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Export Behaviour of SMEs in Transition Countries

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Title Page (With all author contact info)

Export Behaviour of SMEs in Transition Countries

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Export Behaviour of SMEs in Transition Countries*

Abstract

Melitz's dynamic model of export participation is the basis of our empirical specification that accounts for a wide range of internal and external factors affecting the export behaviour of SMEs in Transition Countries (TCs). Using firm-level data, our estimates highlight the particular importance of the human and technology-related factors to the export behaviour of SMEs in TCs. Other important factors for SME exporting activities are productivity-enhancing spillovers from industry – especially vertical - linkages, firm size, ownership type, type of activity, the availability of external finance, networking through business associations, and market share. In addition, significant period and country differences are identified. This paper contributes to the transition literature by filling an important gap in the understanding of the SME internationalisation process and by identifying a comprehensive set of variables to explain firms' export behaviour in TCs.

Key words: Export behaviour • SMEs • Transition countries • Melitz's dynamic model • Spillovers • Multiple imputation.

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1 Introduction

It is now well established that small and medium sized enterprises (SMEs) play a vital role in the process of transition to a market economy. As the large firm sector, the prevalent form of organisation under central planning, underwent restructuring and decline, thousands of new SMEs took advantage of liberalised entry conditions and entered the market.[1] They responded rapidly to systemic shocks, produced goods and services demanded by the population and, in the process, contributed to the generation of new jobs and incomes.[2] While the contribution of SMEs to domestic output and employment has been studied by many authors, and for many TCs, their role in cross-border trade and their contribution to exports has not been studied widely. The aim of this paper is to develop the research in this area by investigating the factors influencing the export behaviour of SMEs and by providing empirical evidence for TCs.[3]

An important constraint on our analysis is the absence of a well-developed theory on the behaviour of SMEs and, in particular, on SMEs and international trade (Brock and Evans, 1989, Dunning, 1988; 1993; 2001; Axinn and Matthyssens, 2002; and others). However, a recent strand of the international trade literature linking firm heterogeneity and participation in foreign markets has been developed. This approach, initiated by the pioneering work of Melitz (2003), argues that firm's export entry and exit decisions are determined by the interplay of two factors: firm-level variation in productivity; and sunk costs. As Greenaway and Kneller (2007) explain, as a result of the interaction between these two factors, high productivity firms self-select into export markets compared to less productive firms, which resort to the domestic market. Because of capacity constraints, SMEs may be expected to be less represented in export markets relative to their large counterparts due to economies of scale and the fixed costs involved in exporting activities. Furthermore, as a result of the latter, there is a high level of persistence in firms' exporting activities, which additionally leads to a higher representation of larger firms in exporting activities.

Many of the variables we employ in our empirical investigation fall within the Melitz framework. Factors related to higher quality labour, physical capital, R&D and innovation activities, learning-by-doing, firm and industry spillovers, and others, are all productivity enhancing factors (for a comprehensive survey on the sources of productivity see Syverson, 2011). However, the concerns noted earlier with regards to the limitations of the existing theories of the firm's internationalisation process still echo within academic circles (see Spence and Crick, 2006). Hence, we draw upon a number of additional strands of thought either to substantiate or to complement Melitz's approach to internationalisation.

Although the core of our theoretical framework is based on the Melitz (2003) approach, it is augmented with a variety of supplementary hypotheses in order to allow for other influences that may be important in the transition process or derived from the empirical literature. Transition is a process whereby countries increasingly

[1] The SME definition follows the European Community definition, based on the number of employees: small firms (including micro firms) have up to 50 employees; and medium firms have up to 250 employees.

[2] See, for example, Bartlett and Prasnikar (1995); Futo et al. (1997); Scase (1998); McMillan and Woodruff (2002); Hoshi et al. (2003); Iakovleva (2005); and Estrin et al. (2006) among many other contributions.

[3] We conceptualise firms' export behaviour by taking into account not only the level of export activity but also the likelihood that firms will export at all.

acquire the institutional and economic characteristics of market economies. In addition the passage from central planning to market system requires a change and upgrading of human capital and investment in physical capital as well as technology. The technology spillovers resulting from FDI were crucial in speeding up the transition process in these countries. Although these factors are important in all countries, the transition process was heavily reliant on these factors. In principle, we expect firms' export behaviour in TCs to be mainly and increasingly influenced by similar variables to those that influence firms' export behaviour in developed market economies. However, the study also draws on the literature in transition economics by including a number of variables to address transition specific influences and the institutional and cultural heterogeneity amongst transition countries: ownership variables (especially foreign ownership); capital city effects, which may be more important in TCs; and country dummies.

This paper employs large firm-level datasets drawn from the Business Environment and Enterprise Performance Surveys (BEEPS) conducted jointly by the World Bank and EBRD, which have remained underutilised in the area of cross-border trade.[4] Tobit estimation is used to account for influences both on the likelihood that firms will decide to export (propensity) and on the export decisions of existing exporters (intensity). Three features of our empirical strategy help to ensure the robustness of the results and subsequent inferences. First, we investigate six datasets with corresponding variations in model specification: each of the three comparable rounds of BEEPS separately; the three waves pooled; a panel of firms surveyed in all three rounds; and a two-year panel of firms surveyed in the final two waves. Secondly, we compare the results from alternative – cross-section and panel - estimators. Thirdly, as a robustness check, we re-estimate the models using each of the six datasets made complete by the imputation of missing values.

Our estimates show, *ceteris paribus*, that the accumulation of human capital and technology are important sources of international competitiveness for SMEs. Consistent with this, companies with a greater percentage of highly educated workers in the workforce export more, while gross investment and new and upgraded technologies also promote exports. In addition, we find some evidence that productivity-enhancing spillovers promote SME exports. With regards to the firm-specific variables, the bigger the size of the firm the larger the share of sales generated in export markets. Companies with a foreign capital share have better prospects for exports; the same applies to firms engaging in production activities, who are more proficient in foreign markets than are non-production companies. The availability of external finance appears to be a significant determinant of the export behaviour of SMEs in TCs. So does membership in business associations, which enhances the networking ability of firms. Finally, period dummies highlight 2005 as the best performing year in terms of export performance; and, as expected, country dummies capture major differences in firms' export behaviour in transition countries.

Using Jones and Coviello's (2005) language, our study puts in place a few 'pieces of the puzzle' in the firm's internationalisation process in TCs. The contribution of this study can be viewed from different perspectives. *First*, we fill an important gap in SME internationalisation literature by studying SME export behaviour – by

[4] Studies using BEEPS data include Carlin et al., 2001b; Vagliasindi, 2001; 2006; Svejnar and Commander, 2007; Gorodnichenko et al., 2010; and *Transition Report 2005*.

which we mean both export propensity and export intensity - in TCs. Although there are many studies of internationalisation of firms' entrepreneurial activities, those relating to international activities of SMEs in transition are very scarce[5], and lagging well behind investigations linking SMEs with other developments in the economy, such as growth and employment. The *second* contribution relates to the large number of mainly supply-side factors included in the analysis, reflecting a comprehensively specified model of export behaviour. The *third* contribution concerns research practice. We apply multiple imputation techniques to the BEEPS datasets, because – we argue - this enables us to utilize this data more fully, which is an issue ignored by previous authors using these surveys.[6]

The paper proceeds with section 2 where we present the theoretical reasoning informing the investigation. Section 3 presents our empirical strategy and the datasets. Section 4 reports and discusses the econometric results. The final section concludes.

2 Determinants of export behaviour

An important constraint on our analysis is the lack of well-established theories explaining the behaviour of SMEs in the economy, specifically their internationalisation decisions. In a series of studies, Dunning (1988, 1993, 1995, and 2001) argues that there is no single theory of international trade able to fully explain a firm's international expansion. Dunning explains (1995, p.165):

> … the nature and character of international transactions have so much changed in recent years, that the traditional intellectual apparatus of the international economist is, by itself, no longer adequate to explain real-world phenomena, and only by drawing upon the tools of other branches of economics, notably, industrial, institutional, and techno-growth economics, can contemporary cross-border flow of goods, services, and assets be properly understood.

Dunning's position on the incompleteness of international trade theory continues to resonate with his peers to this day. More recent studies (Axinn and Matthyssens, 2002; Jones and Coviello, 2005; Crick and Spence, 2005; Spence and Crick, 2006; Thai and Chong, 2011) share the same concerns. Axinn and Matthyssens (2002) provide a review of the existing theories of internationalisation, which include: industrial organization theory; the resource based view; transaction costs theory; the amalgamation of these three in the form of Dunning's eclectic paradigm; the Uppsala model of internationalization; innovation-based models; network theory; and other approaches. In the same vein as Dunning, they argue that current internationalisation theories fail to explain and predict the behaviour of firms in the global marketplace, primarily because theoretical developments have been unable to keep pace with the rapidly changing, hyper-competitive global environment. Further, it is argued that each theory explains a specific aspect of firm behaviours in a specific environmental context. If the

[5] A detailed analysis of two recent large-scale surveys (Keupp and Gassmann, 2009, surveying 179 papers; and Terjesen and Hessels, 2010, surveying 200 papers) shows that very few of them were related to transition countries; and none of them employed the large BEEPS databases, Melitz's theoretical framework, or the methodology employed in this paper.

[6] For any missing value in the dataset we lose all other information related to a surveyed entity (as we have to drop the entire observation). This fact is usually ignored in empirical investigations.

latter holds true, then attempts to develop an approach to explain and predict firms' internationalisation process in the transition context, the subject of this study, are virtually non-existent. Yet, a transition country setting, according to Thai and Chong (2011), provides a unique backdrop characterized by distorted information, weak market structures, poorly specified property rights and institutional uncertainty, making existing explanations of firms' internationalisation process less convincing.

However, a stream of recent studies (Melitz, 2003; Melitz and Ottaviano, 2003; Bernard et al., 2003, Helpman et al. (2004); Arnold and Hussinger, 2005; Aw et al., 2007; Aw et al., 2008; among others) on firm heterogeneity and participation in international markets has provided a comprehensive framework for analysing factors influencing firms' decisions to internationalize.[7] According to this line of thinking, export entry and exit decisions are determined by differences in firm productivity levels and incurred sunk costs. According to Melitz's (2003) dynamic industry model of heterogeneous firms, high-productivity firms self-select into export markets. An important ingredient of the theory is the recognition that entering export markets incurs sunk costs. As Greenaway and Kneller (2007) explain, firms have to engage in market research, train people, modify products to respond to local requirements, establish new distribution networks, etc. The importance of sunk costs has been recognised for some time (see Dixit, 1989; Dixit and Pindyck, 1994), and their effect on export entry has been demonstrated empirically (Roberts and Tybout, 1997; Bernard and Jensen, 2004; etc.). These studies argue that the presence and the magnitude of sunk costs generate large hysteresis effects.

To guide the specification of the empirical model, we draw upon the Melitz dynamic model of export participation as well as on other lines of thought arguing for the inclusion of human-related factors; technology-related factors; and other firm characteristics. Most variables included in the empirical model share a common characteristic; namely, that they are supply-side variables in that they relate directly to the ability of firms to produce. In line with previous research, we use export intensity (foreign sales as a percentage of total sales) to measure the degree of firms' involvement in foreign markets (Bonaccorsi, 1992; Calof, 1993; Wakelin, 1998; White et al., 1998; Becchetti and Rossi, 2000; Wagner, 2001; Gorodnichenko et al., 2010; and others). The theory that export behaviour is determined essentially by the interplay of productivity levels and the fixed costs of exporting suggests that the same factors will affect both the firm's propensity to export and, if it exports at all, the firm's export intensity (see Melitz, 2003, pp.1695-96 and Greenaway and Kneller, 2007). This influences our empirical strategy discussed below. To anticipate, the estimated effects of our independent variables represent the combined effects of two channels of influence on our dependent variable: namely, influences on the likelihood that firms will decide to export (propensity); and influences on the export decisions of existing exporters (intensity). We refer to these estimates as influences on export behaviour. We do not refer to export performance, because our dependent variable does not directly correspond to conventional efficiency measures.[8]

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[7] For an extensive survey of this literature see Greenaway and Kneller (2007).

[8] There are other measures of assessing firm's involvement in export markets. For instance, White et al. (1997) use three measures of export performance other than export intensity: number of foreign countries served by a firm; management's perceptions of export profitability; and management's satisfaction with export performance. Their discussion is inconclusive with regards to the best export performance measure. In their empirical investigation they are rather pragmatic; they apply all four indicators to measure export performance in a sample of US service firms. Unfortunately, the dataset BEEPS is not so generous with information on export performance: the export intensity

2.1 Human capital related factors

The importance of human resources has been extensively examined at the country and firm level. These studies systematically highlight the supremacy of human capital for the sustained comparative and competitive advantage of nations and firms. Human capital is at the core of the *New Growth Theory*, which argues that the creation and diffusion of knowledge is the primary engine of economic growth (Grossman and Helpman, 1994). At the micro level, human capital factors affect firms' export propensity and intensity through increases in productivity (Arnold and Hussinger, 2005; Bryan, 2006; Kleynhans, 2006; Kagochi and Jolly, 2010). The connection between the quality of labour variables such as education, training, overall experience, and tenure at the firm and the firm's productivity has been investigated in a growing body of work (see Syverson, 2011). For instance, Chevalier et al. (2004) and Carlin et al. (2001a) argue that higher levels of education or skill acquisition signal or enhance productivity. In addition, according to Bryan (2006), training helps to sustain higher levels of productivity. In our model of export behaviour we measure the impact of human capital accumulation through several proxies: [i] the education of the workforce; [ii] on-the-job-training; [iii] the presence of highly skilled workers within the firm, which includes also the managerial staff and other professionals; [iv] changes in organisational structure[9]; and [v] the general manager's education.

First, a number of studies (Keeble et al., 1991; Wood, 1991; Dex and Scheibl, 2001, 2002; Power and Reid, 2005; etc.) argue that SMEs are more inclined to have flexible organisational arrangements than are larger firms, because of their limited scope of operations, well-understood relationships within the firm, relatively simple organisational structures, ease of accessing networks of firms, etc. Conversely, Meijaard et al. (2005) argue that organisational structures within SMEs are much more complex than is argued by transaction costs and agency costs theories. We investigate whether or not organisational flexibility translates into higher export intensity and propensity by introducing a dummy variable indicating whether or not a firm underwent any organisational transformation (from minor reallocations to adoption of completely new organisational arrangements) in the previous three-year period. *Second*, the link between firm management and firm productivity is well-established. However, as Syverson (2011) argues, the literature has yet to dig deeper into the role of managers in productivity gains. This study aims to shed some light on this question by employing a variable that depicts the level of education of the general manager and its influence on firm's export behaviour. The above discussion leads us to the following hypothesis:

> *Hypothesis 1: The quality of labour in SMEs in transition countries is positively related both to the propensity of firms to export (i.e., the likelihood of exporting at all) and to the intensity of exports by those firms that do export.*

variable is the only information provided in all three rounds of BEEPS. Of course, export profitability also has its own additional drawbacks as a measure of export performance.

[9] Changes in the organisational structure indicate organisational innovations. As these changes have at their core the human factor and its better utilisation, we have decided to place them within this category of factors.

2.2 Technology-related factors

A significant body of literature has concentrated on explaining the productivity–export relationship through firm-level investments in productivity enhancing activities. Most of these studies have focused on R&D investment (Aw et al., 2007; 2008; 2011; Esteve-Perez and Rodriguez, 2012; among others). Less attention has been paid to the impact of investment in physical capital on increasing firm's productivity levels (see Syverson, 2011). We start with the latter; *firstly*, following Carlin et al. (2001a), we use gross investment in capital goods as a proxy for embodied technological change, and expect it to have a positive impact on the firm's productivity, leading to better export behaviour of the firms under consideration. *Secondly*, R&D expenditure can be used as an indicator of innovation activities (an input measure of innovation) to investigate its effect on the export behaviour of firms.[10] *Thirdly*, the introduction of new or upgraded technology or new or upgraded products can be used as another, broader indicator of the innovation process, expected to have positively affected the firm's export behaviour. *Finally*, a firm's level of technology relative to its main rivals may also be used as an indication of technological progress, with positive impact on export behaviour. These indicators are expected to translate into similar changes in export behaviour, i.e. a higher propensity to export and a greater intensity of exporting.

The estimated relationship between the technology-related variables and export behaviour is potentially flawed by endogeneity, caused by reverse causation. Aw et al. (2011) summarises recent work on the firm's investments in technology adaptation and the latter's impact on the productivity-export link. Their survey shows that exporting and technology-related investments are interdependent firm decisions, and both may endogenously affect the firm's future productivity. In our case, because of the way in which the above variables are defined in some waves of the survey, such endogeneity would be precluded.[11] We hypothesise that past technical progress may influence current export intensity. However, we have no such reasons for hypothesising that current export intensity could affect past technical progress (see Table 1 for the description of variables). In such cases, the activities captured by these questions substantially lag current export intensity, our dependent variable. Finally, the dummy variable modelling the firm's technology level relative to its competitors reflects repondents' judgements that can only arise from past experience and corresponding accretion of knowledge. In this case, this variable too refers to a period preceding the one in which respondents estimate their current export intensity.

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[10] For reasons that will be explained below, investment in R&D and gross investment can be used only in estimations from the 2005 dataset.

[11] The three surveys are not consistent regarding the years or periods in which technology related variables are measured, thus causing confusion. We summarise the situation as follows.

i. In all three rounds, the definition of the dependent variable, the export intensity, refers to the year of the survey (2002, 2005 and 2008/09).
ii. In all three rounds, the variable for innovation activities - i.e., the introduction of new or upgraded products and processes - always refers to a period before the year of the survey (4 years before in 2002 and 3 years before in 2005 and 2008/09).
iii. Conversely, for the variables 'gross investment' and 'investment in R&D', the definition changed in each round of the survey. In 2002, the variables are recorded for the previous four years ('since 1998', Question Q.83); in 2005, the variables are recorded for '2004' (Question Q.85) (which might be the same year as the export intensity variable); and in 2008/09, the variables refer to 2007 (Questions K.4 and O.3) (the same year as the export intensity variable). Accordingly, these variables are excluded from the models estimated on the 2005 and 2008/09 datasets, because they would be potentially endogenous by virtue of their definition.

The use of the variable indicating the introduction of new or upgraded products and processes (in all three surveys) and the variables 'gross investment' and 'investment in R&D' for 2002 do not cause any endogeneity problem; these will have some effect on export intensity in a later period, but the current value of export intensity cannot affect the previous values of these variables. In cases where these variables and export intensity are measured contemporaneously, the problem of endogeneity precludes using those variables in the estimation process.

The above discussion informs the following hypothesis:

> *Hypothesis 2: The physical capital, technological capabilities – R&D expenditures and innovativeness – and technological sophistication of SMEs in transition countries are positively related both to the decision to export and to the intensity of exporting.*

2.3 Productivity-enhancing spillovers

We investigate two types of productivity-enhancing spillovers that occur when the activities of a firm lead to improvements in the technology or productivity of other firms: namely, economic externalities that may arise from agglomeration; and/or industry linkages, especially vertical linkages through input-markets in intermediate goods (see World Bank, 2009).[12] We consider these in turn.

We start from the view that localisation and urbanisation economies generated by the concentration of firms in cities play an important role in the overall performance of firms, including their export activities (Audretsch and Stephan, 1999, Fujita and Thisse, 2002; Fujita et al. 1999; etc.). In our specifications, we concentrate on the impact of the location of SMEs in capital cities on firms' export behaviour. The process of transition can be most markedly observed in the capital cities, which have by far overtaken other parts of these countries (even in those countries that have joined the EU). Therefore, we expect firms located in these cities to be able to benefit from agglomeration economies (specifically resulting from a favourable environment for identifying and exploiting synergies between previously unrelated industries, knowledge spillovers, university and research institutions, access to the pool of higher quality work force, etc.).[13]

We also investigate the impact of industry spillovers derived from sales to multinationals and large domestic firms. The recent literature, including those on TCs, has emphasised the positive effects of knowledge spillovers from MNEs on domestic firms (Greenaway et al., 2004; Kneller and Pisu, 2007; Sutton, 2007). Greenaway et al. (2004) is the first study to empirically test export spillover effects from MNEs to domestic firms. Among the channels of export spillovers they identify are two that might be facilitated by relationships arising from sales to MNEs; namely: [a] information externalities – a transfer of knowledge and experience from MNEs operating in the host market; and [b] demonstration and imitation effects – domestic firms acquiring new technologies and management techniques used by MNEs. However, little attention, especially in the transition literature, has been given to the spillovers from large domestic companies to SMEs and import-export transformation. With regards to the connection between export behaviour and spillovers from large domestic companies, we rely on the same reasoning as that used for sales to MNEs due to a number of theoretical and empirical considerations related to large firms, domestic or foreign. *First*, there is overwhelming evidence that large firms are more export oriented than small firms (see the discussion on firm size below); hence, any form of linkage between SMEs and large

[12] Of course, as Syverson (2011) explains, spatial proximity is not a prerequisite for generating productivity spillover effects. According to him (p. 349), 'producers are likely to attempt to emulate productivity leaders…regardless of whether they share a common input market'.

[13] We acknowledge that a dummy variable for location in a capital city cannot capture the full range and richness of agglomeration hypotheses. However, this variable does relate to the marked development of capital cities under transition. Unfortunately, the BEEPS dataset does not support more comprehensive proxies for agglomeration.

firms is likely to produce information spillovers. Linked to the first, a *second* observation is that larger firms are better resource endowed than SMEs, meaning that they are more likely to be at the frontier of technology adoption and adaptation. As a result, there is a likelihood that SMEs will benefit from imitation and demonstration effects also from large domestic firms.

In addition, the literature on international trade establishes the importance of imports for the development of domestic firms and industries through a number of channels. One channel concerns the importance of imports for firms' capital formation. Firms benefit from imported technology, but also from the possibility that firms will make simultaneous investment to assimilate this technology (see Aw et al., 2007). Second, imports are used as inputs in export production processes (Arize, 2002). Accordingly, we integrate the import intensity factor as one of the determinants of exports.

Hence, in the context of productivity-enhancing spillovers, the hypothesis states:

> *Hypothesis 3: The propensity as well as the intensity of exporting of SMEs in TCs are positively affected by: (Hypothesis 3a) agglomeration induced externalities, and (Hypothesis 3b) industry linkages*, especially vertical linkages through input-markets.

In practice, it is difficult to identify the separate effects of externalities associated in large part with, respectively, geographic proximity and vertical linkages; for example, both may be promoted by institutions promoting workforce (re)training and/or knowledge creation and transfer. To capture as distinctly as possible – given the available data - the influence of these two different types of externalities, we use different indicators for the two types of externality. To capture spillover effects arising from industrial linkages, especially vertical linkages through input markets in intermediate goods, we estimate the influence of sales to MNEs and large domestic firms as well as of import intensity (Hypothesis 3b). Within the framework of our multivariate model, the inclusion of these three variables should minimize the extent to which our capital city variable also captures spillover effects arising from vertical links, thereby maximizing the extent to which the estimated capital city effect captures agglomeration economies (Hypothesis 3a).

2.4 Other firm characteristics

Discussion on the firm size–export relationship has produced a number of hypotheses. First of all, the literature mainly supports the export proficiency of larger firms relative to smaller firms on the grounds of resource availability and lower transaction costs (Brock and Evans, 1989; Kim et al. 1997; Acs et al. 1997; Wakelin, 1998; Bleaney and Wakelin, 2002; etc.). However, a number of studies support the idea that smaller firms perform better in export markets due to their inherent flexibility (Mills, 1984; Mills and Schumann, 1985; etc.). Moreover, firm size as measured by the number of employees may be potentially endogenous. As a result, we use a lagged size variable, that is, the number of employees working for the company three years earlier. Finally, the size variable may have non-linear effects on the degree of a firm's export involvement. Accordingly, we transform the model into a quadratic form, by including both the natural logarithm of the total number of employees for each firm and its squared value.

Firms' business experience influences their productivity level (learning-by-doing effects). Syverson (2011, p. 344) argues that 'experience allows producers to identify opportunities for process improvements'. The importance of firm experience in export markets has been widely acknowledged. To test for the latter, we rely on *Learning Theory* – rooted in the behavioural theory of the firm – which argues that development of knowledge may have an impact on perceptions of opportunities offered by greater internationalisation (Clercq et al., 2005). In addition, studies have identified a non-linear relationship between business experience and export growth, which we also test. Everett and Watson (1998) argue that the rate of failure among younger firms is higher than among experienced ones, due to the greater variability in their cost functions when they begin operations. Everett and Watson (1998) concentrate on firms' experience in the domestic market. However, this effect may be more pronounced in foreign markets, where cost variability is likely to be higher to the extent that foreign markets are unfamiliar and entrepreneurs face lack of information and different systems as well as different languages and cultures. In a similar vein, Arnold and Hussinger (2005) argue that experience may be important for younger firms but not for older ones. They argue that there is a certain threshold age, beyond which a firm is unlikely to gain more experience. To test for this non-linear effect, we specify our models with both firm age and its squared value.

The *Industrial Economics* literature and the literature on transition economies have established the impact of ownership structure on firm performance. Demsetz (1997, p. 429), for example, argues that wealth and its distribution among different stakeholders matters to society's productivity. In this paper, ownership structure refers to the 'type of dominant owner' of a company. The BEEPS dataset allows us to identify the largest shareholder of a company (thus the dominant shareholder) as a foreign entity, the state or a private (domestic) individual or company. There is already a well-established literature on the importance of ownership structure for firm performance in transition economies. There is almost complete unanimity in the transition literature that dominant foreign ownership has a positive and significant impact on the performance of firms. Private (domestic) ownership is expected to be the next, i.e., it is also expected to have a positive effect on the performance of firms. Firms owned by the state are expected to be least well performing given the problems of state ownership and the shortage of resources needed to restructure state owned companies. Yet the empirical work on the impact of private ownership is rather mixed. Private ownership does not immediately improve the performance of privatised firms; it takes time for the new owners to be able to engage in strategic restructuring and gradually improve the firm's performance. Private owners taking over in the course of privatization do not always find it easy to obtain the necessary credit to finance strategic restructuring and invest in new technology. For a while, therefore, the difference between firms with dominant private ownership and state ownership, particularly over a short period of time, may not be significant.

Search and information costs take a central position in the *transaction cost theory*. For successful export activities, primarily a systematic collection of information is required, since it can act as a catalyst to reduce the uncertainties of the international environment (Leonidou and Adams-Florou, 1999). Due to their resource constraints, SMEs appear to be more dependent than large firms on services, information and contacts generated through business associations (Bennett, 1998). Hence, we investigate the impact of membership in business associations on SME export behaviour.

Many country-level studies have demonstrated the importance of the development of financial markets for firms' export activities (Beck, 2002 and 2003; Manova, 2006; etc.). SMEs have even greater need for credit relative to large firms due to their limited capital resources. Moreover, SMEs face greater difficulties in obtaining external finance (due to information asymmetries and/or institutional factors), which may be reflected in their overall performance, including international activities (Beck et al. 2006 and 2008; Hutchinson and Xavier, 2006). Hence, we investigate the export effect of the availability of external finance.

Two additional firm-related factors that we investigate are the level of capacity utilisation (facilities and manpower) and market share. Conventionally, capacity utilisation is treated as a simple proxy for pressure of demand. However, more recent literature suggests a more subtle supply-side interpretation. Drawing on Bansak et al. (2007), capacity utilisation may reflect the possibility that new and relatively cheap technologies available to firms allow them to hold excess capacities to respond to increases in demand. In other words, when there is a boost in export demand then SMEs use their excess capacities to respond. They explain as follows (p.633): '…new technologies may make it easier to ramp production up and down. Combined with falling prices of high-tech equipment, this may encourage firms to install a broader margin of excess capacity – operating at lower average utilization – to be able to handle upswings in demand.' These alternative approaches imply different signs on the estimated effect of capacity utilisation: a positive relationship with export activity in the case of the demand-side interpretation; a negative one in the case of the supply-side interpretation; and an insignificant effect in the event either that neither effect is present in the data or that both are and offset one another. The demand-side explanation raises a further issue; namely, because greater exports may increase demand pressure and thus capacity utilisation, there may be simultaneity and thus potential endogeneity. However, as with the technology variables, the potential endogeneity of capacity utilisation is addressed by using the question on the level of capacity utilisation that refers to a period before the current one to which export intensity refers.[14] Second, we assume that firms with a greater share of the domestic market would have an incentive to try to expand their activity across borders to take advantage of additional demand in foreign markets. Accordingly, we anticipate that the likelihood of exporting would be higher for firms that have a larger share of the domestic market.

Finally, we control for differences in the exporting behaviour of firms for each individual country and over time. Regarding the former, we introduce country dummies to take into account that there are significant institutional, cultural, and other differences among TCs. Moreover, the country dummies play an important role in our estimation strategy by controlling for influences that otherwise would be difficult to address.[15] On the other

[14] There are two questions on capacity utilisation in BEEPS: (1) In your judgement, what is your firm's current output in comparison with the maximum output possible using its facilities/man power at the time? (2) What was the capacity utilisation 36 months ago? We use the second, backward-looking measure.

[15] Our firm-level investigation and modeling strategy is not the appropriate platform for estimating the effects of national-level influences on firms' export behavior such as free-trade agreements, macroeconomic developments (including policy) and institutional influences. Even a minimal specification to this end would require country (country-group) dummies, period dummies, and country (country-group)-period dummies to model political developments such as regional free-trade associations (especially where such developments come into force during the period of the sample). However, observations on these variables are available only in small numbers (there are 25 countries in our panel samples) and would be collinear with one another by construction, thereby precluding estimation with any useful degree of precision. Instead, we attempt to control for such influences in order to address potential sources of omitted variables bias. Here, our strategy rests on

hand, the three rounds of the survey have taken place in three different periods with different external environments, covering almost a decade of varying conditions affecting the export behaviour of firms across the sample (such as rates of growth in the EU). Whether and how these changes were reflected in the firm's export propensity and intensity we aim to capture through period dummies.

3 Empirical strategy

3.1 Methodology

As the BEEPS database contains information on exporters and non-exporters, the dependent variable (*y*) – percentage share of export sales in total sales – is zero in a significant number of cases (i.e. for non-exporters), and the observations for exporters are roughly continuous over the positive range of values. This type of data is addressed by the generalised tobit model (Wooldridge, 2006, p.587). In tobit estimation, zero-value observations are incorporated into the model as the outcome of a decision-making process. In effect, tobit estimation models a dual decision making process: in our case, firms' decisions as to whether or not to export; and, if so, how much to export. In this way, tobit estimation addresses the potential endogeneity of our independent variables that would arise if the self-selection of firms into the export market were to be omitted from the model. This differs from two-step models that estimate first the determinants of the decision as to whether to export or not and then, in a second-stage regression, the determinants of firms' exports conditional upon the probability of exporting at all. Which approach is the more appropriate depends upon whether or not the two parts of firms' export decisions have the same or different determinants. The theory informing our empirical specification suggests that the same factors affect both the firm's propensity to export and, if it exports at all, the firm's export intensity (see Section 2, above). Moreover, diagnostic assessment of these alternatives – i.e. the same or different determinants – also endorses the tobit model as a valid estimator for our data (reported below). Finally, an additional complication is suggested by the dependent variable being defined as a proportion, therefore bounded by zero and one. However, this should not be a problem in our samples, because few firms export all or even nearly all of their output. Moreover, robustness checks using estimators capable of directly addressing this problem yield estimates fully consistent with those reported below. [16]

the ability of the firm-level fixed (i.e. time invariant or constant) effects in our model (see Section 3.1 below) to capture the influence not only of time-invariant variables (such as geographical characteristics) but also of "slowly moving variables". Here we follow Plümper and Troeger (2007, pp.126), who cite Beck (2001): " … although we can estimate (…) with slowly changing independent variables, the fixed effect will soak up most of the explanatory power of these slowly changing variables." This applies, in particular, to "politically relevant variables" such as trade agreements, macroeconomic policies and institutions. Even if such variables were not formally in force for the whole of the sample period, anticipated (leading), current and lagged effects – recognized, for example, in the literatures on trade agreements and macroeconomic policy – suggest that it is reasonable to think of their effects as sufficiently "slow-moving" over the sample period to be aggregated by time invariant effects at firm and/or country level. Accordingly, our panel estimates control for otherwise unmodelled systematic influences on the dependent variable at the firm level, which is the appropriate level for our investigation; in addition, country dummies control for any remaining systematic influences that vary between countries; and period dummies control for any remaining systematic influences that are common across all firms in the sample in a particular period. In the cross-section estimates, the country dummies control for otherwise unmodelled systematic influences on the dependent variable that occur in the period covered by the sample.

[16] Maddala (1977, 162-63) and Wooldridge (2002, pp.518-19) discuss the use of tobit models to estimate models where the dependent variable is generated by, in effect, a dual decision making process: in our case, firms' decisions as to whether or not to export and, if so, how much to export. The advantage of tobit estimation is that zero observations, which potentially yield useful information, are incorporated into the model as the outcome of a decision-making process. Moreover, truncation at one is unlikely to affect our estimates in a substantial manner: in our pooled sample, for example, only 1.35 percent of firms generate 100 percent of their sales from exports (four percent when the upper limit is set at 95

The model for cross-section data has the following form:

$$y_i = \begin{cases} x_i\beta + \varepsilon_i > 0 & \text{for exporters} \\ 0 & \text{for non-exporters} \end{cases}$$
$$\varepsilon_i \sim N(0, \sigma^2)$$

where $i = 1, 2,\ldots,$ N firms; x_i is a $1\times(k+1)$ vector containing the k variables of interest discussed in Section 2 together with an intercept term, and β is the corresponding $(k+1)\times 1$ vector of coefficients to be estimated; and ε_i are independently and individually distributed (iid) over the whole sample with mean zero and variance σ^2. And, for panel data:

$$y_{it} = \begin{cases} x_{it}\beta + \alpha_i + \varepsilon_{it} > 0 & \text{for exporters} \\ 0 & \text{for non-exporters} \end{cases}$$
$$\alpha_i \sim N(0, \sigma_a^2)$$
$$\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$$

where, in addition, t = 2002, 2005 and 2008/9; x_{it} is a $1\times(k+1)$ vector containing the k variables of interest together with an intercept term; the a_i are time invariant (fixed) effects distributed iid over the firms with mean zero and variance σ^2_a; and the ε_{it} are iid over the whole sample with variance σ^2_ε.

Although a 2-year or 3-year panel sample may not be sufficient to identify any dynamics in the data, it is sufficient to estimate a tobit model, which accounts for unobserved effects that are constant (fixed) over time but vary between firms by means of the firm-specific error term α_i.[17]

Further, we follow Wooldridge (2002, pp. 521-524) who distinguishes between two types of marginal effects: the 'conditional' marginal effects, which account for changes in the expected (or predicted) value of exports (y) for the subpopulation of firms for which exporting activity is observed (y>0); and the 'unconditional' marginal effects that account, in addition, for the effect of changing values of the independent variables on the probability that exporting will take place at all (i.e., will change from zero to positive and, hence, be observed). For dummy variables, both conditional and unconditional marginal effects are calculated as the discrete change in the expected value of the dependent variable as the dummy variable changes from zero to one.

percent). Nonetheless, we implemented two robustness checks to address residual concerns on this issue. We replicated our preferred model using our pooled sample: firstly, we implemented tobit estimation with censoring at both zero and one; secondly, we implemented the generalized linear model recommended by Baum (2008, p.301) for modelling 'proportions data in which zeros and ones may appear as well as intermediate values'. In neither case were the estimates substantially different from those reported below. Finally, we note that in Tobin's (1956) original presentation of what came to be known as the tobit model, his dependent variable is a proportion. For these reasons we disagree with Hobdari et al. (2009, p.12) who criticise the tobit estimation of export intensity because this variable is "bounded by definition". In our view, this neglects the dual decision making process that informs the construction of the tobit estimator.

[17] Random effects (RE) estimation is defined by the assumption that the independent variables are exogenous with respect to the group-specific (time invariant or fixed) effects. To minimize potential endogeneity of this kind, we specify a model in line with a wide range of theoretical influences in order to include in the estimated part of the model as many time-invariant determinants of firms' export intensity as possible (Wooldridge, 2006, pp.481 and 493). However, we have stressed the limitations of theory, which suggests that we might not have captured all possible influences. Yet, many of our variables of interest are dummy variables; and these, according to investigation by Monte Carlo methods, may be estimated with correct coefficients and standard errors. Greene (2003a, p.26) finds that: 'In spite of the high intercorrelation of the (group-specific) effects and the regressors, the dummy variable coefficient and its standard error are estimated essentially correctly ... Surprisingly, the marginal effect of the dummy variable is also well estimated ...' Table 2 establishes that the panel model includes 17 dummy variables and 10 continuous variables. Moreover, the groups of variables of particular interest – human capital and innovation/technology – both contain dummy variables, so that analysis does not depend only on continuous variables. There are, of course, remaining doubts concerning the validity of RE estimation. For this reason, we do not rely only on panel analysis, but also report cross-section estimates for three individual waves as well as for a pooled dataset.

3.2 The data[18]

The data used in this investigation are from BEEPS, an extensive survey targeting the business environment and the performance of enterprises in TCs (see Appendix Table 5 for a two-way table showing the countries and number of observations for each country in each round of the survey). We employ data for 2002 including 5,330 firms; 2005 with 5,385 firms; and 2008/9 with 7,247.[19] As our study concentrates on the SME sector, we utilize these datasets by estimating six specifications of the econometric model on five samples of SMEs: namely, three for the individual years 2002, 2005 and 2008/9; a pooled dataset; a panel of companies surveyed in 2005 and 2008/09; and, a panel of companies surveyed in all three rounds.[20,21] The definition of our variables and their summary statistics are provided in Table 1 and in the Appendix, Table 6.[22]

Table 1 Description of variables used in the econometric specifications

Dependent variable	Description
expint	Export intensity – the share of total sales generated by exports (%)
Independent variables	**Description**
ftwor_edu	Education of the workforce – the share of the workforce with some university or higher education (%)
training	Dummy for firms which have conducted on-the-job-training
skilled	The share of skilled workers (including also the managerial staff and other professionals) in a firm's current total full-time workforce (%)
ceo_edu	Dummy for firms whose general manager has superior education
org_str	Dummy for firms which underwent changes in organisational structures
gross_inv	Investment in new buildings, machinery and equipment. For 2002, the data refers to spending since 1998 as a share of the firm's sales over the same period (%). For 2005, the data refers to spending in 2004 (in $1,000). For 2008/9, the variable is a dummy variable taking the value of 1 if the firm has spent any money on R&D in 2007.
inv_rd	Investment in R&D by each firm (including wages and salaries of R&D personnel, materials, R&D related education and training costs). The reference year for this variable is the same as that for the variable '*gross investment*' (the previous item). The variable is

[18] Only a short description of the content of the BEEPS dataset is provided here. Various sample specific information – general and country specific - are provided in the reports accompanying the survey and datasets (see shttp://www.ebrd.com/pages/research/analysis/surveys/beeps.shtml; accessed February, 2011). See also the EBRD 2005 *Transition Report*.

[19] BEEPS was conducted also in 1999, but this survey is omitted from our analysis as nonconformities with later rounds are too great; many variables covered in the later rounds were not included in the 1999 round.

[20] From the dataset we have dropped firms with over 250 employees (i.e. large firms). In addition, to preserve the randomness of the sample, we have dropped also the panel component of firms for 2005 and 2008/9 and the so-called 'manufacturing overlay' (a group of additional companies surveyed outside the normal sample stratification in several countries in order to increase the weight of their manufacturing sectors). The SME component for different countries ranges from 80 to 85 percent.

[21] With regards to the panel sample, we employ only the "balanced panel component", as imputing the unbalanced panel would mean violating the Missing Completely at Random assumption, crucial to the Multiple Imputation technique.

[22] In addition to the usual descriptive statistics, we also examined the correlation matrix between our variables, paying particular attention to those related variables grouped together as "human capital", "technology" or productivity-enhancing "spillover" variables. On conventional criteria (Taylor, 1990, p.37), only one correlation coefficient across all of our samples, and across all categories of interest, can be characterised as a "modest or moderate" correlation (i.e. between 0.36 and 0.67); otherwise, the largest correlations in each category are all "low or weak" (i.e. ≤ 0.35).

	continuous for 2002 and 2005 and a dummy for 2008/9 (as for the previous variable).
prli_tech	Dummy for firms which introduced new products or upgraded existing products or introduced new technology over the last 36 months
tech	Dummy for firms who consider that their technology is more advanced than that of their main competitors
location	Dummy for firms located in the capital city
mne_sal	The share of the company's domestic sales to multinationals located in their country (%)
large_sal	The share of the company's domestic sales to large domestic firms (%)
impint	Imported material inputs as a share of total material inputs (%)
size	Number of full time employees at the firm three years earlier
age	Business experience – years since establishment
entact	For the *panel sample*, a dummy for companies operating in production activities For *cross-sectional* samples the share of sales generated by production activities
foreign	The percentage share of the firm's assets owned by foreign shareholder(s)
soe	For *panel*, the percentage share of the firm's assets owned by the state For *cross-sectional* samples, a dummy for state owned companies (companies with over 50 percent of the firm's assets belonging to the state)
credit	Dummy for companies who have a credit line or a loan from a financial institution
bus_assoc	Dummy for membership in business associations
mark_shar	Dummy for companies with more than 5 percent of total domestic market sales
cap_util	Capacity utilisation of facilities or manpower three years ago (%)
Country dummies	The reference category in each sample is the country with the lowest average export intensity.
Year dummies	The reference category is 2008/9.

The summary statistics (Appendix, Table 5) show a fairly low involvement of SMEs in export activities; data from the sample specifications show that only around 20 percent of SMEs in the TCs engage in export activities. In addition, as expected, the calculations also show that export markets are not the domain of SMEs, with the average share of export sales in total sales at around 7 percent. However, SMEs in TCs seem fairly well endowed with human capital, in terms of the education of their workforce and the skills that they possess. Moreover, sample companies have continuously invested in new infrastructure and technology. With regards to the latter, over 65 per cent of companies in the pooled sample have introduced new product lines (as well as upgrading old ones) and new technologies during the last decade.

Other firm specific data show that, on average, sample firms have just over 40 employees, and are overwhelmingly privately (around 95 percent) and domestically owned (on average around 90 percent). Less than one third are located in the capital city, generally engaging in trade and services. Data show that imports are a significant source of inputs and other supplies, while large domestic firms are an important market for SMEs, more than are foreign MNEs. Finally, over one third of sample companies are members of business associations.

3.3 Robustness checking - handling missing data

The proportion of missing data for most variables in the samples is fairly low (see Appendix, Table 6).[23] However, both the gross investment and spending on R&D variables have a high percentage of missing responses. Given the prominence of these variables in our discussion (Section 2 above), we do not want to drop them entirely from our estimated models: first, because their particular effects are of interest; and, second, because we want to demonstrate that the estimates of our other variables of interest are not greatly affected by the inclusion or omission of these two variables. Moreover, we argue that it is not an entirely satisfactory option to drop observations with missing values of these variables. This is for two reasons. First, because we would then be unable to utilize fully the data available for other variables. Secondly, because dropping observations with missing values ("listwise deletion") is justified only on the strong assumption that these values are 'missing completely at random' (MCAR); otherwise, the consequence is again inefficient and biased coefficient estimates (Schafer and Graham, 2002), arising from differences between the distribution of the missing observations and the distribution of the observed items. We conclude that it is not satisfactory to drop either variables or observations. Consequently, we imputed the missing values (the percentage of imputed values for each variable corresponds to the percentage of missing values detailed in Appendix, Table 6). To this end, we applied multiple imputation (MI) as the technique most favoured in the statistical literature on analysing survey data with missing values.

Rubin (1987, p.2) defines MI as a 'technique that replaces each missing or deficient value with two or more acceptable values representing a distribution of possibilities'. The MI procedure first estimates an imputation model on the observed data *m* times to create *m* complete datasets (i.e. datasets in which the observed data is completed by the imputed values). To preserve the features of the joint distribution in the imputed values the imputation model includes both factors known to be associated with missingness and factors that explain the variation of the target variables (Schafer and Graham, 2002; Van Buuren et al., 1999). Then, each dataset is analysed by an estimation method specified by the researcher. Finally, the results obtained from the *m* analyses - one for each dataset - are combined to produce parameter estimates and standard errors that fully reflect missing-data uncertainty. The particular feature of MI is that it allows for both within-imputation and between-imputations dimensions of randomness - hence, errors - in estimating parameters, which are reflected in the accompanying standard errors. This procedure yields valid estimates from imputed datasets of the standard errors in addition to approximately unbiased estimates of all parameters. This is the most significant advantage of the MI technique.[24] Moreover, MI rests on the assumption that values are "missing at random" (MAR), which is a weaker assumption than the MCAR assumption entailed by analysing a dataset with missing values.[25]

[23] The missing values in our case are treated as non-response items, resulting from two sources: first, the interviewee did not know the answer or refused to reply; and, second, the interviewer neglected to ask the question or did not record the answer.

[24] Rubin (1987, p. 2) suggests *m* in a range of 2 to 10. However, Kenward and Carpenter (2007, p. 208) show that in some cases a larger *m* is required for reliable estimation and inference, especially in cases when the proportion of missing data is high. Because the percentage of missing data for some of our variables is relatively large, we apply *m*=20. For practical implementation of MI, we use the routines written for STATA (see Royston, 2005a, 2005b, 2007; and, Carlin et al., 2008). The syntax written to implement MI for this paper is available on request.

[25] Although this assumption cannot be tested, Schafer and Graham (2002) show that small violations of MAR usually have only a minor impact on estimates and standard errors.

Accordingly, in all six datasets used for estimation – i.e., the two- and three-year panels, the pooled, and the cross-section samples for 2008/9, 2005 and 2002 – all the missing values are imputed, regardless of the number of missing values for individual variables. Consequently, the sample sizes have increased substantially in relation to the non-imputed samples: the longitudinal datasets by 14 and140 percent, respectively; the pooled dataset by 7 percent; and the 2008/9, 2005 and 2002 datasets by, respectively, 13.5 percent, 25 percent and 330 percent.[26] This large increase in the size of the datasets is reflected in the results. Although the signs on the estimated effects in the imputed and non-imputed samples are remarkably consistent, some estimates differ in their statistical significance and in their magnitude. For survey datasets with the typical characteristics displayed by BEEPS, we propose that results from imputed datasets should be taken to complement, rather than substitute for, the results from non-imputed datasets. Accordingly, the results from MI serve as a robustness check of the non-imputed results.

4 Results and discussion

We analyse a range of datasets and apply different specifications (reflecting nonconformities between the surveys). The consistency of estimates across the different datasets, both imputed and non-imputed, and the correspondingly different specifications suggests robustness of the reported results. The results are overwhelmingly consistent in terms of the direction of the estimated effects. Moreover, most of the estimated coefficients are consistent across different specifications in terms of statistical significance. There are slight differences in the magnitude of the coefficients, albeit not worth dwelling upon as they do not imply any change in our conclusions.

Tables 2 and 3 report the unconditional marginal effects and their respective standard errors from estimating tobit models on the six samples, in each case both non-imputed and imputed. We comment in detail only on the unconditional marginal effects, because these refer to the whole population of firms (i.e. both potential exporters and those that are exporting), and are therefore the effects most relevant for our discussion.[27] To adopt a conservative approach to inference, we report cluster-robust standard errors for the cross-section estimates (clustered on country). For the panel estimates the standard maximum likelihood estimates are compared to bootstrap estimates, with no noteworthy difference in the corresponding levels of statistical significance.[28]

[26] When, for example, we write that imputation increases our "pooled dataset by seven percent", we do not mean that we have imputed seven per cent of our entire dataset. Rather, *by imputing a relatively few missing observations for many variables we retrieve relatively many observations*. For example, if a variable has one missing value then we lose the corresponding observation, which may have complete data on, say, 19 other variables. By imputing the one missing value for one variable, we retrieve the observation and thus the observed data on the other 19 variables.

[27] The corresponding estimated conditional marginal effects are available on request.

[28] Because of limited space in the table, the bootstrapped standard errors (using 50 replications) are not reported; they are available on request.

Table 2. Unconditional marginal effects: panel tobit estimation of the determinants of SME export behaviour in transition countries [a), b)]

	Estimations for non-imputed samples		Estimations for imputed samples	
VARIABLES	3-year panel	2005 & 2008 panel	3-year panel	2005 & 2008 panel
HUMAN-RELATED FACTORS				
Edu. of workforce	0.043***	0.064**	0.043***	0.026
(*ftwor_edu*)	(0.015)	(0.027)	(0.014)	(0.016)
TECHNOLOGY-RELATED FACTORS				
Gross investments	-	-2.560	-	-0.332
(*gros_inv*)[c)]		(3.143)		(2.023)
Spending on R&D (*inv_rd*) [c)]	-	-1.049	-	1.494
		(1.666)		(1.451)
New or upgraded	1.336*	1.932	1.288**	2.000**
product/new tech. (*prli_tech*)	(0.693)	(1.391)	(0.636)	(0.878)
PRODUCTIVITY-ENHANCING SPILLOVERS				
Firm location (*entres*)	2.022*	4.135*	2.102*	3.112**
	(1.217)	(2.327)	(1.217)	(1.555)
CONTROL VARIABLES				
Lagged firm size (*lnsize*) [d)]	1.680***	1.541**	1.702***	2.098***
	(0.377)	(0.662)	(0.360)	(0.494)
Firm activity (*entact*) [c)]	9.785***	13.090***	9.816***	7.675***
	(2.198)	(3.747)	(2.204)	(2.200)
Share of foreign capital	0.030**	0.034	0.026**	0.045***
(*foreign*)	(0.012)	(0.023)	(0.011)	(0.015)
State controlled companies	-0.035	-0.000	-0.019	-0.014
(*soe*)[c)]	(0.026)	(0.055)	(0.021)	(0.032)
Access to credit (*credit*)	0.451	2.648*	0.492	1.393
	(0.696)	(1.519)	(0.638)	(0.944)
Year dummy for 2002	0.262	-	0.803	-
(*year_2002*)	(0.691)		(0.624)	
Year dummy for 2005	1.005	2.374	1.200*	0.488
(*year_2005*)	(0.661)	(1.763)	(0.634)	(1.132)
Country dummies [e)]	Yes	Yes	Yes	Yes
Observations	856	272	975	650
Number of panelid	325	208	325	325

Notes:

[a)] Standard errors in parentheses. We report oim standard errors (i.e. derived from the observed information matrix). Levels of significance are indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

[b)] The 2008/9 survey did not include a number of variables, which had been included in the previous rounds (e.g., *training, skilled, org_str, ceo_edu, tech, mne_sal, large_sal, impint, bus_assoc, mark_share* and *cap_util*). Hence, these variables are missing from the panel sample. In addition, we had to drop the *age* variable as the varying definitions were incompatible over the years.

[c)] See Table 1 for the different definitions of this variable in different samples.

[d)] Squared values for the *size* variable were included in the initial specification but then dropped) following *F-tests* of joint significance.

[e)] The estimated conditional marginal effects for the country dummies are available on request.

Table 3 Unconditional marginal effects: tobit estimation of the determinants of SME export behaviour in transition countries [a)]

	Estimations for non-imputed samples				Estimations for imputed samples			
VARIABLES	Pooled	2008/9 [b)]	2005	2002	Pooled	2008/9 [b)]	2005	2002
HUMAN-RELATED FACTORS								
Edu. of workforce (*ftwor_edu*)	0.052***	0.037***	0.034***	0.062***	0.051***	0.034***	0.038***	0.030***
	(0.007)	(0.007)	(0.007)	(0.017)	(0.007)	(0.008)	(0.008)	(0.009)
Training (*training*)	-	-	-0.072	-1.289	-	-	-0.076	-0.206
			(0.383)	(1.090)			(0.426)	(0.525)
Skilled workforce (*skilled*)	-	-	-0.002	0.026	-	-	0.002	-0.004
			(0.006)	(0.017)			(0.007)	(0.006)
Changes in org. structure (*org_str*)	-	-	0.228	1.526	-	-	0.196	0.258
			(0.409)	(1.151)			(0.387)	(0.317)
CEO education (*ceo_edu*)	-	-	-	-0.502	-	-	-	0.981**
				(1.283)				(0.463)
TECHNOLOGY-RELATED FACTORS								
Gross investments (*gros_inv*) [c)]	-	-	-	0.024	-	-	-	0.075***
				(0.053)				(0.027)
Spending on R&D (*inv_rd*) [c)]	-	-	-	0.035	-	-	-	0.004
				(0.066)				(0.035)
New or upgraded product/new tech. (*prli_tech*)	1.491***	1.005**	0.850**	2.981***	1.500***	1.045**	0.991**	1.000**
	(0.277)	(0.450)	(0.425)	(0.720)	(0.290)	(0.439)	(0.434)	(0.486)
Technology level relative to competition (*tech*)	-	-	-	0.072	-	-	-	0.810*
				(1.079)				(0.452)
PRODUCTIVITY-ENHANCING SPILLOVERS								
Firm location (*entres*)	-0.082	-0.448	0.105	-0.169	0.033	-0.260	-0.239	0.046
	(0.317)	(0.357)	(0.419)	(0.628)	(0.308)	(0.359)	(0.480)	(0.506)

Sales to MNEs (*mne_sal*)	-	-	0.075*** (0.016)	0.080*** (0.022)	-	-	0.087*** (0.015)	0.090*** (0.015)
Sales to large firms (*large_sal*)	-	-	0.031*** (0.006)	0.073*** (0.011)	-	-	0.039*** (0.007)	0.047*** (0.008)
Import intensity (*impint*)	-	-	0.019*** (0.007)	0.028** (0.013)	-	-	0.027*** (0.007)	0.023*** (0.007)
CONTROL VARIABLES								
Lagged firm size (*lnsize*)	2.131*** (0.352)	1.260* (0.652)	1.069** (0.426)	3.071** (1.199)	2.040*** (0.351)	1.196* (0.632)	1.413*** (0.331)	1.776** (0.739)
Lagged firm size squared (*lnsizesq*) [d)]	-0.025 (0.055)	0.065 (0.099)	0.034 (0.066)	-0.118 (0.192)	-0.019 (0.053)	0.066 (0.093)	0.002 (0.054)	-0.031 (0.106)
Age of the firm (*lnage*)	-0.262 (0.197)	-0.585*** (0.227)	0.150 (0.292)	-0.643 (0.624)	-0.267 (0.184)	-0.608*** (0.232)	-0.068 (0.302)	-0.193 (0.245)
Firm activity (*entact*) [c)]	0.040*** (0.004)	0.065*** (0.004)	0.016*** (0.004)	0.008 (0.011)	0.042*** (0.004)	0.065*** (0.004)	0.021*** (0.004)	0.015** (0.006)
Share of foreign capital (*foreign*)	0.066*** (0.005)	0.044*** (0.005)	0.035*** (0.006)	0.055*** (0.013)	0.065*** (0.004)	0.045*** (0.005)	0.046*** (0.008)	0.048*** (0.006)
State controlled companies (*soe*) [c)]	-0.839* (0.500)	0.829 (1.057)	-0.331 (0.535)	0.222 (1.397)	-0.762 (0.474)	0.864 (1.127)	-0.532 (0.579)	0.036 (0.797)
Access to credit (*credit*)	1.871*** (0.234)	1.506*** (0.369)	0.907*** (0.333)	-1.313* (0.739)	1.929*** (0.220)	1.660*** (0.349)	0.963*** (0.344)	1.226*** (0.429)
Member. in business assoc. (*bus_assoc*)	-	-	2.038*** (0.760)	1.367 (1.142)	-	-	2.607*** (0.810)	2.469*** (0.506)
Market share (*mark_share*)	-	-	-	2.934** (1.250)	-	-	-	1.749*** (0.555)
Capacity utilization (*cap_util*)	-	-	-0.010 (0.009)	-0.035** (0.016)	-	-	-0.012 (0.009)	-0.024*** (0.008)
Year dummy for 2002 (*year_2002*)	0.830 (0.521)	-	-	-	0.873* (0.473)	-	-	-

Year dummy for 2005 (*year_2005*)	0.703*	-	-	-	0.655	-	-	-
	(0.422)				(0.404)			
Country dummies [e)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,753	6,384	4,323	1,238	17,962	7,247	5,385	5,330
Pseudo R-squared	0.0630	0.0904	0.0771	0.0733	0.0627	0.0890	0.0721	0.0764

Notes:

[a)] In the cross-section samples, we report (in parentheses) cluster-robust standard errors to control for intra country correlations. Levels of significance are indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

[b)] The 2008/9 survey did not include a number of variables, which had been included in the previous rounds (e.g., *training*, *skilled*, *org_str*, *ceo_edu*, *tech*, *mne_sal*, *large_sal*, *impint*, *bus_assoc*, *mark_share* and *cap_util*). Hence, these variables are missing from the 2008/9, pooled, and panel samples.

[c)] See Table 1 for the different definitions of this variable in different samples.

[d)] Squared values for *size* and *age* variables have been included (or dropped) following *F-tests* of joint significance.

[e)] The estimated conditional marginal effects for the country dummies are available on request.

To assess the validity of tobit estimation there is a diagnostic check suggested by Greene (2003b, p. 768) and Wooldridge (2002, p. 534), which evaluates the appropriateness of the tobit model. As this check requires, we find that the probit and tobit coefficient estimates are consistent after appropriate transformations.[29,30] This diagnostic check suggests that, for each of the six regressions on the non-imputed samples reported in Tables 2 and 3, the determinants are similar for both the propensity of firms to export in a particular period and the intensity of exports by those firms that do export in a particular period. This finding is consistent with the theory informing our empirical specification and has useful policy implications, which are developed in the conclusion to this paper. Here, the import of these checks is to suggest that, in each case, the tobit models provide consistent and unbiased estimates.

For ease of interpretation, Table 4 provides a summary of the outcomes for each econometric model estimated for the TCs. To provide a robustness check, Table 4 also summarises the effects of MI, by providing information on the results from the imputed datasets as well as highlighting differences with the estimates arising from the non-imputed datasets. These results take the empirical analysis as far as is permitted by the available data, which is restricted to cross-section samples together with the two- and three-year panels. Nonetheless, our results do indicate the importance of various factors influencing the export behaviour of firms.

First, the human capital measures affect positively firms' export behaviour. The hypothesised positive relationship between human resources and exporting – Hypothesis 1 - has been confirmed by the estimated effects of the education of the workforce (*ftwor_edu*), which shows that the greater the percentage of employees with higher education the higher the expected percentage share of exports in a firm's sales. The unconditional marginal effects for the samples indicate, *ceteris paribus*, that a one percent increase in the pool of employees with higher education will increase the percentage share of exports in a firm's turnover, within a range of between 0.030 and 0.064 per cent. This indicates that better quality of human resources at the firm level may produce lower unit costs and/or higher quality of production, enabling firms to trade higher quality products at lower prices in international markets.

However, association between export behaviour and the other human related variables is weak at best. The estimates of on-the-job training (*training*) are statistically insignificant. The explanation for this result can be viewed from the resource based perspective. The literature on human resources supports the view that large firms commit greater resources to training than do small firms (Bryan, 2006; Colombano and Krkoska, 2006; etc.). Bryan (2006, p. 635) explains that 'small firms are less likely to train employees than larger firms, because they suffer higher labour turnover and higher failure rates, and they tend to have shallow hierarchies that limit long-term career prospects'. Flexibility of SMEs with regards to organisational structure (*org_str*) has no significant effect on export behaviour either. As we pointed out, the literature hails SMEs for their ability to change and adapt, treating this as source of their competitiveness. Especially in the transition context, with many countries with unstable business environments, we assumed that this factor would come into play. However, the

[29] Greene and Wooldridge suggest that tobit estimates should be divided by the estimated standard error of the regression and then compared with the respective parameters of the probit model. If the tobit model is valid then the ratios should be close – they cannot be equal due to sampling error – to the corresponding coefficient estimates in the probit model; otherwise the tobit estimates might be unreliable.

[30] The detailed comparisons of tobit and probit estimates are reported for the panel and pooled samples in the Appendix, Tables 7 and 8. For reasons of space, these comparisons are not reported for the other three samples, but are available on request. Henceforth, the same applies to all empirical results referred to but not reported in detail.

Table 4. Summary of estimation results for SME export behaviour in TCs

Dependent variable: Export intensity – percentage of total sales generated by export sales

Variables	Expected sign	Outcomes (non-imputed samples)	Outcomes (imputed samples)
Human capital resources: education of the workforce; on-the-job-training; skilled employees; education of CEO; changes in the organisational structure.	+	Coefficient on the education variable positive and highly statistically significant across samples.	Similar outcomes after MI, except for the 2-year panel. In addition, CEO education positive at the 5 percent level of significance.
Technology-related factors: investment-sales ratio; R&D intensity; introduced new or upgraded products or new technology; technology relative to competition	+	Introduction and upgrade of new products and technologies highly significant and positive, except in the 2-year panel.	Similar results after MI with regards to the introduction and upgrade of new products and technologies. Gross investment and variable describing the level of firm's technology relative to their competitors significant for 2002.
Productivity-enhancing spillovers	+	Location is insignificant throughout the cross-section samples. Conversely, the panel estimates show a significant and positive relationship. Industry linkages are positive for 2002 and 2005. The results indicate that the greatest effect is produced by interacting with MNEs.	Results similar to those from the non-imputed samples.
Firm size	Positive with the possibility of a quadratic relationship	No indication of a quadratic relationship. Natural logarithm of lagged firm size positive and highly significant for all the samples.	Results similar to those from the non-imputed samples.
Business experience	Positive with the likelihood of a quadratic relationship	Insignificant throughout, except for the 2008/9 sample.	Results similar to those from the non-imputed samples.
Sector of activity (firm activity)	+	Highly significant and positive, except in the 2002 estimates.	Highly significant and positive throughout.
Foreign capital share	+	Highly significant and positive throughout, except for the 2-year panel.	Highly significant and positive throughout.
State ownership	-	Statistically insignificant, except for the pooled	Statistically insignificant in all samples.

		sample.	
Access to external finance	+	Positive and significant, except for the 3-year panel.	Positive and significant, except for both panel samples.
Membership in business associations	+	Highly significant and positive for 2005, but insignificant for 2002.	Highly significant and positive for both 2002 and 2005.
Market share	+	Highly significant and positive for 2002.	Results similar to those from the non-imputed samples.
The level of capacity utilisation	+/-	Statistically significant and negative for 2002; negative but insignificant for 2005.	Results similar to those from the non-imputed samples.
Time variations	+/-	Higher propensity and intensity of firms identified for 2005 relative to 2009 only in the pooled sample. No significant differences between 2002 and 2009.	Higher propensity and intensity identified for 2005 relative to 2009, in the pooled and in the 3-year panel samples. No significant differences between 2002 and 2009.

resulting insignificant coefficient should not be viewed as a complete story. The lack of data made it impossible to investigate any other form of flexibility - such as price, product or technology - in relation to the export behaviour of firms. Finally, education of the CEO (*ceo_edu*) produces a positive relationship with the export behaviour of firms. In the imputed dataset for 2002, the coefficient is significant at the five per cent level. As pointed out, the evidence on the education of managers and its impact on firms' behaviour is scarce. Gottesman and Morey (2006) believe that managers with higher educational attainment will be more adaptive and innovative, and more likely to possess other characteristics that may improve firm's export propensity and intensity. Following the discussion of firm flexibility, we can argue that being adaptive and innovative is crucial for a successful manager in the highly uncertain transition environment.

We argued that the accumulation of technology (through investments in capital goods and innovation) will lower costs, enhance the quality characteristics of products and determine the emergence of new products. These are routes for increasing firms' productivity and, thereby, increasing competitiveness in the market. The hypothesised positive relationship between technological and innovation capabilities and exporting – Hypothesis 2 - has been confirmed by the consistently positive and significant coefficients on the dummy variable capturing whether or not the firm has "established new, upgraded a product line or introduced a new technology" in the recent past (*prli_tech*). The estimated unconditional marginal effect ranges from around one to three, meaning that firms reporting recent product or process innovation export up to three per cent more of their output than firms that do not. The other three technology related variables, namely, the investment-sales ratio *(gross_inv)*; R&D intensity (*inv_rd*); and the assessment of the firm's technology relative to its competitors (*tech*) generally yield insignificant results, especially the R&D intensity variable. Gross investments and firm's technology relative to its competitors appear significant for the imputed 2002 sample. For the 2002 sample, gross investment is reported as percentage of average annual sales in a previous period: hence, the statistically significant estimated coefficient for gross investment in the imputed sample means that a one percentage point increase in the share of gross investment in sales leads to an increase in the export share in sales of 0.075 of a percentage point. With regards to the firm's assessment of its technology level, a discrete change from 0 to 1 – signifying better technology relative to firm's competitors - increases the export share in total sales by up to 0.8 of the percentage point.

Among the variables included to capture productivity-enhancing spillover effects, we find a suggestive contrast between the capital city effect (*entres*) estimated from those samples in which the three variables measuring industry - especially vertical - linkages (sales to MNEs - *mne_sal*, sales to domestic large firms - *large_sal*, and import intensity – *impint*) are absent and the capital city effect estimated from those samples in which the vertical linkages effects are present:

- two of the samples in which the industry (vertical) linkages variables are *absent* (the three- and two year panel samples) yield a statistically significant capital city effect; yet
- both samples in which the industry (vertical) linkages variables are *present* (the 2002 and 2005 samples) yield insignificant capital city effects.

This contrast suggests that when the capital city indicator is the only variable able to capture productivity externalities, whether arising from agglomeration or industry (vertical) linkages, then it may capture all such effects. This is informative about such effects in general but cannot tell us anything about the origins of such effects. However, the 2002 and 2005 samples, which contain both the capital city effect and the three variables measuring industry (vertical) linkage effects, yield highly significant linkage effects of the anticipated sign but utterly insignificant capital city effects. Together, these results are consistent with Hypothesis 3b (that industry, - especially vertical - linkages positively influence export behavior in TCs) but tend to refute Hypothesis 3a (that agglomeration effects associated with capital cities positively influence export behavior in TCs).

On this interpretation, no capital city effect on the exporting of SMEs in TCs has been identified (*location*), although one would anticipate such a relationship from the prominence given to informal networks and communication in studies of firms' performance in TCs as productivity-enhancing mechanisms (see Smallbone and Welter, 2001). In contrast, statistically significant results are found for the effects of sales to MNEs (*mne_sal*) and large domestic companies (*large_sal*) as well as import intensity (*impint*). These mirror the productivity spillovers derived from industry linkages. With regards to the interactions with MNEs and large domestic companies, our findings are in line with the outcomes in Konings (2001), Yudaeva et al. (2003), Javorcik, (2004) and Gorodnicenko et al. (2010), among others, linking knowledge transfers from MNEs to domestic firms. The unconditional marginal effects for non-imputed samples in 2002 and 2005 indicate, *ceteris paribus*, that a one percent increase in the share of sales to multinationals will increase the percentage share of exports in a firm's turnover by 0.075 and 0.080 per cent, respectively. A novelty of our investigation is the indication that that the same effect is produced by interaction with large domestic firms. Here too, the unconditional marginal effects for non-imputed samples indicate, *ceteris paribus*, a one percent increase in firms' sales to large domestic companies will increase the percentage share of exports in total sales by 0.031 and 0.073 percent, respectively. It is logical to assume that within industries there is no single source of spillovers, but rather all gain from interactions with each other. With regards to the final industry-linkage variable, the higher the share of imported inputs, all things being equal, the greater the propensity to engage in exporting as well as to export more. Damijan et al. (2004) argue that firms can exhibit significant productivity gains especially from serving advanced markets. Following this logic, we believe that not only exporting to advanced countries but also importing (or any other form of international interactions) will induce productivity increases in SMEs in TCs. This is what the import intensity variable (*impint*) indicates in our case; a one percent increase in the share of imported material input relative to the total leads to an increase in the percentage share of exports in total sales by 0.019 and 0.028 percent, respectively. In this context, we should point out the reorientation of the international trade of TCs towards developed countries after the breakdown of socialism; this pattern still persists, with the European Union being the main trading partner for the majority of TCs.

The other firm specific variables included in our specifications are in line with what SME literature generally predicts, including empirical investigations for TCs. With regards to the controlling variables, as the unconditional marginal effects show, size (*size*) is an important factor in the exporting behaviour of SME sector in TCs. This result is consistent with other studies pointing out the significance of size in foreign markets. The results indicate that as firms grow in size there is a higher propensity for non-exporters to export as well as for exporters to export more. However, the size variable does not reveal non-linear effects on the degree of export involvement. In addition, the estimated coefficient on the age variable is generally statistically insignificant, indicating no obvious role of experience in firms' export behaviour (*age*).

As far as the ownership variables (foreign vs. domestic owned and state vs. private owned) are concerned, the results are generally as expected. The effect of foreign ownership on the export behaviour of SMEs is positive and consistent across the various datasets (*foreign*). The unconditional marginal effects estimated across the various samples indicate that a one per cent increase in the foreign ownership of SMEs increases the percentage of export sales in total sales by between 0.03 and 0.07 per cent (rounded).[31] Our results confirm what has been already found in many studies regarding TCs that highlight the superior performance of foreign firms vis-à-vis domestic firms on the grounds of the productivity gap between these two categories of firms.[32] Although it was expected that state ownership would have a negative and significant effect on firm performance in general, and on export behaviour in particular, the empirical evidence is rather weak. The results for state owned companies (*soe*) indicate statistically insignificant effects on export behaviour throughout the samples, except for the pooled estimates which is negative and statistically significant at 10 percent. This is consistent with some of the earlier studies of the impact of privatisation, which also failed to show the negative relationship between state ownership and firms' performance (see Bevan et al., 1999). Furthermore, this result can be explained by the fact that the sample contained only a small number of state owned firms (ranging from a maximum of 10.73 percent in 2002 to 1.41 percent in 2008/9), and that a large number of firms (almost 20 per cent of the total in 2008/9 sample), were privatised in the 2002-2008 period, and therefore did not have enough time to adjust to market based conditions.

The sector of activity variable (*entact*) indicates, *ceteris paribus*, that companies involved in production activities engage more in exporting relative to trade and service companies (the result appears in all samples, apart from the imputed 2002 sample). The difference in the magnitude of the marginal effect for the panel samples relative to other samples is a product of the difference in the definition of the variable. For the panel sample, a discrete change from 0 to 1 – signifying production activities in relation to other activities - increases the export share in total sales by up to 13 per cent. For other samples, a one percent increase in the share of production in total sales increases the export share in total sales in a range from 0.015 to 0.065 per cent. Although the service sector is rapidly gaining in importance in many emerging markets (Kandilov and Grennes, 2010), it seems that production activities of the SME sector in TCs have an edge compared to service activities when it comes to exporting.

Other important outcomes of our estimations relate to access to external finance, market share, membership in business organisations, and capacity utilisation. Our results demonstrate that access to finance (*credit*) is indeed an important factor that enhances an SME's competitive edge. The results overwhelmingly confirm the positive relationship between availability of finance and export behaviour. In addition, in line with other studies on TCs (see Hobdari et al., 2009), the estimated effect of market share (*mark_shar*) indicates that SMEs with greater share of domestic market tend to take advantage of greater demand in foreign markets. Furthermore, the results are consistent with the suggestion that business associations (*buss_assoc*) are an invaluable source of export information for SMEs in TCs and provide a route for SMEs to engage in international business networks. Finally, the results for capacity utilisation are generally too weak to be conclusive. However, the estimates for the 2002 sample – imputed and non-imputed – yield a negative rather than a positive relationship with exporting, which is in line with a supply-side rather than the conventional demand-side interpretation. Should this supply-side

[31] In an attempt to find out whether *majority foreign ownership* has a different effect from *any foreign ownership*, the model was respecified using a dummy variable for majority foreign ownership, taking a value of one for companies with 50+1 percent foreign capital and zero otherwise. The models in Table 2 were then reestimated. The results were similar to those reported in Table 2, where foreign ownership is measured by a continuous variable. (These additional results are available on request.)

[32] See for instance Yudaeva et al. (2003) in the case of Russia; Konings (2001) for Bulgaria, Poland and Romania; and Djankov and Hoekman (2000) for the Czech Republic.

interpretation be supported by future studies, then researchers may need to reconsider the routine use of capacity utilisation as a simple proxy for demand pressure. For, in this case, capacity utilisation may reflect a more subtle supply side strategy, whereby firms carry excess capacity in order to increase their flexibility to respond to the uncertain opportunities of export markets.

Two final groups of variables attempt to identify country and period disparities in the export behaviour of firms in TCs. In the cross-section tobit estimates, the country dummies are generally significant (of the 201 estimated country fixed effects, only three are *not* highly significant). This is consistent with our assumption that the former communist legacy, the pace of reforms, institutions, culture, and varying macroeconomic conditions may have had an impact on the export behaviour of firms. In contrast, in the panel estimates, of the 87 estimated country fixed effects only two *are* significant. Together, these results suggest that the firm-level time invariant (fixed) effects in our panel models and the country fixed effects in our cross-section models play a similar role with respect to controlling for otherwise unmodelled systematic influences on the dependent variable. In addition, the year dummies control for otherwise unobserved period-specific but group-invariant influences. We see higher export intensity and propensity of firms surveyed in 2005 than in 2008/9 (no significant difference is found for 2002). We should note that TCs have suffered greatly during the 2008/9 financial crisis, especially primary commodity producing countries in the CIS. In addition, highly financially integrated countries in CEB and SEE also felt heavily the brunt of the crisis. Hence, the results for the period variables partially confirm these claims.[33]

5 Conclusions

This paper investigates the determinants of the export behaviour of SMEs in transition countries (TCs), using cross-sectional and panel SME samples from the World Bank/EBRD Business Environment and Enterprise Performance Survey (BEEPS) carried out in 2002, 2005, and 2008/9. We were concerned, in particular, with the impact of human capital and technology related factors, as productivity-enhancing factors, on the export behaviour of firms. In the same light we investigated two potential channels of productivity-enhancing spillovers: namely, beneficial externalities arising, respectively, from location in the capital city and from industry – especially vertical - linkages. We also investigated the effects of firm-size, experience-related factors, location, type of ownership, sector of activity, financial constraints, and membership in business associations. Tobit models were employed to analyse the relationship between firms' export behaviour (measured by the share of total sales generated by exports) and these potential factors. This econometric approach enabled us to differentiate between exporters and non-exporters, while including both in our investigation. Hence, we have analysed firms' export behaviour by taking into account the likelihood that firms will export at all as well as the level of export activity.

A recent strand of international trade literature argues that firm's export entry and exit decisions are determined by the interplay of firm-level variation in productivity and sunk costs. We draw largely on Melitz's dynamic model of export participation for the core of our empirical model. We augment this with a number of additional strands of thought, which either substantiate or complement Melitz's approach, to specify our empirical model of

[33] For a detailed discussion of the effects of financial crisis in TCs see *EBRD Transition Report* (2009). A collection of papers in Bartlett and Monastiriotis (2010) concentrate on the effects of the crisis on SEE countries.

the export behaviour of SMEs in TCs. Although confined to broadly supply-side factors, the scope of our model specification – the large number of factors included – contributes to a greater understanding of SME behaviour in international markets.

Missing values are endemic to survey analysis, and thus a common problem in empirical SME research. Missing values entail the possibility of sample bias induced by non-random "missingness". Accordingly, we re-estimated each model on samples completed by imputed values. We propose this is a robustness check on our estimates in addition to estimating variant model specifications on six different samples (two- and three-year panels, and the three waves individually and pooled). The following results are robust in that they appear not only with the same sign but also with similar size and statistical significance across the majority of estimates – i.e. over variant model specifications estimated on different samples using both non-imputed and imputed datasets.

Under the *ceteris paribus* condition, we find that both human capital and technology-related factors are important sources of international competitiveness for small firms in TCs. Companies with a larger share of *educated workers* have higher export propensity and intensity. Similarly positive effects are identified for the *introduction or upgrading of products and technologies* (i.e. product and process innovation). Three variables included in the analysis indicate the importance of industry – especially vertical - linkages for the export behaviour of SMEs: *sales to multinationals*; *sales to large domestic companies*; and *import intensity*. Moreover, we find the following positive influences on the propensity and intensity of SMEs to export: *firm size; foreign capital share; sector of activity* (i.e. production); *the availability of external finance*; and, *membership in a business association*.

The policy implications are three-fold: export promotion may best be targeted at potential rather than existing exporters; the same policies may both encourage potential exporters to export and existing exporters to export more; and a wide-range of complementary supply-side measures are necessary to make a substantial impact on firms' export behaviour.

Following Melitz, the premise of our discussion is that high-productivity firms self-select into export markets. The implication is that policy makers should target potential exporters rather than actual exporters as, by definition, the latter do not require policy intervention to enter foreign markets. As López (2004, 2005) argues, notably in the context of developing countries, firms 'consciously' increase their productivity levels in order to serve export markets. In other words, firms make productivity-enhancing investments with the aim of penetrating foreign markets. Policy makers can support this process by developing appropriate policy instruments to facilitate productivity enhancement: in particular, support for innovation; technology improvement; R&D spending; and development of human capital. As Greenaway and Kneller (2007, p. 157) explain, intervention may 'stimulate more conscious self-selection and deliver a productivity boost'.

It has already been mentioned that the probit estimations (conducted as a diagnostic check) show the factors that influence the firms' propensity to export. A comparision of the probit and tobit estimates indicate that the same set of variables influence – with the same sign – both decisions as to whether or not to export (propensity) and, if so, how much to export (intensity). These results suggest that the same policies can increase both the probability that potential exporters will decide to export and the export efforts of existing exporters. In other words, policy prescriptions can be focused on the same areas for both potential exporters and actual exporters.

The results presented in this paper show that the marginal effects are generally rather small. This suggests that no single policy can transform the export activity of SMEs. Rather, a wide range of well-designed and consistently implemented policies will be required to boost SME exporting and, indeed, to promote the sector more generally. According to this study, such policies could usefully embrace: education; support for SME investment in technology and R&D; foreign participation in SME ownership; support for integration into the supply chains of larger firms, especially MNEs; measures to increase banking sector competitiveness, which improve the availability of finance for SMEs; and measures to promote membership of business associations (and, perhaps, by implication, SME networking in general).

Appendix

Table 5. Number of observations for each country in the each year of survey

	2002		2005		2008/9	
Country	Total	%	Total	%	Total	%
Albania	155	2.91	132	2.45	140	1.93
Armenia	148	2.78	139	2.58	202	2.79
Azerbaijan	144	2.70	120	2.23	235	3.24
Belarus	216	4.05	255	4.74	165	2.28
Bosnia and Herzegovina	154	2.89	142	2.64	268	3.70
Bulgaria	217	4.07	193	3.58	154	2.13
Croatia	158	2.96	148	2.75	95	1.31
Czech Republic	229	4.30	285	5.29	197	2.72
Estonia	147	2.76	135	2.51	183	2.53
FYROM	146	2.74	152	2.82	224	3.09
Georgia	157	2.95	130	2.41	271	3.74
Hungary	208	3.90	229	4.25	196	2.70
Kazakhstan	214	4.02	220	4.09	389	5.37
Kosovo	-	-	-	-	263	3.63
Kyrgyzstan	156	2.93	143	2.66	151	2.08
Latvia	151	2.83	139	2.58	173	2.39
Lithuania	175	3.28	140	2.60	190	2.62
Moldova	154	2.89	155	2.88	191	2.64
Mongolia	-	-	-	-	324	4.47
Montenegro	-	-	-	-	102	1.41
Poland	441	8.27	460	8.54	323	4.46
Romania	222	4.17	229	4.25	388	5.35
Russia	444	8.33	497	9.23	712	9.82
Serbia and Montenegro	-	-	226	4.20	-	-
Serbia	-	-	-	-	235	3.24
Slovakia	144	2.70	171	3.18	198	2.73
Slovenia	170	3.19	127	2.36	180	2.48
Tajikistan	151	2.83	159	2.95	257	3.55
Ukraine	399	7.49	412	7.65	606	8.36
Uzbekistan	226	4.24	247	4.59	235	3.24
Yugoslavia	204	3.83	-	-	-	-
Total	5300	100.00	5385	100.00	7247	100.00

Table 6. Summary statistics for the variables used in the econometric specifications

Variable	Datasets	Fractions		Mean	Std. dev.	Min	Max	% of missing data
		1	0					
expint	3-year average	-	-	7.13	20.61	0	100	0.30
ftwor_edu	3-year average	-	-	29.64	29.83	0	100	2.17
training	2-year average	42.55	57.46	-	-	-	-	6.25
skilled	2-year average	-	-	45.65	31.79	0	100	1.35
org_str	2-year average	45.11	54.90	-	-	-	-	0.80
ceo_edu	2002	68.04	31.96	-	-	-	-	0.60
gross_inv	2002	-	-	7.73	7.04	0	99	34.40
inv_rd	2002	-	-	5.38	18.16	0	80	63.60
prli_tech	3-year average	66.83	33.17	-	-	-	-	0.20
tech	2002	85.35	14.65	-	-	-	-	6.80
location	3-year average	30.26	69.74	-	-	-	-	0.00
impint	2-year average	-	-	30.95	38.82	0	100	4.70
mne_sal	2-year average	-	-	3.59	13.09	0	100	3.25
large_sal	2-year average	-	-	12.94	24.38	0	100	3.25
lnsize	3-year average	-	-	2.83	1.33	0	6.82	3.57
lnage	3-year average	-	-	2.32	0.69	0.82	5.23	0.53
entact	Panel	25.23	74.77	-	-	-	-	0.00
	3-year average	-	-	34.61	44.69	0	100	0.30
foreign	3-year average	-	-	8.78	25.74	0	100	0.33
soe	Panel	-	-	3.43	16.15	0	100	3.00
	3-year average	6.44	93.56	-	-	-	-	0.33
credit	3-year average	41.08	58.92	-	-	-	-	0.40
bus_assoc	2-year average	34.57	65.44	-	-	-	-	0.00
mark_shar	2002	28.96	71.04	-	-	-	-	2.90
cap_util	2-year average	-	-	79.50	21.17	3	100	3.15
year_2008/9	2-year average	36.84	63.16	-	-	-	-	0.00
year_2005	2-year average	31.66	68.35	-	-	-	-	0.00
year_2002	2-year average	31.50	68.50	-	-	-	-	0.00

Table 7. Diagnostic check: comparison between the transformed tobit coefficients and the corresponding probit coefficients in the 3-year panel sample

Variables	Panel non-imputed sample			Panel imputed sample		
	Tobit estimates	βj/σ	Probit estimates	Tobit estimates	βj/σ	Probit estimates
ftwor_edu	0.294***	0.010	0.011***	0.242***	0.009	0.007**
prli_tech	9.621*	0.330	0.415**	11.331***	0.407	0.474***
entres	12.572**	0.431	0.294	12.092*	0.435	0.311
lag_lnsize	11.583***	0.397	0.358***	10.347***	0.372	0.333***
entact	45.048***	1.544	1.406***	40.954***	1.472	1.280***
foreign	0.207**	0.007	0.011***	0.197**	0.007	0.011***
soe	-0.242	-0.008	-0.006	-0.162	-0.006	-0.004
credit	3.087	0.106	0.177	8.831	0.317	0.418**
d_2002	1.781	0.061	0.047	5.900	0.212	0.188
d_2005	6.719	0.230	0.243	7.828*	0.281	0.311*
alb	37.093	1.272	1.180	-24.670	-0.887	-0.897
arm	-3.598	-0.123	-0.513	0.621	0.022	-0.249
aze	-20.650	-0.708	-0.754	-2.093	-0.075	-0.278
bel	40.900	1.402	1.005	-22.548	-0.810	-1.038
bul	46.015	1.578	1.164	1.382	0.050	-0.300
cro	37.827	1.297	1.198	-5.995	-0.215	-0.482
czech	67.120	2.301	2.263**	-5.390	-0.194	-0.361
est	37.735	1.294	0.979	-11.951	-0.429	-0.620
geo	25.461	0.873	0.326	3.341	0.120	-0.213
hun	1.424	0.049	0.146	-12.381	-0.445	-0.613
kaz	7.828	0.268	0.115	-54.433	-1.956	-1.711
kyr	2.831	0.097	-0.107	-13.408	-0.482	-0.538
lat	36.382	1.247	1.527*	-13.705	-0.493	-0.615
lith	32.790	1.124	0.910	-0.399	-0.014	-0.206
mac	48.307	1.656	1.354*	8.692	0.312	-0.210
pol	47.841	1.640	1.774**	-16.063	-0.577	-0.276

rus	56.941	1.952	1.967**	-6.583	-0.237	-0.657
ser	51.186	1.755	2.041**	-14.290	-0.514	-0.244
slk	60.177	2.063	1.564	-8.016	-0.288	0.007
slo	71.997	2.468	2.361***	5.353	0.192	-0.379
taj	-7.601	-0.261	-0.230	-4.589	-0.165	-0.595
ukr	35.285	1.210	0.870	-10.676	-0.384	-0.909
uzb	-6.797	-0.233	-0.240	-20.333	-0.731	-1.004
mol	37.264	1.278	1.028	-23.052	-0.828	-0.654
Constant	-143.273	-4.912	-4.510	-104.480	-3.755	-3.317
Overall variance	27.826	/	/	27.826	/	/

Note: Asterisks correspond to the following levels of significance *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8. Diagnostic check: comparison between the transformed tobit coefficients and the corresponding probit coefficients in the pooled sample

	Pooled non-imputed sample			Pooled imputed sample		
Variables	Tobit estimates	βj/σ	Probit estimates	Tobit estimates	βj/σ	Probit estimates
ftwor_edu	0.363***	0.006	0.007***	0.358***	0.006	0.007***
prli_tech	10.877***	0.180	0.239***	10.994***	0.181	0.255***
entres	-0.570	-0.009	0.045	0.228	0.004	0.059
lag_lnsize	14.801***	0.245	0.244***	14.232***	0.235	0.235***
lag_lnsizesq	-0.174	-0.003	-0.001	-0.129	-0.002	0.000
lnage	-1.817	-0.030	0.009	-1.860	-0.031	0.010
entact	0.280***	0.005	0.005***	0.293***	0.005	0.005***
foreign	0.458***	0.008	0.007***	0.452***	0.007	0.007***
soe	-6.265	-0.104	-0.117*	-5.675	-0.094	-0.107*
credit	12.598***	0.209	0.252***	13.037***	0.215	0.260***
d_2002	5.599	0.093	0.151**	5.899*	0.097	0.145***
d_2005	4.769*	0.079	0.100**	4.466*	0.074	0.102***
alb	64.664***	1.072	0.980***	64.165***	1.059	0.967**
arm	32.898***	0.545	0.443***	34.923***	0.576	0.482***
aze	15.742***	0.261	0.179***	12.933***	0.213	0.142***
bel	49.103***	0.814	0.768***	49.209***	0.812	0.779***
bul	55.031***	0.912	0.858***	57.318***	0.946	0.900***
bih	64.362***	1.067	1.101***	63.699***	1.051	1.080***
cro	68.714***	1.139	1.267***	68.306***	1.127	1.196***
czech	71.086***	1.178	1.294***	70.718***	1.167	1.275***
est	67.132***	1.113	1.127***	66.905***	1.104	1.135***
geo	28.409***	0.471	0.376***	29.584***	0.488	0.377***
hun	60.656***	1.005	1.082***	60.926***	1.006	1.082***
kos	45.340***	0.751	0.768***	45.540***	0.752	0.786***
kyr	18.853***	0.312	0.254***	18.847***	0.311	0.239***

lat	61.724***	1.023	1.022***	62.956***	1.039	1.037***
lith	64.632***	1.071	1.085***	65.805***	1.086	1.110***
mac	74.304***	1.232	1.195***	73.991***	1.221	1.198***
mol	53.332***	0.884	0.800***	52.790***	0.871	0.797***
mon	17.749***	0.294	0.140***	17.263***	0.285	0.137***
pol	52.589***	0.872	0.908***	52.938***	0.874	0.925***
rom	40.904***	0.678	0.614***	40.800***	0.673	0.594***
rus	13.729***	0.228	0.249***	14.733***	0.243	0.256***
slk	74.343***	1.232	1.346***	73.102***	1.207	1.311***
slo	96.482***	1.599	1.778***	97.347***	1.607	1.802***
taj	20.929***	0.347	0.265***	21.883***	0.361	0.278***
ukr	30.318***	0.503	0.480***	30.949***	0.511	0.486***
uzb	19.217***	0.319	0.299***	19.729***	0.326	0.263***
yug	62.964***	1.044	1.170***	63.635***	1.050	1.182***
Constant	-182.672	-3.028	-3.260	-183.169	-3.023	-3.292
Overall variance	60.333	/	/	61.637	/	/

Note: Asterisks correspond to the following levels of significance *** p<0.01, ** p<0.05, * p<0.1

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Reply to Referee No. 2

We are grateful to the Referee for the last set of comments. We have taken her/his remarks into consideration and made appropriate changes to both our estimations and to the paper itself. In this note we reply to the Referee's comments in the order they were sent to us.

Before discussing individual comments, we would like to mention two specific points raised by the Referee and dealt with by us.

a. Endogeneity. While we have been aware of the problem of endogeneity (especially with respect to the technology related variables - *gross investment* and *investment in R&D*, and *introduction of new products and processes*, etc.), we believed that the way the variables were defined (referring to their values in a previous period) would ensure that endogeneity will not be a problem. However, the Referee noted that the definition of variables were not as we had thought. The Referee had checked the 2008/09 survey questionnaire and noted that the export ratio and investment variables were contemporaneous. Following the Referee's lead, we checked the wording of the questionnaire in all three surveys and found that there are variant forms of the same question (i.e. the questions are not all the same as the one checked by the Referee. We have now taken these variant forms into account and, accordingly, have revised our estimation strategy where appropriate and made corresponding changes to the text. These are explained in detail in the response to the Referee's Point 2, below.

b. Country dummies. The Referee drew our attention to the fact that the regional dummies defined by us cannot adequately control for country-specific influences (e.g. cultural and institutional factors). We agree with this comment. Therefore, we have re-estimated all models/specifications using country dummies. This has modestly improved the efficiency of estimation, but has not changed any substantive results or conclusions. However, the inclusion of country dummies does help to address another point raised by the Referee (see Response to Point 10 below).

We now respond to the individual points raised by the Referee. In each case we repeat the comment fully first and then provide our answer. For convenience, extensive additions to the paper have been highlighted in gray shading and are reproduced below.

Point 1. The contributions are vague, for instance "study SME export behaviour in TCs" and not succinct, like "research practice"?

Response: The two quotations referred to by the Referee are from the Introduction section of the paper. 'Introduction' is a brief signpost to the contents of the paper. It is not a place where each point can be discussed in detail; that is done later, in various places, in the paper. We mention three contributions of the paper:

i. That we attempt to fill a gap in the literature on the internationalization process of SMEs in transition countries. We extend the Meliz's theory (formulated and tested for non-transition economies by introducing a number of additional dimensions). In the Introduction, to be more precisely informative, we have added the following (highlighted in gray):

"*First*, we fill an important gap in SME internationalisation literature by studying SME export behaviour in TCs. To this end, we investigate both influences on the likelihood that firms will decide to export (propensity) and influences on the export decisions of existing exporters (intensity)."

The concepts "propensity" and "intensity" have previously been defined (two paragraphs above).

ii. That we use a number of supply side factors to make the model more comprehensive (and then test the model in the paper).
iii. That we apply the multiple imputation technique to the BEEPS dataset. Many authors have used this dataset without mentioning the problem of missing observations. This is methodologically questionable as it involves an important assumption: namely, that missing values are missing at random. We compare the imputed and non-imputed results to draw conclusions about the imputation technique. Although we now advance MI as a 'robustness check' (suggested by the Referee in Point 6), this is still a contribution to 'research practice' as other authors have not applied MI to the BEEPS database for this purpose. We refer to "research practice", to indicate that we claim no contribution to theory, or even to research methodology, but that we do draw the attention of SME and transition researchers to the case for data imputation.

It is of course possible to expand on these points with longer and more detailed explanation but this would not be appropriate for the Introduction section of the paper. The paragraph to which all these points pertain has been rewritten as follows to be succinct but informative (from pages 4/5 of the resubmitted paper; footnotes omitted).

> Using Jones and Coviello's (2005) language, our study puts in place a few 'pieces of the puzzle' in the firm's internationalisation process in TCs. The contribution of this study can be viewed from different perspectives. *First*, we fill an important gap in SME internationalisation literature by studying SME export behaviour – by which we mean both export propensity and export intensity - in TCs. Although there are many studies of internationalisation of firms' entrepreneurial activities, those relating to international activities of SMEs in transition are very scarce, and lagging well behind investigations linking SMEs with other developments in the economy, such as growth and employment. The *second* contribution relates to the large number of mainly supply-side factors included in the analysis, reflecting a comprehensively specified model of export behaviour. The *third* contribution concerns research practice. We apply multiple imputation techniques to the BEEPS datasets, because – we argue - this enables us to utilize this data more fully, which is an issue ignored by previous authors using these surveys.

Point 2. Severe concerns about H2. Although the hypothesis makes sense the data does not allow test for it without creating a bias of endogeneity.

Authors acknowledge that the estimated relationship between the technology-related variables and export behaviour is potentially flawed by endogeneity, caused by reverse causation. They posit on p. 7 that 'current export intensity could not affect past technical progress', which is true, however they claim that the dummy for firms that introduced new products refers to a period before the current one to which export intensity refers, which in effect means that it is lagged. This is not the case and I checked it in the questionnaires for each round of BEEPS. For instance in 2009 questionnaire it refers to year 2007. The question is: In fiscal year 2007, what percent of this establishment's sales were: indirect exports (sold domestically to third party that exports products), %; direct export (%). At the same time another question: In fiscal year 2007, did this establishment spend on research and development activities, either in-house or contracted with other companies (outsourced)?

Same is for the previous rounds of BEEPS. It proves endogeneity in a model which cannot be solved without a panel element. Even with a panel 3 waves do not allow to use lagged value and therefore an instrument should be used for 2 variables: Gross investments, Spending on R&D.

Response: As mentioned in the introduction to this Response, the Referee is right about the wording of questions on *export intensity*, *gross investment* and *investment in R&D* in the 2008/09 Survey being contemporaneous, but this is not the case for the innovation activities variable – i.e. firms introducing new products and processes or upgrading their products **-** in the same survey and the relevant questions in the other two surveys. The Referee seems to have assumed that the definitions are the same as the ones he has checked but, as we explain below (providing the actual questions in the other surveys as evidence), the definitions are different in other surveys and many of them refer to previous periods.

Firstly, the definition of the most important technology related variable, i.e., innovation activities (indicated by firms introducing new products and processes or upgrading their products), is indeed as we have explained in the paper (i.e., it refers to the previous three years) in all three surveys. Secondly, the definitions of gross investment and investment in R&D in the 2005 survey refer to 2004 while it is not clear from the questionnaire whether export intensity refers to 2004 or 2005. But, using the 2008/09 survey as an example and wanting to be on the safe side, we treat export intensity as referring to 2004 (and therefore contemporaneous with the investment questions). Thirdly, in the 2002 survey, the investment questions clearly refer to an earlier period (since 1998) than export intensity, as we had treated them in the paper.

The actual survey questions in the three surveys are presented below:

2002 Questionnaire:

Export intensity has been derived from Question 14a.

Q.14a	What percentage of your firm's sales are:

Sold domestically	%	**258-260**	**Q14a1**
Exported directly	%	**261-263**	**Q14a2**
Exported indirectly through a distributor	%	**264-266**	**Q14a3**

Gross investment (first row) and the R&D variable (second row in the table) are both derived from Question 83.

Q.83	On average since 1998 how much has your company spent on the following expressed as a per cent of the average annual sales of your firm over the same period?

	In % of average annual sales over since 1998		
New buildings, machinery and equipment	%	**1055-1057**	**Q83a**
Research and development (including wages and salaries of R&D personnel, materials, R&D related education and training costs)	%	**1058-1060**	**Q83b**

The dummy variable for firms which introduced new products or upgraded existing products or introduced new technology is derived from Question 85.

Q.85	Has your company undertaken any of the following initiatives since 1998? **INTERVIEWER: FOR EACH INITIATIVE ANSWERED "YES" ASK**: And how important in retrospect was this initiative for the survival and/or growth of your company over that period?

- **INTERVIEWER: SHOW CARD: 33**
- **Not important: 1, Slightly important: 2, Fairly important: 3, Very important: 4, Extremely important: 5, Don't know: 6**

	Undertaken				How important		
	Yes	No					
Developed successfully a major new product line	1	2	**1113**	**Q85a1**	1 2 3 4 5 6	**1124**	**Q85b1**
Upgraded an existing product line	1	2	**1114**	**Q85a2**	1 2 3 4 5 6	**1125**	**Q85b2**
Introduced new technology that has substantially changed the way that the main product is produced	1	2	**1115**	**Q85a3**	1 2 3 4 5 6	**1126**	**Q85b3**

2005 questionnaire:

Export intensity has been derived from Question 7 (NOTE: the Question is in the present tense).

Q.7	What percentage of your firm's sales are sold domestically, exported directly, exported indirectly through a distributor? **INTERVIEWER: IF THE ENTERPRISE EXPORTS DIRECTLY ASK:** In which year did your firm first export directly? **INTERVIEWER: IF THE ENTERPRISE EXPORTS INDIRECTLY THROUGH A DISTRIBUTOR ASK**: In which year did your firm first export indirectly?

			IF FIRM EXPORTS ASK (First Year)	
Sold domestically	%	**256-258**		
Exported directly	%	**259-261**		**265-268**
Exported indirectly through a distributor	%	**262-264**		**269-272**

Gross investment (first row) and the R&D variable (second row in the table) have been derived from Question 58 (NOTE: the Question is for 2004, while the survey was conducted in 2005)

Q.58	Could you please tell me how much did your firm spend in 2004 on each of the following:

	Local currency	USD (000's)	
New buildings, machinery and equipment			**1250-1256**
Research and development (including wages and salaries of R&D personnel, R&D materials, R&D related education and R&D training costs)			**1257-1263**
Advertising and marketing (including wages and salaries for in-house advertising & marketing personnel)			**1264-1270**

The dummy variable for firms which introduced new products or upgraded existing products or introduced new technology has been derived from Question 60.

Q.60	Has your company undertaken any of the following initiatives over the last 36 months? **INTERVIEWER: FOR EACH INITIATIVE ANSWERED "YES" ASK**: And how important in retrospect was this initiative for the survival and/or growth of your company over that period?

- **INTERVIEWER: SHOW CARD: 22**
- **Not important: 1, Slightly important: 2, Fairly important: 3, Very important: 4, Extremely important: 5, Don't know: 6**

	Undertaken			How important	
	Yes	No			
Developed successfully a major new product line/service	1	2	**1312**	1 2 3 4 5 6	**1320**
Upgraded an existing product line/service	1	2	**1313**	1 2 3 4 5 6	**1321**

2008/9 questionnaire:

Export intensity is derived from Question D3.

D.3	In fiscal year **2007**, what percent of this establishment's sales were: **SHOW CARD 6**

INTERVIEWER: THESE MUST BE ASKED IN THE ORDER THEY APPEAR ON THE TA

	Percent	
National sales	d3a %	IF 100, GO TO QUESTION D.30
Indirect exports (sold domestically to third party that exports products)	d3b %	IF 100, GO TO QUESTION D.8
Direct exports	d3c %	IF 0, GO TO QUESTION D.8
	100%	

INTERVIEWER: CHECK THAT TOTAL SUMS TO 100%

Gross investment is derived from Question K4.

K.4	In fiscal year **2007**, did this establishment purchase any fixed assets, such as machinery, vehicles, equipment, land or buildings?

Yes	1	
No	2	GO TO QUESTION K.6
Don't know (spontaneous)	-9	GO TO QUESTION K.6
		k4

The R&D variable has been derived from Question O3.

O.3	In fiscal year **2007**, did this establishment spend on research and development activities, either in-house or contracted with other companies (outsourced)?

Yes	1	
No	2	
Don't know (spontaneous)	-9	
		ECAo3

The dummy variable for firms which introduced new products or upgraded existing products or introduced new technology is derived from Question O1 and O13.

O.1	In the last three years, has this establishment introduced new products or services?

Yes	1	
No	2	GO TO QUESTION O.3
Don't know (spontaneous)	-9	GO TO QUESTION O.3
		ECAo1

O.13	In the last three years, has this establishment upgraded an existing product line or service?

Yes	1
No	2
Don't know (spontaneous)	**-9**

ECAo13

As a result of the contemporaneity of export intensity and the investment variables in the two surveys (2005 and 2008/09) and the absence of good instruments[1], we have changed our estimation strategy in the following ways.

- For 2008/09 and 2005, we have dropped the variables 'gross investment' and 'investment in R&D' from the cross section, pooled and the three-year panel samples to avoid the problem of potential endogeneity. However, for the 2002 sample, we have retained these variables as they refer to a previous period.
- For the non-imputed 2 year panel, we use the lagged values – i.e. those from the previous surveys - of the two investment variables for 2008/09 (taking the lagged values from the 2005 survey) and 2005 (taking the lagged values from the 2002 survey). Consequently, the panel becomes a 2-year panel. This is the strategy suggested by the Referee.

The referee has previously noted that we have more than one variable designed to capture the influence of technology/innovation. This, together with the inclusion of the 'gross investment' and 'investment in R&D' variables in our models estimated on the 2002 and two-year panel samples, as well as the consistency of the estimates of the effects of the other technology/innovation variables across our various estimated models, suggests that our estimates are not impaired by omitted variables.

We believe this strategy will respond to the Referee's question about endogeneity. In the revised paper, we have added a long footnote (no.11 on p.8) to explain these issues.

The three surveys are not consistent regarding the years or periods in which technology related variables are measured, thus causing confusion. We summarise the situation as follows.

i. In all three rounds, the definition of the dependent variable, the export intensity, refers to the year of the survey (2002, 2005 and 2008/09).
ii. In all three rounds, the variable for innovation activities - i.e., the introduction of new or upgraded products and processes - always refers to a period before the year of the survey (4 years before in 2002 and 3 years before in 2005 and 2008/09).
iii. Conversely, for the variables 'gross investment' and 'investment in R&D', the definition changed in each round of the survey. In 2002, the variables are recorded for the previous four years ('since 1998', Question Q.83); in 2005, the variables are recorded for '2004' (Question Q.85) (which might be the same year as the export intensity variable); and in 2008/09, the variable gross investment (question K.4) and investment in R&D (question O.3) refers to 2007 (the same year as the export intensity variable). Accordingly, these variables are excluded from the models

[1] Although one way of dealing with endogeneity is the use of instrumental variables, we emphasise that we have searched the questionnaires comprehensively in order to find suitable instruments. However, as is usually the case with survey data, no suitable instruments were found. This is a common problem also found by researchers using, for example, the Community Innovation Survey.

estimated on the 2005 and 2008/09 datasets, because they would be potentially endogenous by virtue of their definition.

The use of the variable indicating the introduction of new or upgraded products and processes (in all three surveys) and the variables 'gross investment' and 'investment in R&D' for 2002 do not cause any endogeneity problem; these will have some effect on export intensity in a later period, but the current value of export intensity cannot affect the previous values of these variables. In cases where these variables and export intensity are measured contemporaneously, the problem of endogeneity precludes using those variables in the estimation process.

Point 3. H3 is a mix of both Agglomeration economies and industry linkages of SMEs in transition countries which are hypothesized to affect the propensity and the intensity of export.

Ideally they should be split as those are oranges and apples. Different theoretical framework should be provided for both and not pooled together. H3 is too broad. The mechanism why industry links should impact export intensity is not explained. I have doubts that trade between SMEs and MNEs could be sold as productivity spillover which requires cooperation in knowledge transfer and research, other forms of cooperation rather than trade only. H3 is very confusing and it shows that the authors are mixing up different concepts.

Response: We recognize that it would be desirable to separate the two types of externalities from each other. Accordingly, we have divided Hypothesis 3 into 3a and 3b, explicitly relating each of the productivity-enhancing variables to one of these two hypotheses. Hypothesis 3a is concerned with 'agglomeration induced externalities' while Hypothesis 3b is concerned with 'externalities associated with industry, in particular vertical linkages'.

There is a wide body of literature on different types of agglomeration economies. Sometimes they arise from diversity: firms from different industries being located near each other and so better able to identify and exploit synergies – i.e. "Jacobs externalities"; and knowledge spillovers arising from the proximity of firms, universities and research institutions (i.e. "cluster" effects discussed by Krugman, Porter, etc.). Firms located in large urban areas are expected to benefit from these externalities. However, in our case, the data allows us only to identify firms in capital cities; however, this is the best available proxy to population centres. (This proxy is, for example, routinely used is gravity modeling of trade flows.) Hence, the variable most strongly related to Hypothesis 3a (agglomeration) is the capital city location. (Please also see p. 9 of the resubmitted paper.)

There is also ample evidence for the existence of spillovers to domestic firms arising from their vertical links to MNEs in host countries (Javorcik, 2004 is a good example). These spillovers arise from the learning effects of supplying a multinational firm, which imposes higher quality standards on its suppliers (as well as the improved quality of labour force, management and knowledge of the production processes and markets), and lead to productivity gains for domestic firms (please see also p.9 of the resubmitted paper). The same principle may also prevail when SMEs act as suppliers to large domestic firms. There is a literature on this and we wish to investigate it as a hypothesis in the context of transition. We feel this is a legitimate reason. Import intensity has similar effect: importing enables firms to learn about quality of similar products and intermediate goods, technology and markets, and thus improve their productivity. The variables most strongly, but not exclusively, related to industry linkages are sales to MNEs, sales to large domestic firms and import intensity.

As far as the measurement of these two different types of externalities is concerned (or the apples and oranges problem, in the Referee's words), we use different variables to indicate these two different types of externalities. To capture spillover effects arising from industry – especially vertical - links, we estimate the influence of sales to MNEs and large domestic firms as well as of import intensity. Within the framework of our multivariate model, the inclusion of these three variables should minimize the extent to which our capital city variable captures spillover effects arising from industry – especially vertical - links (Hypothesis 3b), thereby maximizing the extent to which the estimated capital city effect captures agglomeration economies (Hypothesis 3a).

Indeed, if we look at the results reported in the revised paper, we find a suggestive contrast between the capital city effect estimated from those samples in which the variables measuring vertical linkages are *absent* and the capital city effect estimated from those samples in which the vertical linkages effects are *present*:

- two of the samples in which the vertical linkages variables are absent (the three- and two year panel samples) yield a statistically significant capital city (*entres*) effect; and
- both samples in which the vertical linkages variables are present (the 2002 and 2005 samples) yield insignificant capital city effects.

This contrast suggests that when the capital city indicator is the only variable able to capture productivity-enhancing externalities, whether arising from agglomeration or vertical linkages, then it may captures all such effects. This is informative about such effects in general but cannot tell us anything about the origins of such effects. (It can tell us something about "fruit" but not whether we are dealing with "apples or oranges".) However, the 2002 and 2005 samples, which contain both the capital city effect and the three variables measuring industry – especially vertical - linkages effects, yield highly significant linkages effects of the anticipated sign but utterly insignificant capital city effects. Together, these results are consistent with Hypothesis 3b (that industry – especially vertical - linkages positively influence export behavior in TCs) but tend to refute Hypothesis 3a (that agglomeration effects associated with capital cities positively influence export behavior in TCs).

We have modified the paper in line with this discussion; please see pages 9-11 of the resubmitted paper.

Point 4. Whether hypothesis is rejected or not is not at all discussed in a result section.

In the discussion of results we have now made explicit reference to the hypotheses. Please see pages 27 and 28 of the resubmitted paper. The following are the relevant extracts.

> The hypothesised positive relationship between human resources and exporting – Hypothesis 1 - has been confirmed by the estimated effects of the education of the workforce (*ftwor_edu*),
>
> The hypothesised positive relationship between technological and innovation capabilities and exporting – Hypothesis 2 - has been confirmed by the consistently positive and significant coefficients on the dummy variable capturing whether or not the firm has "established new, upgraded a product line or introduced a new technology" in the recent past (*prli_tech*).
>
> Together, these results are consistent with Hypothesis 3b (that industry, - especially vertical - linkages positively influence export behavior in TCs) but tend to refute

> Hypothesis 3a (that agglomeration effects associated with capital cities positively influence export behavior in TCs).

Point 5. Authors indirectly acknowledge multicollinearity problem in a model and still do not provide the correlation table which will illustrate this. Although I appreciate a textbook example on Multicollinearity issues provided in the author's response I cannot agree it does not affect the final estimation. To many proxies are used to test the same hypothesis and therefore are likely to be multicollinear. As an option factor analysis could be used in this case which may resolve both endogeneity and multicollinearity problem, however I am not sure it is what authors have as their methodology approach.

Response:

For convenience, we also reproduce the Referee's previous comment on the issue of multicollinearity, to which we previously responded at length.

> First, correlation matrix is not presented. This is fine, however then in methodology the authors would be better off to explain why human related factors, technology related factors are pooled together. Are they are not multicollinear?? For instance firm having high education workforce will also invest more in training and the workers skills would be higher. Firms that invest in RandD are also expected to have higher new or upgraded products, technology level and finally gross investment. Same is true for productivity spillovers group. What made it possible pooling this explanatory variables together apart of omitted bias issue?

We now respond to the issue of multicollinearity:

First, we recognise that multicollinearity is a "tricky" issue for applied econometrics, because it is always present to some extent in non-experimental data and it is not amenable to formal testing procedures. Rather, researchers have to consider a variety of indicators in order to assess the seriousness of the problem. In our previous response, we referred to a number of indicators to argue that multicollinearity was not a substantial problem in any of our datasets and thus was not unduly influencing our results.

We now continue our previous response.

Following the Referee's suggestion, we present and interpret the correlation matrices for all samples used for estimation (the full set of correlation matrices are presented in Appendix 1 to this Response). Please note that the variables are not "pooled" in the usual statistical sense of this term. Rather, cognate variables are grouped together for presentational convenience, to relate particular variables to broader hypotheses, and to facilitate coherent interpretation.

The *largest* correlation coefficients among the variables of interest in the different samples are as follows.

In the 3-year panel and in the pooled samples:

- there is only one human capital variable and one productivity spillover variable, so there are no "within group" correlation coefficients;

- in the panel sample, among the three technology-related variables the largest correlation coefficient (*r*) is 0.2680 (the corresponding coefficient of determination (r^2) is 0.072);

- in the pooled sample, among the three technology-related variables the largest correlation coefficient (*r*) is 0.3047 (the corresponding coefficient of determination (r^2) is 0.093).

In the 2008/09 sample:

- there is only one human capital variable and one productivity spillover variable; and
- among the three technology-related variables, the largest correlation coefficient (*r*) is 0.2269 (the corresponding coefficient of determination (r^2) is 0.051).

In the 2005 sample:

- among the four human capital variables, the largest correlation coefficient (*r*) is 0.3440 (the corresponding coefficient of determination (r^2) is 0.118);

- among the three technology-related variables, the largest correlation coefficient (*r*) is 0.0833 (the corresponding coefficient of determination (r^2) is 0.007); and

- among the four productivity spillover variables, the largest correlation coefficient (*r*) is 0.1538 (the corresponding coefficient of determination (r^2) is 0.024).

In the 2002 sample:

- among the five human capital variables, the largest correlation coefficient (*r*) is 0.3857 (the corresponding coefficient of determination (r^2) is 0.149);

- among the four technology-related variables, the largest correlation coefficient (*r*) is 0.1928 (the corresponding coefficient of determination (r^2) is 0.037); and

- among the four productivity spillover variables, the largest correlation coefficient (*r*) is 0.1688 (the corresponding coefficient of determination (r^2) is 0.028).

In large samples, correlation coefficients can be statistically significant but not large enough to be important. This understanding is general in the social sciences. For example, Taylor (1990, p.37):

> Like all scale values, the correlation coefficient is difficult to interpret. Labelling systems exist to roughly categorize *r* values where correlation coefficients (in absolute value) which are ≤ 0.35 are generally considered to represent low or weak correlations, 0.36 to 0.67 modest or moderate correlations, and 0.68 to 1.0 strong or high correlations with *r* coefficients ≥ 0.90 very high correlations.

On these criteria, only one correlation coefficient across all of our samples, and across all categories of interest, can be characterised as a "modest or moderate" correlation; all the others – the largest in each category – are "low or weak correlations". According to custom and practice in applied economics, none of these correlation coefficients comes even close to levels suggesting the presence of serious multicollinearity.

In our previous response on the multicollinearity issue, we argued at length on the basis of our preferred criteria that multicollinearity was not a substantial problem in our estimates (i.e. not putting the validity of our estimates into question). On the Referee's preferred criterion of the correlation coefficients, we come to the same conclusion.

Accordingly, we have added the following note (no.21, p.15 of the resubmitted paper) to the Data Section:

> In addition to the usual descriptive statistics, we also examined the correlation matrix between our variables, paying particular attention to those related variables grouped together as "human capital", "technology" or productivity-enhancing "spillover" variables. On conventional criteria (Taylor, 1990, p.37), only one correlation coefficient across all of our samples, and across all categories of interest, can be characterised as a "modest or moderate" correlation (i.e. between 0.36 and 0.67); otherwise, the largest correlations in each category are all "low or weak" (i.e. ≤ 0.35).

In addition, our reported results do not suggest contamination from multicollinearity.

1. In our 3-Year panel estimates, both imputed and non-imputed, data constraints limit the estimates to one variable in each of the three categories at issue (human-related; technology-related, and productivity-enhancing "spillovers"); hence, multicollinearity effects are precluded *by definition*.

2. In our 2-Year panel estimates, both imputed and non-imputed, we are able to include two more technology-related variables. However, the inclusion of these does not fundamentally change the results for the "new or upgraded product/new technology" variable (*prli_tech*) in comparison to the estimates for the 3-Year panel (or, indeed, for the variables in the other categories of concern). Of course, we expect some change, because the sample is different.

3. For the pooled and the 2008/09 sample, data constraints limit the estimates to one variable in each of the three categories at issue (human-related; technology-related, and productivity-enhancing "spillovers"); hence, multicollinearity effects are precluded.

4. In the 2002 sample, both non-imputed and imputed, we specify the model with:

    a. five variables related to human capital, yet the estimated coefficient on the "education of the workforce" variable (*ftwor_edu*) is broadly consistent with the estimated coefficients from samples in which multicollinearity effects are precluded – i.e.

        i. both the pooled and the 2005 and 2008/09 samples, and

        ii. both the three-year and two-year panels;

    b. four variables related to technology, yet the estimated coefficient on the "new or upgraded product/new technology" variable (*prli_tech*) is consistent with (albeit somewhat larger than) the estimated coefficients from samples in which multicollinearity effects are precluded – i.e.

        i. for both the pooled and the 2005 and 2008/09 samples, and

        ii. in the three-year panels;

5. In all main respects, the comments on the 2002 sample apply also to the 2005 sample.

This is additional evidence that multicollinearity either is not present by definition or that our results do not display the telltale signs of serious multicollinearity (notably, dramatic differences with respect to sign and significance as well as size).

In sum, the evidence is not consistent with the suggestion that: “Too many proxies are used to test the same hypothesis and therefore are likely to be multicollinear.”

Reference:

TAYLOR, RICHARD (1990), Interpretation of the Correlation Coefficient: A Basic Review. *Journal of Diagnostic Medical Sonography*, Vol.6(1) (January/February) 35-39.

Finally, we respond to the following Comment by the Referee:

As an option factor analysis could be used in this case which may resolve both endogeneity and multicollinearity problem, however I am not sure it is what authors have as their methodology approach.

Response:

Factor analysis is not part of our empirical strategy. This is for two reasons: this approach is of limited values for a small number of potentially collinear variables; and the results of estimating statistical factors are difficult to interpret and so of reduced relevance for policy.

Point 6. Rather than claiming a contribution to a research practice by implementing a multiple imputation (contribution 3) I'd recommend to include a robustness check section which will explicitly explain MI as a robustness check approach.

We are happy to present the estimates from imputed datasets as robustness checks. To this end, changes have been made to the paper; please Section 3.3 - Robustness checking - handling missing data - on pages 17-18 of the resubmitted paper. This section concludes:

> For survey datasets with the typical characteristics displayed by BEEPS, we propose that results from imputed datasets should be taken to complement, rather than substitute for, the results from non-imputed datasets. Accordingly, the results from MI serve as a robustness check of the non-imputed results.

And in the Conclusion (p.31):

> Accordingly, we re-estimated each model on samples completed by imputed values. We propose this is a robustness check on our estimates in addition to estimating variant model specifications on six different samples (two- and three-year panels, and the three waves individually and pooled).

Point 7. Country dummies are not included. Including regional dummies authors claim there are no significant cultural differences, for instance within CIS countries, like Ukraine and Uzbekistan or Russia. Country dummies should be included and reported in the model and table. This will also demonstrate how much of export intensity is explained by the cultural and institutional factors in a country or / and the factors already captured by the model.

Response: As we acknowledge in the Introduction to this Response, we found this a most useful suggestion. The estimates now all include a full set of country dummies (omitting the country with the lowest export intensity as the reference category). The inclusion of country dummies has resulted in some modest efficiency gains but has not changed any substantive results or conclusions.

Point 8. Although authors claim their study covers all transition economies. To say so, a bar diagram should be provided for each country with the number of obs. Per each country for each year. Year dummies in this case will also help to identify the number of countries for which data is available. Its of high importance given the quality of BEEPS data, which contains many missing values.

Response: To provide the maximum information with the greatest clarity we have provided a table to this end (please see Appendix, table 5). Readers are signposted to this on p.15 of the resubmitted paper.

> (see Appendix Table 5 for a two-way table showing the countries and number of observations for each country in each round of the survey).

Point 9. We need to understand why these hypotheses are theoretically relevant for TCs and how this study advances our understanding in an important field. Relevant citations are missing while building the the "theory part" of the manuscript and a proper discussion of the hypotheses with citation, avoiding methodological description.

We have explained throughout the early part of the paper that we use a theoretical framework developed by Melitz and others but applies it to TCs by supplementing it with other hypotheses. We make the point that there is as yet insufficient evidence that the theory and corresponding hypotheses apply to TCs. For example on pages 4/5 of the resubmitted paper (a long footnote with supporting detail is omitted):

> Although there are many studies of internationalisation of firms' entrepreneurial activities, those relating to international activities of SMEs in transition are very scarce, and lagging well behind investigations linking SMEs with other developments in the economy, such as growth and employment:

Our contribution is to test whether these hypotheses can be applied to TCs. This point is made in several places in the paper. For example, on pages 3/4 of the resubmitted paper, we have pointed out:

> Although the core of our theoretical framework is based on the Melitz (2003) approach, it is augmented with a variety of supplementary hypotheses in order to allow for other

> influences that may be important in the transition process or derived from the empirical literature. Transition is a process whereby countries increasingly acquire the institutional and economic characteristics of market economies. In principle, we expect firms' export behaviour in TCs to be mainly and increasingly influenced by similar variables to those that influence firms' export behaviour in developed market economies. However, the study also draws on the literature in transition economics by including a number of variables to address transition specific influences and the institutional and cultural heterogeneity amongst transition countries: ownership variables (especially foreign ownership); capital city effects, which may be more important in TCs; and country dummies.

And on pages 5/6 of the resubmitted paper:

> If the latter holds true, then attempts to develop an approach to explain and predict firms' internationalisation process in the transition context, the subject of this study, are virtually non-existent. Yet, a transition country setting, according to Thai and Chong (2011), provides a unique backdrop characterized by distorted information, weak market structures, poorly specified property rights and institutional uncertainty, making existing explanations of firms' internationalisation process less convincing.

The additional hypotheses relating to human capital factors, technology factors and productivity-enhancing spillovers are particularly important to the transition process. The passage from central planning to market system requires a change and upgrading of human capital and investment in physical capital as well as technology. The technology spillovers resulting from FDI were crucial in speeding up the transition process in these countries. Although these factors are important in all countries, the transition process was heavily reliant on these factors. We are trying to test whether these expectations can be confirmed by the data or not.

Of course, in order to respond to the Referee's point and strengthen the "relevant citations … while building the "theory part" of the manuscript" we have added additional references in various parts of the text. For example, on p.6 of the resubmitted paper, we have (in gray shading):

> However, a stream of recent studies (Melitz, 2003; Melitz and Ottaviano, 2003; Bernard et al., 2003, Helpman et al. (2004); Arnold and Hussinger, 2005; Aw et al., 2007; Aw et al., 2008; among others) on firm heterogeneity and participation in international markets has provided a comprehensive framework for analysing factors influencing firms' decisions to internationalize.

Point 10. Finally, not all recommendations provided are considered, for instance controlling for cross-border trade and cooperation within Euroregions, which is relevant for TCs having long trade and cultural ties. There are more recommendations that remained untouched.

Response: For convenience, we also reproduce the Referee's previous comment on this issue, to which we previously responded.

> Is there something in TCs that could grow exporter from the start-up? I'd suggest including additional control if a firm is situated in so called Free Trade zones, which became very popular especially in CIS or "Euroregions" serving the same purpose in EU context to link a presence in this regions to the propensity of firms to export and to the

> intensity of exports. That would be indeed original, as authors may find policy for these areas are successful / not successful and would lead to policy implications on the other level.

We numbered this (from the second sentence on) as Point 4(e) and responded as follows:

The BEEPS database does not identify whether firms are located in a 'free trade zone' or not. So, unfortunately, it is not possible to pursue this point.

There seems to have been mutual misunderstanding on this point. We interpreted this recommendation as referring to the possible effect of special economic areas (variously called "free trade zones", "industrial zones", "business parks", etc) designed to promote business activity, including start-up activity. The above response was predicated on this understanding. However, in the light of the wording of the new Point 10 above, we assume that the recommendation refers to regional free-trade agreements (FTAs) such as CEFTA. The basic point made in our new response is that our strategy is to control for aggregate and macro-level effects rather than to estimate them. The following explains this distinction.

There is a huge literature devoted to the estimation of the effects of all types of trade and trade-related related agreements – customs unions, FTAs, etc – on cross-border trade. Typically, these estimates proceed by estimating a gravity model augmented with appropriate dummy (indicator) variables to identify the effects of the trade agreement(s) being investigated on aggregate bilateral trade or, less commonly, sectoral bilateral trade flows. The by-now standard approach is to use large panel datasets of bilateral trade flows and to estimate a fixed effects model, thereby allowing the fixed effects for the bilateral relationships to control for the myriad of unobserved/unobservable factors that potentially promote or retard trade. (On the estimation of this type of model, see Baldwin and Taglioni, 2007.)

Our study is of a different type. The empirical trade literature exploits the variation in large numbers of bilateral trade flows observed at annual intervals over many years (typically yielding thousands of observations) to estimate trade policy effects. In contrast, we exploit the variation in thousands of firm-level observations to estimate the effect of a range of micro determinants of firms' export behavior.

With only a small number of countries (N=25) and a very small number of periods (T=2 or 3) even our panel investigation is not designed to support the estimation of trade policy effects. We have argued above that multicollinearity is a sample-size issue; it is always present in non-experimental datasets but its effects typically attenuate with sample size. Accordingly, for our effects of interest, large samples minimize the effects of multicollinearity. However, were we to use our data to attempt estimation of trade policy effects, even a minimal specification would require country (country-group) dummies, period dummies, and country (country-group)-period dummies to model FTAs (and/or similar trade agreements) where the trade agreement comes into force during the period of the sample. However, in the context of our model and corresponding data, such a strategy would face two intractable problems; namely, observations on these variables are:

i. available only in small numbers, and are
ii. collinear with one another by construction.

These problems preclude the possibility of estimating FTA (etc) effects with any useful degree of precision. For this purpose, a different type of model would be necessary.

Similar considerations apply also to other macro-level influences on firms' export behaviour: business-cycle effects (e.g. output; employment; inflation); related policy differences (e.g. interest rates; fiscal stance); and national institutional differences. Firms' export behavior could be affected by changes in any of these variables either at home or in trading partners.

Although our firm-level investigation and modeling strategy is not the appropriate platform for estimating the effects of national-level influences – e.g. trade-agreements (including FTAs), macroeconomic developments (including policy) and institutional influences – *we do attempt to control for such influences*.

In our investigation, we do not attempt to estimate aggregate or macro-level effects that go beyond the purpose of our model and that are not supported by sufficient variation in the data. Instead, we control for such influences to address potential sources of omitted variables bias. In our estimates, trade policy and macroeconomic effects on firms' export behavior are controlled for by the time-invariant or fixed effects, which capture the combined influence of otherwise unmodelled systematic influences on the dependent variable.

- In our panel estimates, we control for firm-level effects, country effects and period effects. The three samples in our 3-year panel range over seven years; and over four years in our 2-year panel. The literature on trade policy effects recognizes anticipated (leading), current and lagged effects of trade agreements. Accordingly, even if a trade agreement was not in force for the whole of the sample period it is reasonable to think of its effect as sufficiently "slow-moving" to be modeled by one or more time invariant effects at firm and/or country level.

- In our cross-section estimates, we control for country effects.

The ability of fixed effects to capture the effects not only of time-invariant variables (such as geographical characteristics) but also of "slowly moving variables" is noted by Plümper and Troeger (2007, pp.126), who cite Beck (2001): " … although we can estimate (…) with slowly changing independent variables, the fixed effect will soak up most of the explanatory power of these slowly changing variables." This applies, in particular, to "politically relevant variables", which include trade agreements, macroeconomic policies and institutions.

Our panel estimates control for otherwise unmodelled systematic influences on the dependent variable at the firm level, which is the appropriate level for our investigation; in addition, the country dummies control for any remaining systematic influences that vary between countries; and the period dummies control for any remaining systematic influences that are common across all firms in the sample in a particular period. In the cross-section estimates, the country dummies control for otherwise unmodelled systematic influences on the dependent variable that occur in the period covered by the sample.

The firm-level fixed effects and the country fixed effects play a similar role with respect to otherwise unmodelled systematic influences on the dependent variable. This is demonstrated by comparison of the estimated country fixed effects:

- in the cross-section tobit estimates of the unconditional marginal effects, of the 201 reported country fixed effects, only three are *not* highly significant (most are significant at the one-percent level); in contrast,

- in the four sets of panel estimates (non-imputed and imputed 3-year and 2-year panels), of the 87 estimated country effects only two *are* significant.

This comparison suggests that although the validity of our panel estimates is safeguarded by multiple controls for otherwise unmodelled systematic effects – including trade policy (FTAs etc) and macroeconomic effects – the validity of our cross-section estimates is similarly safeguarded by controlling for country fixed effects.

We agree with Referee 2 that this is an important point. Because it is not discussed explicitly in the previous version of the paper, we propose to add the following (this appears at the end of Section 2, p.13 in the resubmitted paper).

The country dummies play an important role in our estimation strategy by controlling for influences that otherwise would be difficult to address (footnote 15).

Footnote 15:

Our firm-level investigation and modeling strategy is not the appropriate platform for estimating the effects of national-level influences on firms' export behavior such as free-trade agreements, macroeconomic developments (including policy) and institutional influences. Even a minimal specification to this end would require country (country-group) dummies, period dummies, and country (country-group)-period dummies to model political developments such as regional free-trade associations (especially where such developments come into force during the period of the sample). However, observations on these variables are available only in small numbers (there are 25 countries in our panel samples) and would be collinear with one another by construction, thereby precluding estimation with any useful degree of precision. Instead, we attempt to control for such influences in order to address potential sources of omitted variables bias. Here, our strategy rests on the ability of the firm-level fixed (i.e. time invariant or constant) effects in our model (see Section 3.1 below) to capture the influence not only of time-invariant variables (such as geographical characteristics) but also of "slowly moving variables". Here we follow Plümper and Troeger (2007, pp.126), who cite Beck (2001): " … although we can estimate (…) with slowly changing independent variables, the fixed effect will soak up most of the explanatory power of these slowly changing variables." This applies, in particular, to "politically relevant variables" such as trade agreements, macroeconomic policies and institutions. Even if such variables were not formally in force for the whole of the sample period, anticipated (leading), current and lagged effects – recognised, for example, in the literatures on trade agreements and macroeconomic policy – suggest that it is reasonable to think of their effects as sufficiently "slow-moving" over the sample period to be aggregated by time invariant effects at firm and/or country level. Accordingly, our panel estimates control for otherwise unmodelled systematic influences on the dependent variable at the firm level, which is the appropriate level for our investigation; in addition, country dummies control for any remaining systematic influences that vary between countries; and period dummies control for any remaining systematic influences that are common across all firms in the sample in a particular period. In the cross-section estimates, the country dummies control for otherwise unmodelled systematic influences on the dependent variable that occur in the period covered by the sample.

References:

Baldwin, R and D. Taglioni, 2007. "Trade Effects of the Euro: A Comparison of Estimators," *Journal of Economic Integration*, 22(4), pp. 780-818.

Beck, Nathaniel/ Katz, Jonathan N. (2001): Throwing Out the Baby with the Bath Water: A Comment on Green, Kim, and Yoon, International Organization 55:2, 487-495.

Plümper, T. and Troeger, V. (2007). Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects, *Political Analysis* 15:124–139.

Finally, we respond to the following comment:
"There are more recommendations that remained untouched."

Response: We have compared the text of the original comments with the text reproduced in our previous response. In this document, we numbered the points to ensure a comprehensive and coherent response. To this end, the Referee's text was reproduced exactly (nothing was omitted). We cannot find any recommendations to which we did not respond.

In this document, we have reproduced the Referees' comments in entirety and responded to each one. For completion, we reproduce the Referees' final sentence. However, this raises no specific issues requiring a response. We appreciate the Referees' advice to date as well as his/her best wishes.

Due to these fundamental theoretical and methodological issues I refrain from further commenting the results and the implications. I hope that you find these comments useful to further improve the paper. I wish you good luck with your research.

<u>Response to Additional Request on imputation syntax by the Referee</u>

The imputation syntax is presented in Appendix 2.

Appendix 1: Correlation matrixes

3-year panel

```
corr ftwor_edu d_gros_inv d_inv_rd prli_tech entres lag_lnsize entact foreign soe credit cis see d_2002 d_2005
(obs=403)
```

	ftwor_~u	d_gros~v	d_inv_rd	prli_t~h	entres	lag_ln~e	entact	foreign	soe	credit	cis
ftwor_edu	1.0000										
d_gros_inv	-0.1475	1.0000									
d_inv_rd	0.0115	0.2196	1.0000								
prli_tech	-0.0631	0.2680	0.2294	1.0000							
entres	0.2725	-0.0023	-0.0098	0.0246	1.0000						
lag_lnsize	-0.0610	0.1435	0.2388	0.3062	-0.0138	1.0000					
entact	-0.1334	0.1705	0.2070	0.2773	0.0130	0.3323	1.0000				
foreign	0.1690	0.0721	0.0389	0.0995	0.0709	0.2403	0.2596	1.0000			
soe	0.0804	-0.0207	0.0155	-0.0008	0.0259	0.1756	-0.0299	-0.0626	1.0000		
credit	-0.1036	0.0997	0.2145	0.1274	-0.0610	0.1366	0.0187	-0.0453	-0.0696	1.0000	
cis	0.2594	-0.1475	-0.0801	-0.0249	0.0512	0.1066	0.0834	-0.0027	0.1112	-0.1867	1.0000
see	-0.0318	-0.0001	-0.0659	0.0408	-0.0890	-0.1674	-0.0529	-0.0699	-0.0671	-0.0295	**-0.4723**
d_2002	0.1586	0.1190	**0.5133**	0.0281	0.0776	0.0567	0.0617	0.0241	0.0684	0.0713	0.0439
d_2005	0.0353	-0.3044	-0.4474	-0.2546	0.0106	-0.1149	-0.0737	-0.0332	0.0330	0.0016	0.0207

	see	d_2002	d_2005
see	1.0000		
d_2002	-0.1235	1.0000	
d_2005	0.0519	**-0.4622**	1.0000

Pooled sample

```
. corr ftwor_edu d_gros_inv d_inv_rd prli_tech entres lag_lnsize lag_lnsizesq lnage entact foreign soe credit cis see
d_2002 d_2005
(obs=11582)
```

	ftwor_~u	d_gros~v	d_inv_rd	prli_t~h	entres	lag_ln~e	lag_ln~q	lnage	entact	foreign	soe
ftwor_edu	1.0000										
d_gros_inv	0.0113	1.0000									
d_inv_rd	0.0801	0.3047	1.0000								
prli_tech	0.0325	0.2058	0.1995	1.0000							
entres	0.2345	0.0232	0.0403	0.0327	1.0000						
lag_lnsize	-0.1288	0.1543	0.1573	0.1184	-0.0113	1.0000					
lag_lnsizesq	-0.1262	0.1493	0.1545	0.1003	-0.0168	0.9718	1.0000				
lnage	-0.1490	0.0042	0.0056	0.0498	-0.0583	0.3757	**0.3681**	1.0000			
entact	-0.1007	0.0310	0.1172	0.0922	-0.0832	0.1936	0.1822	0.0456	1.0000		
foreign	0.1100	0.0746	0.0870	0.0308	0.1151	0.1325	0.1346	-0.0803	0.0320	1.0000	
soe	0.0375	-0.0065	0.0475	-0.0568	-0.0070	0.1540	0.1643	0.1899	-0.0037	-0.0620	1.0000
credit	-0.0722	0.2092	0.1108	0.1165	-0.0478	0.1766	0.1705	0.0555	0.0217	0.0216	-0.0580
cis	0.2897	-0.1413	-0.0589	0.0066	0.0073	0.0692	0.0484	-0.1159	0.0995	-0.0450	0.0099
see	-0.1710	0.0363	0.0690	0.0472	0.0432	-0.0228	-0.0217	0.0903	-0.0601	0.0012	-0.0261
d_2002	0.1582	0.2624	**0.4926**	0.0166	0.0516	-0.0075	-0.0022	-0.1551	0.0753	0.0974	0.1280
d_2005	0.0399	-0.1221	-0.2788	-0.1962	0.0055	-0.1834	-0.1439	-0.0892	0.0121	0.0062	0.0887

	credit	cis	see	d_2002	d_2005
credit	1.0000				
cis	-0.1568	1.0000			
see	0.0926	**-0.5299**	1.0000		
d_2002	0.0105	0.0088	-0.0827	1.0000	
d_2005	-0.0503	-0.0665	-0.0325	-0.2653	1.0000

2008/9 sample

```
corr ftwor_edu d_gros_inv d_inv_rd prli_tech entres lag_lnsize lag_lnsizesq lnage entact foreign soe own_conc credit
cis see
(obs=6124)
```

	ftwor_~u	d_gros~v	d_inv_rd	prli_t~h	entres	lag_ln~e	lag_ln~q	lnage	entact	foreign	soe
ftwor_edu	1.0000										
d_gros_inv	-0.0169	1.0000									
d_inv_rd	0.0396	0.2199	1.0000								
prli_tech	0.0561	0.1939	0.2269	1.0000							
entres	0.2314	0.0259	0.0494	0.0512	1.0000						
lag_lnsize	-0.1020	0.1723	0.1387	0.0162	-0.0217	1.0000					
lag_lnsizesq	-0.0959	0.1698	0.1403	0.0131	-0.0194	0.9787	1.0000				
lnage	-0.1298	0.0458	0.0796	0.0350	-0.0577	0.3200	**0.3137**	1.0000			
entact	-0.0363	-0.0322	0.0722	0.0250	-0.0886	0.1190	0.1092	0.0201	1.0000		
foreign	0.0440	0.0806	0.0429	0.0326	0.1133	0.1536	0.1606	-0.0160	0.0453	1.0000	
soe	-0.0038	-0.0195	-0.0151	-0.0261	-0.0496	0.0884	0.0937	0.0898	-0.0134	-0.0233	1.0000
own_conc	-0.0344	-0.0498	-0.0630	-0.0342	0.0282	-0.1909	-0.1851	-0.1468	-0.0435	0.0203	-0.0409
credit	-0.0807	0.2621	0.1314	0.1082	-0.0354	0.1535	0.1549	0.0637	-0.0373	0.0217	-0.0151
cis	**0.3715**	-0.1629	-0.1220	-0.0252	0.0255	0.0110	0.0044	-0.1301	0.1422	-0.0886	0.0726
see	-0.2287	0.0847	0.1447	-0.0104	0.0679	-0.0573	-0.0501	0.0699	-0.1014	0.0134	-0.0379

	own_conc	credit	cis	see
own_conc	1.0000			
credit	-0.0216	1.0000		
cis	-0.0585	-0.2153	1.0000	
see	0.1025	0.1305	**-0.6094**	1.0000

2005 sample

```
corr ftwor_edu training skilled org_str gros_inv inv_rd prli_tech entres mne_sal large_sal impint lag_lnsize lag_lnsizesq lnage entact
foreign soe credit bus_assoc cap_util_1 cis see
(obs=3140)
```

	ftwor_~u	training	skilled	org_str	gros_inv	inv_rd	prli_t~h	entres	mne_sal	large_~l	impint
ftwor_edu	1.0000										
training	0.0548	1.0000									
skilled	**-0.3440**	0.0411	1.0000								
org_str	0.1243	0.1809	-0.0731	1.0000							
gros_inv	0.0230	0.0067	-0.0099	0.0096	1.0000						
inv_rd	0.0501	0.0528	-0.0354	0.0588	0.0137	1.0000					
prli_tech	0.1100	0.2151	-0.0052	0.2489	0.0833	0.0762	1.0000				
entres	0.2346	0.0690	-0.1201	0.0990	-0.0257	0.0037	0.0434	1.0000			
mne_sal	0.0511	0.1138	-0.0116	0.0709	0.0526	0.0541	0.0652	0.0802	1.0000		
large_sal	0.0824	0.1682	-0.0465	0.1138	0.0110	0.0422	0.0958	0.0741	0.0403	1.0000	
impint	0.1605	0.1298	-0.0870	0.1324	-0.0250	0.0154	0.1940	0.1538	0.0628	0.1199	1.0000
lag_lnsize	-0.0429	0.2248	0.0226	0.2096	-0.1179	0.0448	0.1381	0.0244	0.0673	0.1583	0.0021
lag_lnsizesq	-0.0637	0.2175	0.0368	0.1903	-0.1063	0.0388	0.1228	0.0066	0.0632	0.1541	-0.0076
lnage	-0.0612	0.1492	0.0161	0.0432	-0.0745	0.0173	-0.0025	-0.0319	0.0194	0.0574	-0.0452
entact	-0.1400	0.0835	0.1300	0.0521	-0.0023	0.0460	0.1514	-0.0556	0.0282	0.1546	0.0025
foreign	0.1183	0.0825	-0.0712	0.0616	-0.0200	0.0197	0.0515	0.0946	0.1627	0.1272	0.1778
soe	0.0228	0.0430	-0.0150	0.0387	-0.0559	0.0014	-0.0399	-0.0118	-0.0148	-0.0323	-0.0865
credit	-0.0190	0.1214	-0.0502	0.1399	0.0407	0.0031	0.1071	-0.0552	0.0705	0.0967	0.1555
bus_assoc	0.0319	0.2095	-0.0225	0.1300	0.0005	0.0249	0.0957	0.0644	0.0815	0.1215	0.1154
cap_util_1	-0.0445	-0.0998	0.0396	-0.1928	-0.0194	-0.0338	-0.1550	-0.0427	-0.0657	-0.0426	-0.0720
cis	0.2323	-0.1714	-0.1104	0.0629	-0.0300	0.0021	0.0372	-0.0166	-0.1010	-0.0927	-0.0793
see	-0.0908	0.0036	0.0066	0.0229	-0.0111	0.0113	0.0913	0.0424	0.0365	0.0003	0.1354

	lag_ln~e	lag_ln~q	lnage	entact	foreign	soe	credit	bus_as~c	cap_ut~1	cis	see
lag_lnsize	1.0000										
lag_lnsizesq	**0.9672**	1.0000									
lnage	**0.4131**	**0.4203**	1.0000								
entact	0.2681	0.2555	0.0800	1.0000							
foreign	0.1514	0.1440	-0.0608	0.0033	1.0000						
soe	0.2593	0.2718	0.3098	-0.0011	-0.0821	1.0000					
credit	0.1978	0.1864	0.0544	0.0746	0.0342	-0.0592	1.0000				
bus_assoc	0.2259	0.2204	0.1993	0.0486	0.0650	0.0233	0.2186	1.0000			
cap_util_1	-0.0589	-0.0603	-0.0388	-0.0795	-0.0365	-0.0249	-0.0879	-0.0723	1.0000		
cis	0.1142	0.0856	-0.1421	0.0370	0.0017	0.0017	-0.0896	-0.2568	-0.0742	1.0000	
see	-0.0128	-0.0083	0.0770	0.0176	0.0001	0.0163	0.0390	0.2266	-0.0089	**-0.4621**	1.0000

2002 sample

```
. use "/Users/petritgashi/Research/SBEJ research/Final_SBEJ_5th submission_Dec2012/BEEPS_operate/2002_final_05May 2012.dta"

. corr ftwor_edu training skilled org_str ceo_edu gros_inv inv_rd prli_tech tech entres mne_sal large_sal impint lag_lnsize
lag_lnsizesq lnage entact foreign soe credit bus_assoc mark_share cap_util_1 cis see
(obs=1238)
```

	ftwor_~u	training	skilled	org_str	ceo_edu	gros_inv	inv_rd	prli_t~h	tech	entres	mne_sal	large_~l
ftwor_edu	1.0000											
training	-0.0009	1.0000										
skilled	**-0.3857**	0.0463	1.0000									
org_str	0.0468	0.1785	-0.0323	1.0000								
ceo_edu	0.3135	0.0821	-0.0825	0.0893	1.0000							
gros_inv	-0.0225	0.0251	0.0508	0.0619	-0.0377	1.0000						
inv_rd	0.0703	-0.0369	0.0452	0.0489	-0.0002	0.1928	1.0000					
prli_tech	-0.0437	0.1882	0.1219	0.1980	0.0658	0.1173	0.1247	1.0000				
tech	0.0500	0.1148	-0.0182	0.0767	0.0146	-0.0292	0.0413	0.1070	1.0000			
entres	0.2082	-0.0027	-0.1223	-0.0027	0.0653	-0.0639	-0.0442	0.0032	0.0044	1.0000		
mne_sal	0.0835	0.0732	-0.0009	0.0792	0.1092	-0.0504	-0.0412	0.0169	0.0378	0.1060	1.0000	
large_sal	0.0292	0.1585	-0.0211	0.0505	0.0685	-0.0014	0.0127	0.1287	0.0524	-0.0292	-0.0322	1.0000
impint	0.1958	0.1663	-0.0824	0.0642	0.0601	-0.0204	-0.0452	0.0861	0.0760	0.1688	0.0290	0.1212
lag_lnsize	-0.1712	0.1796	0.2316	0.1601	0.2881	-0.0079	0.0131	0.1486	0.0000	-0.0287	0.0916	0.1133
lag_lnsizesq	-0.1878	0.1727	0.2175	0.1499	0.2659	-0.0124	0.0029	0.1498	-0.0011	-0.0313	0.0859	0.0976
lnage	-0.1707	0.1086	0.1270	-0.0084	0.1090	0.0266	0.0292	0.0529	-0.0702	-0.0675	-0.0075	0.0268
entact	-0.2510	0.0439	**0.3267**	0.0525	0.0469	0.0144	0.0814	0.1943	-0.0052	-0.1251	0.0121	0.1843
foreign	0.1956	0.0731	-0.0860	0.0885	0.1540	-0.0384	-0.0300	0.0195	0.0738	0.1216	0.2425	0.0831
soe	0.0099	0.0582	0.0003	0.0207	0.0775	-0.0270	0.0403	-0.0129	-0.0746	-0.0049	-0.0550	-0.0837
credit	-0.1278	0.1136	0.0430	0.0266	0.0084	-0.0509	-0.0753	0.0823	0.0078	-0.1010	0.0130	0.0904
bus_assoc	-0.0339	0.1955	0.0132	0.1242	0.0731	0.0075	-0.0195	0.1396	0.0292	0.0113	0.0368	0.1548
mark_share	0.0060	0.1416	-0.0217	0.0684	0.0748	-0.0205	-0.0160	0.1282	0.0488	0.1692	0.0948	0.1584
cap_util_1	-0.0039	-0.0544	0.0133	-0.1959	-0.0682	-0.0534	-0.0333	-0.0814	0.0679	-0.0164	0.0655	-0.0232
cis	0.2908	-0.1647	-0.0756	0.1243	0.2404	-0.0295	0.0966	-0.0537	-0.0494	0.0166	-0.0300	-0.1102
see	-0.0880	-0.0340	0.0399	0.0354	-0.0869	0.0556	0.0881	0.1116	0.0059	-0.0274	0.0057	0.0086

	impint	lag_ln~e	lag_ln~q	lnage	entact	foreign	soe	credit	bus_as~c	mark_s~e	cap_ut~1	cis
impint	1.0000											
lag_lnsize	-0.0590	1.0000										
lag_lnsizesq	-0.0653	**0.9729**	1.0000									
lnage	-0.0903	**0.4038**	**0.4049**	1.0000								

entact	-0.0920	**0.3133**	0.2965	0.1608	1.0000							
foreign	0.2049	0.1027	0.0932	-0.1426	-0.0282	1.0000						
soe	-0.1111	0.2127	0.2294	**0.3333**	-0.0500	-0.1415	1.0000					
credit	0.0717	0.1595	0.1503	0.0315	0.1099	-0.0145	-0.1099	1.0000				
bus_assoc	0.1074	0.1780	0.1821	0.1329	0.0311	0.1328	-0.0278	0.2081	1.000			
mark_share	0.1425	0.1714	0.1762	0.0934	0.0547	0.1212	0.0666	0.0873	0.1690	1.0000		
cap_util_1	-0.0195	-0.0860	-0.0825	-0.0617	-0.1268	-0.0080	-0.0092	-0.0431	-0.0447	-0.0122	1.0000	
cis	-0.0842	0.0575	0.0273	-0.0879	0.0705	-0.0091	0.0176	-0.1678	-0.2880	-0.1395	-0.1625	1.0000
see	0.0700	-0.0078	0.0033	0.0852	0.0043	0.0005	-0.0288	0.0176	0.1840	0.0970	0.0631	**-0.4032**

	see
see	1.0000

Appendix 2: Imputation syntax

3-year panel sample

```
use "/Users/petritgashi/Desktop/Final_SBEJ_3rd submission_May2012/BEEPS DBs for
3rd submission/BEEPS_operate/panel_final_05May2012.dta"


keep expint ftwor_edu d_gros_inv d_inv_rd prli_tech lag_lnsize lag_lnsizesq
entres foreign soe entact own_conc credit ceb cis see d_2002 d_2005 d_2009
country panelid  year


sum expint ftwor_edu d_gros_inv d_inv_rd prli_tech lag_lnsize lag_lnsizesq
entres foreign soe entact own_conc credit ceb cis see d_2002 d_2005 d_2009
country panelid  year

reshape wide expint ftwor_edu d_gros_inv d_inv_rd prli_tech lag_lnsize
lag_lnsizesq entres foreign soe entact own_conc credit ceb cis see d_2002
d_2005 d_2009 country, i(panelid) j(year)

ice  soe2002 d_20022002 d_20052002 d_20092002 ceb2002 cis2002 see2002
entact2002 entres2002 own_conc2002 foreign2002 expint2002 d_inv_rd2002
prli_tech2002 d_gros_inv2002 credit2002 ftwor_edu2002 lag_lnsize2002
lag_lnsizesq2002 soe2005 d_20022005 d_20052005 d_20092005 ceb2005 cis2005
see2005 entact2005 entres2005 own_conc2005 foreign2005 expint2005 d_inv_rd2005
prli_tech2005 d_gros_inv2005 credit2005 ftwor_edu2005 lag_lnsize2005
lag_lnsizesq2005 soe2009 d_20022009 d_20052009 d_20092009 ceb2009 cis2009
see2009 entact2009 entres2009 own_conc2009 foreign2009 expint2009 d_inv_rd2009
prli_tech2009 d_gros_inv2009 credit2009 ftwor_edu2009 lag_lnsize2009
lag_lnsizesq2009, m(20) match boot (soe2002 soe2005 soe2009 expint2002
expint2005 expint2009 ftwor_edu2002 ftwor_edu2005 ftwor_edu2009 own_conc2002
own_conc2005 own_conc2009 foreign2002 foreign2005 foreign2009)
passive(lag_lnsizesq2002: lag_lnsize2002*lag_lnsize2002 \lag_lnsizesq2005:
lag_lnsize2005*lag_lnsize2005 \lag_lnsizesq2009: lag_lnsize2009*lag_lnsize2009)
eq(d_gros_inv2002: soe2002 expint2009 lag_lnsize2002 ftwor_edu2009 foreign2009,
d_gros_inv2005: soe2005 expint2002 lag_lnsize2005 ftwor_edu2005 foreign2005,
d_gros_inv2009: soe2009 expint2005 lag_lnsize2009 ftwor_edu2002 foreign2002,
d_inv_rd2005: soe2002 expint2009 lag_lnsize2002 ftwor_edu2009 foreign2009,
d_inv_rd2009: soe2005 expint2002 lag_lnsize2005 ftwor_edu2005 foreign2005,
d_inv_rd2002: soe2009 expint2005 lag_lnsize2009 ftwor_edu2002 foreign2002)
dryrun


ice  soe2002 d_20022002 d_20052002 d_20092002 ceb2002 cis2002 see2002
entact2002 entres2002 own_conc2002 foreign2002 expint2002 d_inv_rd2002
prli_tech2002 d_gros_inv2002 credit2002 ftwor_edu2002 lag_lnsize2002
lag_lnsizesq2002 soe2005 d_20022005 d_20052005 d_20092005 ceb2005 cis2005
see2005 entact2005 entres2005 own_conc2005 foreign2005 expint2005 d_inv_rd2005
prli_tech2005 d_gros_inv2005 credit2005 ftwor_edu2005 lag_lnsize2005
lag_lnsizesq2005 soe2009 d_20022009 d_20052009 d_20092009 ceb2009 cis2009
see2009 entact2009 entres2009 own_conc2009 foreign2009 expint2009 d_inv_rd2009
prli_tech2009 d_gros_inv2009 credit2009 ftwor_edu2009 lag_lnsize2009
lag_lnsizesq2009, m(20) match boot (soe2002 soe2005 soe2009 expint2002
expint2005 expint2009 ftwor_edu2002 ftwor_edu2005 ftwor_edu2009 own_conc2002
own_conc2005 own_conc2009 foreign2002 foreign2005 foreign2009)
passive(lag_lnsizesq2002: lag_lnsize2002*lag_lnsize2002 \lag_lnsizesq2005:
lag_lnsize2005*lag_lnsize2005 \lag_lnsizesq2009: lag_lnsize2009*lag_lnsize2009)
eq(d_gros_inv2002: soe2002 expint2009 lag_lnsize2002 ftwor_edu2009 foreign2009,
d_gros_inv2005: soe2005 expint2002 lag_lnsize2005 ftwor_edu2005 foreign2005,
```

```
d_gros_inv2009: soe2009 expint2005 lag_lnsize2009 ftwor_edu2002 foreign2002,
d_inv_rd2005: soe2002 expint2009 lag_lnsize2002 ftwor_edu2009 foreign2009,
d_inv_rd2009: soe2005 expint2002 lag_lnsize2005 ftwor_edu2005 foreign2005,
d_inv_rd2002: soe2009 expint2005 lag_lnsize2009 ftwor_edu2002 foreign2002)
saving(imp_panel_final_05May2012)

tab _mj

drop if _mj==0

reshape long expint ftwor_edu d_gros_inv d_inv_rd prli_tech lag_lnsize
lag_lnsizesq entres foreign soe entact own_conc credit ceb cis see d_2002
d_2005 d_2009 country, i(panelid _mj)

rename _j year
```

2002 sample

```
. use "C:\Documents and Settings\Petrit
Gashi\Desktop\Regressions\2002\2002_final.dta", clear

. ice expint  ftwor_edu training skilled ceo_edu org_str ceo_cha ceo_in
gros_inv inv_rd prli_tech tech lnsize lnsizesq lnage lnagesq  impint entres
foreign_ soe entact own_conc  mark_share   mne_sal large_sal bus_assoc credit
cap_util  see cis  reinvest_prof, boot m(20) match( expint ftwor_edu skilled
gros_inv inv_rd impint  mne_sal large_sal own_conc) saving(imp_2002_final)

   #missing |
     values |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      1,173       20.28       20.28
          1 |      2,158       37.30       57.58
          2 |      1,580       27.31       84.89
          3 |        543        9.39       94.28
          4 |        209        3.61       97.89
          5 |         75        1.30       99.19
          6 |         28        0.48       99.67
          7 |         12        0.21       99.88
          8 |          2        0.03       99.91
          9 |          1        0.02       99.93
         10 |          1        0.02       99.95
         11 |          2        0.03       99.98
         12 |          1        0.02      100.00
------------+-----------------------------------
      Total |      5,785      100.00

   Variable | Command | Prediction equation
------------+---------+-------------------------------------------------------
     lnsize |         | [No missing data in estimation sample]
   lnsizesq |         | [No missing data in estimation sample]
      lnage |         | [No missing data in estimation sample]
    lnagesq |         | [No missing data in estimation sample]
     entres |         | [No missing data in estimation sample]
   foreign_ |         | [No missing data in estimation sample]
        soe |         | [No missing data in estimation sample]
     entact |         | [No missing data in estimation sample]
  bus_assoc |         | [No missing data in estimation sample]
        see |         | [No missing data in estimation sample]
        cis |         | [No missing data in estimation sample]
     credit | logit   | expint ftwor_edu training skilled ceo_edu org_str
```

```
            |          | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |          | lnsizesq lnage lnagesq impint entres foreign_ soe
            |          | entact own_conc mark_share mne_sal large_sal bus_assoc
            |          | cap_util see cis reinvest_prof
    ceo_cha | logit    | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
     expint | regress  | ftwor_edu training skilled ceo_edu org_str ceo_cha
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
  prli_tech | logit    | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_cha ceo_in gros_inv inv_rd tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
    ceo_edu | logit    | expint ftwor_edu training skilled org_str ceo_cha
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
    skilled | regress  | expint ftwor_edu training ceo_edu org_str ceo_cha
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
    org_str | logit    | expint ftwor_edu training skilled ceo_edu ceo_cha
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
     ceo_in | logit    | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_cha gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
  ftwor_edu | regress  | expint training skilled ceo_edu org_str ceo_cha ceo_in
            |          | gros_inv inv_rd prli_tech tech lnsize lnsizesq lnage
            |          | lnagesq impint entres foreign_ soe entact own_conc
            |          | mark_share mne_sal large_sal bus_assoc credit cap_util
            |          | see cis reinvest_prof
   training | logit    | expint ftwor_edu skilled ceo_edu org_str ceo_cha
            |          | ceo_in gros_inv inv_rd prli_tech tech lnsize lnsizesq
            |          | lnage lnagesq impint entres foreign_ soe entact
            |          | own_conc mark_share mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
   cap_util | regress  | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |          | lnsizesq lnage lnagesq impint entres foreign_ soe
            |          | entact own_conc mark_share mne_sal large_sal bus_assoc
            |          | credit see cis reinvest_prof
 mark_share | logit    | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |          | lnsizesq lnage lnagesq impint entres foreign_ soe
            |          | entact own_conc mne_sal large_sal bus_assoc credit
            |          | cap_util see cis reinvest_prof
    mne_sal | regress  | expint ftwor_edu training skilled ceo_edu org_str
            |          | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |          | lnsizesq lnage lnagesq impint entres foreign_ soe
            |          | entact own_conc mark_share large_sal bus_assoc credit
```

```
            |           | cap_util see cis reinvest_prof
  large_sal | regress | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |           | lnsizesq lnage lnagesq impint entres foreign_ soe
            |           | entact own_conc mark_share mne_sal bus_assoc credit
            |           | cap_util see cis reinvest_prof
reinvest_~f | logit     | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |           | lnsizesq lnage lnagesq impint entres foreign_ soe
            |           | entact own_conc mark_share mne_sal large_sal bus_assoc
            |           | credit cap_util see cis
     impint | regress | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |           | lnsizesq lnage lnagesq entres foreign_ soe entact
            |           | own_conc mark_share mne_sal large_sal bus_assoc credit
            |           | cap_util see cis reinvest_prof
       tech | logit     | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv inv_rd prli_tech lnsize
            |           | lnsizesq lnage lnagesq impint entres foreign_ soe
            |           | entact own_conc mark_share mne_sal large_sal bus_assoc
            |           | credit cap_util see cis reinvest_prof
   own_conc | regress | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv inv_rd prli_tech tech lnsize
            |           | lnsizesq lnage lnagesq impint entres foreign_ soe
            |           | entact mark_share mne_sal large_sal bus_assoc credit
            |           | cap_util see cis reinvest_prof
   gros_inv | regress | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in inv_rd prli_tech tech lnsize lnsizesq
            |           | lnage lnagesq impint entres foreign_ soe entact
            |           | own_conc mark_share mne_sal large_sal bus_assoc credit
            |           | cap_util see cis reinvest_prof
     inv_rd | regress | expint ftwor_edu training skilled ceo_edu org_str
            |           | ceo_cha ceo_in gros_inv prli_tech tech lnsize lnsizesq
            |           | lnage lnagesq impint entres foreign_ soe entact
            |           | own_conc mark_share mne_sal large_sal bus_assoc credit
            |           | cap_util see cis reinvest_prof
-------------------------------------------------------------------------------

Imputing
..........1..........2..........3..........4..........5..........6..........7..
........8..........9..........10..........11..........12..........13..........1
4..........15..........16..........17..........18..........19..........20
file imp_2002_final.dta saved
```

2005 sample

```
. ice  expint ftwor_edu training skilled org_str gros_inv inv_rd prli_tech
lnsize lnsizesq entres foreign soe entact credit impint  mne_sal large_sal
own_conc bus_assoc  cap_util  age  agesq expage expagesq  d_reinvest_prof  ceb
cis see, dryrun

   #missing |
     values |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      3,826       57.23       57.23
          1 |        603        9.02       66.25
          2 |      1,579       23.62       89.87
          3 |        387        5.79       95.66
          4 |        189        2.83       98.49
```

```
          5 |         61        0.91       99.40
          6 |         27        0.40       99.81
          7 |          6        0.09       99.90
          8 |          1        0.01       99.91
          9 |          4        0.06       99.97
         11 |          1        0.01       99.99
         13 |          1        0.01      100.00
------------+-----------------------------------
      Total |      6,685      100.00

   Variable | Command | Prediction equation
------------+---------+------------------------------------------------------
  prli_tech |         | [No missing data in estimation sample]
     lnsize |         | [No missing data in estimation sample]
   lnsizesq |         | [No missing data in estimation sample]
     entres |         | [No missing data in estimation sample]
    foreign |         | [No missing data in estimation sample]
        soe |         | [No missing data in estimation sample]
     entact |         | [No missing data in estimation sample]
     credit |         | [No missing data in estimation sample]
  bus_assoc |         | [No missing data in estimation sample]
        ceb |         | [No missing data in estimation sample]
        cis |         | [No missing data in estimation sample]
        see |         | [No missing data in estimation sample]
        age | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc cap_util agesq expage expagesq
            |         | d_reinvest_prof ceb cis see
      agesq | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc cap_util age expage expagesq d_reinvest_prof
            |         | ceb cis see
     expint | regress | ftwor_edu training skilled org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |         | cis see
    org_str | logit   | expint ftwor_edu training skilled gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |         | cis see
   own_conc | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |         | cis see
   cap_util | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc age agesq expage expagesq d_reinvest_prof
            |         | ceb cis see
    skilled | regress | expint ftwor_edu training org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |         | cis see
  ftwor_edu | regress | expint training skilled org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof ceb
```

```
            |          | cis see
    mne_sal | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit impint large_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
  large_sal | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit impint mne_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
     impint | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit mne_sal large_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
d_reinves~f | logit    | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit impint mne_sal large_sal own_conc
            |          | bus_assoc cap_util age agesq expage expagesq ceb cis
            |          | see
     expage | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit impint mne_sal large_sal own_conc
            |          | bus_assoc cap_util age agesq expagesq d_reinvest_prof
            |          | ceb cis see
   expagesq | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |          | entact credit impint mne_sal large_sal own_conc
            |          | bus_assoc cap_util age agesq expage d_reinvest_prof
            |          | ceb cis see
   training | logit    | expint ftwor_edu skilled org_str gros_inv inv_rd
            |          | prli_tech lnsize lnsizesq entres foreign soe entact
            |          | credit impint mne_sal large_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
   gros_inv | regress  | expint ftwor_edu training skilled org_str inv_rd
            |          | prli_tech lnsize lnsizesq entres foreign soe entact
            |          | credit impint mne_sal large_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
     inv_rd | regress  | expint ftwor_edu training skilled org_str gros_inv
            |          | prli_tech lnsize lnsizesq entres foreign soe entact
            |          | credit impint mne_sal large_sal own_conc bus_assoc
            |          | cap_util age agesq expage expagesq d_reinvest_prof ceb
            |          | cis see
------------------------------------------------------------------------------

End of dry run. No imputations were done, no files were created.


. ice  expint ftwor_edu training skilled org_str gros_inv inv_rd prli_tech
lnsize lnsizesq entres foreign soe entact credit impint  mne_sal large_sal
own_conc bus_assoc  cap_util  age  agesq expage expagesq  d_reinvest_prof  cis
see, boot m(20) match(expint ftwor_edu skilled gros_inv inv_rd impint  mne_sal
large_sal own_conc cap_util)saving(imp_2005_final)

   #missing |
     values |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      3,826       57.23       57.23
          1 |        603        9.02       66.25
          2 |      1,579       23.62       89.87
```

```
          3 |        387        5.79       95.66
          4 |        189        2.83       98.49
          5 |         61        0.91       99.40
          6 |         27        0.40       99.81
          7 |          6        0.09       99.90
          8 |          1        0.01       99.91
          9 |          4        0.06       99.97
         11 |          1        0.01       99.99
         13 |          1        0.01      100.00
------------+-----------------------------------
      Total |      6,685      100.00

   Variable | Command | Prediction equation
------------+---------+------------------------------------------------------
  prli_tech |         | [No missing data in estimation sample]
     lnsize |         | [No missing data in estimation sample]
   lnsizesq |         | [No missing data in estimation sample]
     entres |         | [No missing data in estimation sample]
    foreign |         | [No missing data in estimation sample]
        soe |         | [No missing data in estimation sample]
     entact |         | [No missing data in estimation sample]
     credit |         | [No missing data in estimation sample]
  bus_assoc |         | [No missing data in estimation sample]
        cis |         | [No missing data in estimation sample]
        see |         | [No missing data in estimation sample]
        age | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc cap_util agesq expage expagesq
            |         | d_reinvest_prof cis see
      agesq | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc cap_util age expage expagesq d_reinvest_prof
            |         | cis see
     expint | regress | ftwor_edu training skilled org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof cis
            |         | see
    org_str | logit   | expint ftwor_edu training skilled gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof cis
            |         | see
   own_conc | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof cis
            |         | see
   cap_util | regress | expint ftwor_edu training skilled org_str gros_inv
            |         | inv_rd prli_tech lnsize lnsizesq entres foreign soe
            |         | entact credit impint mne_sal large_sal own_conc
            |         | bus_assoc age agesq expage expagesq d_reinvest_prof
            |         | cis see
    skilled | regress | expint ftwor_edu training org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
            |         | cap_util age agesq expage expagesq d_reinvest_prof cis
            |         | see
  ftwor_edu | regress | expint training skilled org_str gros_inv inv_rd
            |         | prli_tech lnsize lnsizesq entres foreign soe entact
            |         | credit impint mne_sal large_sal own_conc bus_assoc
```

```
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
     mne_sal | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit impint large_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
   large_sal | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit impint mne_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
      impint | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit mne_sal large_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
d_reinves~f | logit    | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit impint mne_sal large_sal own_conc
             |          | bus_assoc cap_util age agesq expage expagesq cis see
      expage | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit impint mne_sal large_sal own_conc
             |          | bus_assoc cap_util age agesq expagesq d_reinvest_prof
             |          | cis see
    expagesq | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | inv_rd prli_tech lnsize lnsizesq entres foreign soe
             |          | entact credit impint mne_sal large_sal own_conc
             |          | bus_assoc cap_util age agesq expage d_reinvest_prof
             |          | cis see
    training | logit    | expint ftwor_edu skilled org_str gros_inv inv_rd
             |          | prli_tech lnsize lnsizesq entres foreign soe entact
             |          | credit impint mne_sal large_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
    gros_inv | regress  | expint ftwor_edu training skilled org_str inv_rd
             |          | prli_tech lnsize lnsizesq entres foreign soe entact
             |          | credit impint mne_sal large_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
      inv_rd | regress  | expint ftwor_edu training skilled org_str gros_inv
             |          | prli_tech lnsize lnsizesq entres foreign soe entact
             |          | credit impint mne_sal large_sal own_conc bus_assoc
             |          | cap_util age agesq expage expagesq d_reinvest_prof cis
             |          | see
------------------------------------------------------------------------------

Imputing.........1..........2..........3..........4..........5..........6......
....7..........8..........9..........10..........11..........12..........13....
......14..........15..........16..........17..........18..........19..........2
0 file imp_2002_final.dta saved
```

2008/9 sample

```
. ice expint ftwor_edu d_gros_inv d_inv_rd prli_tech  size sizesq  age  agesq
entres foreign soe entact own_conc  credit cis see, passive (agesq: age*age)
boot m(20) match(expint entact ftwor_edu own_conc age foreign)
saving(imp_2008-09_final)

   #missing |
     values |      Freq.     Percent        Cum.
```

```
------------+-----------------------------------
          0 |      8,389       88.58       88.58
          1 |        760        8.02       96.60
          2 |        194        2.05       98.65
          3 |         82        0.87       99.51
          4 |         26        0.27       99.79
          5 |         13        0.14       99.93
          6 |          3        0.03       99.96
          7 |          3        0.03       99.99
          8 |          1        0.01      100.00
------------+-----------------------------------
      Total |      9,471      100.00

   Variable | Command | Prediction equation
------------+---------+-------------------------------------------------------
       size |         | [No missing data in estimation sample]
     sizesq |         | [No missing data in estimation sample]
     entres |         | [No missing data in estimation sample]
        cis |         | [No missing data in estimation sample]
        see |         | [No missing data in estimation sample]
  prli_tech | logit   | expint ftwor_edu d_gros_inv d_inv_rd size sizesq age
            |         | agesq entres foreign soe entact own_conc credit cis
            |         | see
     expint | regress | ftwor_edu d_gros_inv d_inv_rd prli_tech size sizesq
            |         | age agesq entres foreign soe entact own_conc credit
            |         | cis see
 d_gros_inv | logit   | expint ftwor_edu d_inv_rd prli_tech size sizesq age
            |         | agesq entres foreign soe entact own_conc credit cis
            |         | see
   d_inv_rd | logit   | expint ftwor_edu d_gros_inv prli_tech size sizesq age
            |         | agesq entres foreign soe entact own_conc credit cis
            |         | see
     entact | regress | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq age agesq entres foreign soe own_conc credit
            |         | cis see
    foreign | regress | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq age agesq entres soe entact own_conc credit cis
            |         | see
        soe | logit   | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq age agesq entres foreign entact own_conc credit
            |         | cis see
     credit | logit   | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq age agesq entres foreign soe entact own_conc
            |         | cis see
        age | regress | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq entres foreign soe entact own_conc credit cis
            |         | see
      agesq |         | [Passively imputed from age*age]
  ftwor_edu | regress | expint d_gros_inv d_inv_rd prli_tech size sizesq age
            |         | agesq entres foreign soe entact own_conc credit cis
            |         | see
   own_conc | regress | expint ftwor_edu d_gros_inv d_inv_rd prli_tech size
            |         | sizesq age agesq entres foreign soe entact credit cis
            |         | see
-------------------------------------------------------------------------------

Imputing
.........1.........2.........3.........4.........5.........6.........7..
.......8.........9.........10.........11.........12.........13.........1
4.........15.........16.........17.........18.........19.........20
file imp_2008-09_final.dta saved
```