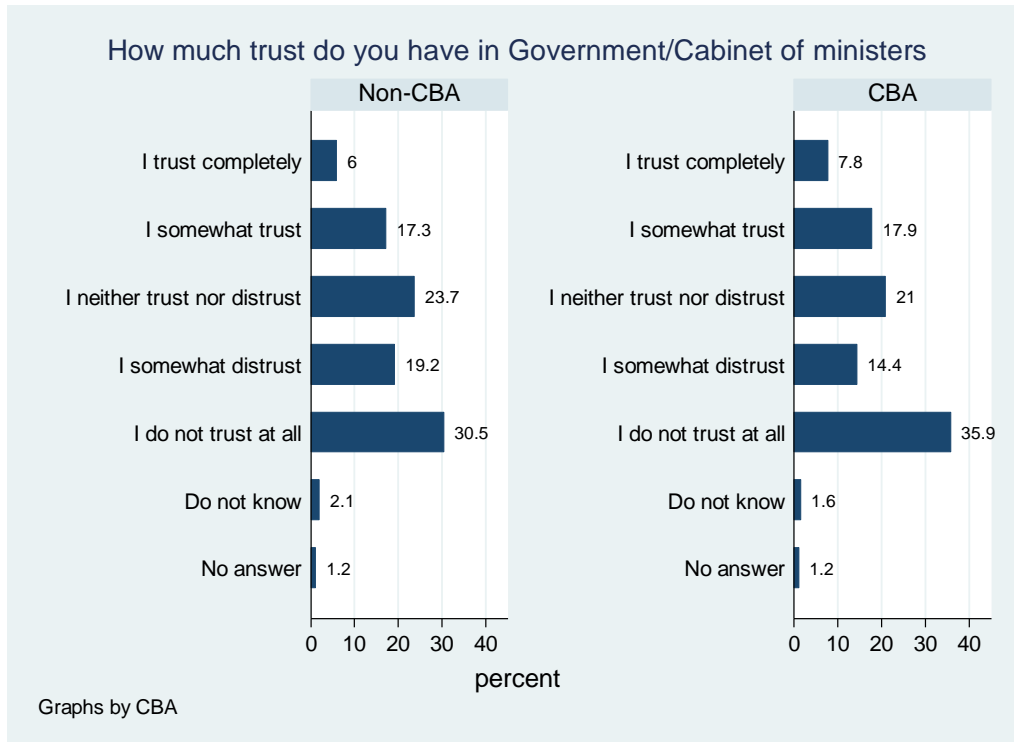
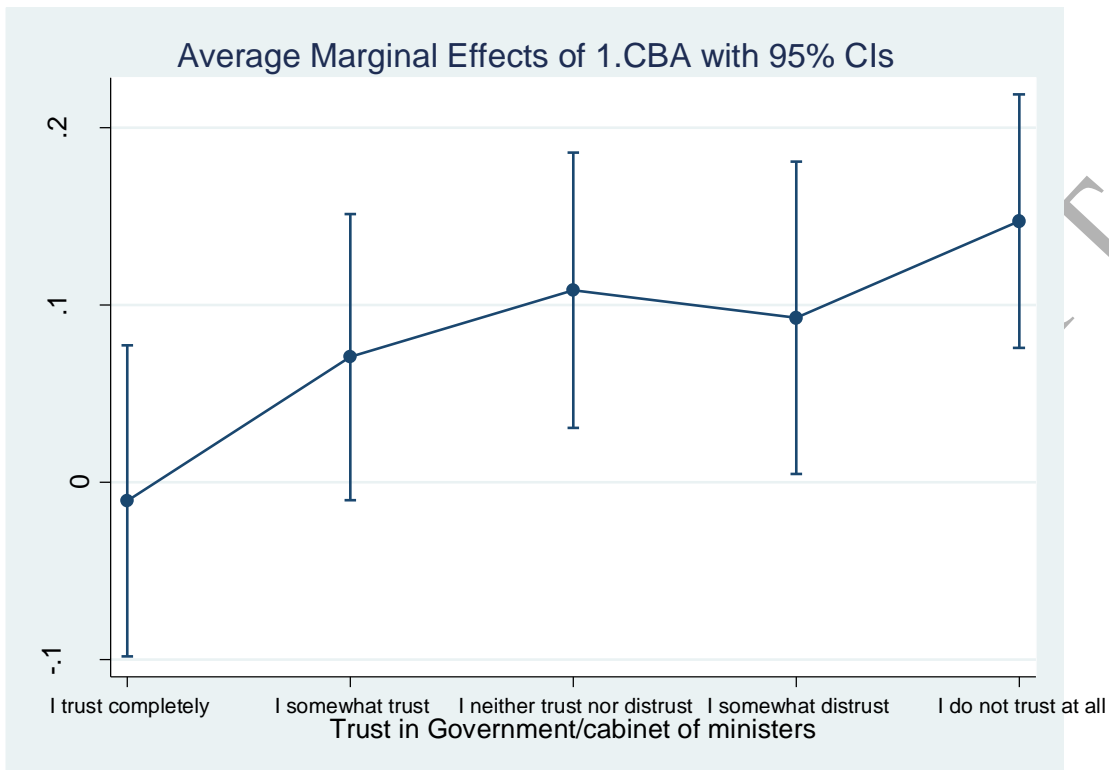
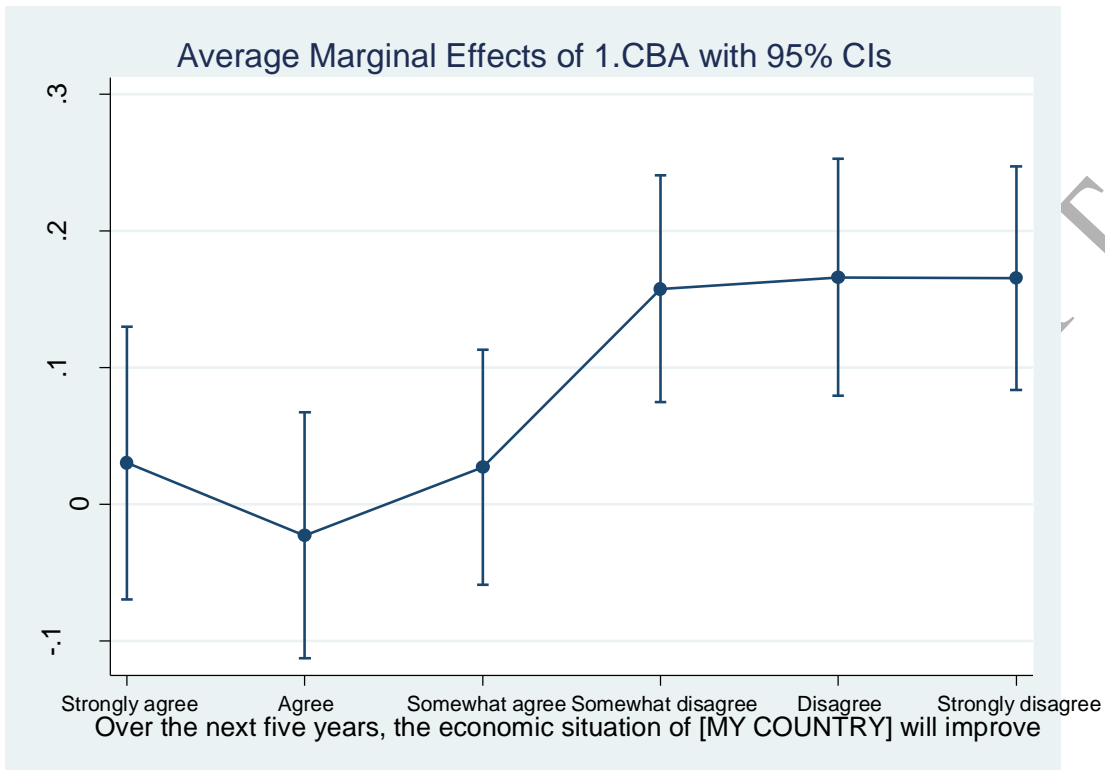
Figure 4. Trust in government in CBA and non-CBA countries

Figure 5. Average marginal effect of CBA on the probability of expecting the local currency to be stable and trustworthy at different levels of trust in government



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Figure 6. Average marginal effect of CBA on the probability of expecting the local currency to be stable and trustworthy at different expectations about the economic situation



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