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Innovation Activities and Competitiveness: Empirical Evidence on the Behaviour of Firms in New EU Member States and Candidate Countries

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Abstract

This paper aims to explore the factors influencing the ability of firms to compete in globalised markets. The Austrian and evolutionary economics and the endogeneous growth literature highlight the role of innovation activities in enabling firms to compete more effectively – and expand their market share. On the basis of these theories, and using a large panel of firms from several Central and East European Countries (CEECs), this paper attempts to identify the factors and forces which determine the ability of firms to compete in conditions of transition. The competitiveness of firms, measured by their market share, is postulated to depend on indicators of firms' innovation behaviour such as improvements in cost-efficiency, labour productivity and investment in new machinery and equipment as well as characteristics of firms and their environment such as location, experience, technological intensity of their industries and the intensity of competition. To control for the dynamic nature of competitiveness and the potential endogeneity of its determinants, and to distinguish between short and long run effects of firm behaviour, a dynamic panel methodology is employed. The results indicate that the competitiveness of firms in transition economies is enhanced with improvements in their cost efficiency, productivity of labour, investment and their previous business experience while stronger competition has a negative impact on it.

1. Introduction

It is generally agreed that the ability of nations to grow and to provide their citizens with better standard of living ultimately depends on the competitiveness of their firms. Economists from different schools of thought have attempted to answer the question of why some firms perform better than others or what makes some firms more competitive than their rivals. While in the traditional economic literature the relative performance of firms is determined exogenously through the random distribution of predetermined attributes, the strand of literature from the Austrian to the evolutionary economics and the endogenous growth argues that the key role in explaining the ability of firms to compete is played by their own activities, with the latter literature paying particular attention to innovation activities of firms. Under the Schumpeterian concept of creative destruction, new knowledge and technology act as sources of differentiation in enabling firms to enjoy temporary monopoly power over their rivals by charging lower prices or offering products of better quality.

The emergence of the market system in transition economies was characterised by numerous imperfections which provided an opportunity for an asymmetric distribution of output between firms in the same industry. By adjusting their behaviour to the specific conditions of transition, firms could choose policies which improved their competitiveness and enabled them to seize the market share of their rivals. Given that the competitiveness of firms in early transition had been constrained by the lack of knowledge and skills relevant to a market economy, inefficient production and outdated technology inherited from the pre-transition period, we would expect that improvements in productivity and cost efficiency, investment in machinery and equipment, innovations and other mechanisms of restructuring will improve their market position. From here it follows that the process of restructuring can be identified as an important precondition for the survival of firms in transition economies.

To examine the validity of the above argument empirically we develop a model relating the firm's market share to several indicators of different types of restructuring and apply it to a large dataset of firms from the manufacturing sectors of several transition economies. Our investigation draws on the research on the relationship between market share and efficiency (Vickers, 1995; Hay and Liu, 1997; Halpern and Korosi, 2001) and the theoretical and empirical literature on innovation activities of firms (Grossman and Helpman, 1994; Aghion and Howitt, 1998; Loof and Heshmati, 2006; Castellacci, 2010; Hashi and Stojcic, 2010). We expect that in the short run firms try to improve their efficiency through the better use of existing resources while in the long run investment in innovation activities is the main source of such improvements. Moreover, we introduce different dimensions of firm efficiency and argue that improvements in firm behaviour may come in the form of cost-reducing activities, as in Aghion and Howitt (1992), and through improvements in the productivity of inputs, as in Grossman and Helpman (1994) – both of which are the outcomes of innovation activities. In other words, unlike much of recent work on innovation which lays the emphasis on product innovations we examine how the above mentioned types of process innovations influence the market share of firms. To the best of our knowledge, this is the first attempt at the analysis of these factors in the transition environment. The paper also responds to a number of questions which have been relatively unexplored in the transition context- the impact of experience, competition from other firms, location and the technological intensity of different industries on the market share of firms.

The structure of the paper is as follows. Section 2 will establish the theoretical basis of the research. Section 3 will review the relevant literature. The model used in the investigation will be developed in Section 4 while the data and the research methodology will be discussed in Sections 5 and 6. The empirical results will be elaborated in the Section 7. Finally, Section 8 will conclude.

2. Theoretical framework

Why do some firms perform better than others? In the traditional models of firm behaviour it is posited that the asymmetric distribution of output within an industry emanates from inter-firm differences in size, efficiency, product quality or technological intensity. These factors are treated as exogenous by considering that the relative ranking of firms within an industry, in terms of their market shares, is determined through a random distribution of firm attributes (Caves and Porter, 1978; Clarke et al., 1984; Schmalensee, 1987). The major weakness of these models is that they do not leave any room for individual efforts of firms to improve their position or to defend themselves from actions of rivals.

Numerous models of firm behaviour have attempted to relax these restrictive assumptions. The common starting point of these models is the recognition of the imperfect nature of competition which provides the opportunity for some firms to outperform their rivals by investing their efforts and resources in the development of distinctive competitive advantages. In one group of studies the behavior of firms is modeled as a response to actions of rivals (Jovanovic, 1982; Jovanovic and Macdonald, 1994; Vickers, 1995). These models contend that through improvements in cost-efficiency firms can drive their higher cost rivals out of the market and seize their market share. However, these models are not very informative about sources of efficiency improvements nor do they consider other forms of improvements in firm behavior.

This latter issue has been addressed by the Schumpeterian literature (Schumpeter, 1942; Nelson and Winter, 1982; Aghion and Howitt, 1992; Grossman and Helpman, 1994; Hay and Liu, 1997; Williams, 2007). These models pay particular attention to the role of innovation, defined as a non-public, partially exclusive form of knowledge, which enables its owner to enjoy monopoly power (Romer, 1990).They point to two ways in which innovations can affect the ability of firms to compete. On the one hand, innovations improve price-driven competitiveness of firms through cost-reductions (Aghion and Howitt, 1992) and through improvements in the productivity of inputs (Grossman and Helpman, 1994). On the other hand, investment in R&D improves the relative sophistication of products with beneficial effect on quality-driven competitiveness of firm (Klette and Griliches, 2000). Both process and product innovations can act as sources of temporary monopoly power since the creation of new knowledge and spillovers make earlier discoveries obsolete (Grossman and Helpman, 1994).

Although innovations have only transitory effects, their creation is a lengthy process involving the development of necessary skills and the acquisition of assets and knowledge about market processes. This is the reason why in the short run firms will respond to actions of their rivals through adjustments within their existing capacities while in the long run their behaviour will depend on managerial decisions regarding investment in skills, technology and innovations (Hay and Liu, 1997). Models in the Austrian tradition predict that the ability of firms to maintain and improve their market share will be higher if they have a history of knowledge of the prospects for success or failure of individual actions (Kirzner, 1997; Ferrier et al., 1999). In addition, Mitchell and Skrzypacz (2005) argue that firms which had high market share in the past are also likely to grow in the present period due to the consumer network externalities such as complementary products, services or the number of users as well as their ability to benefit from economies of scale more easily.

Many studies consider the impact of firm-specific characteristics and features of their environment on their ability to compete. While Hay and Liu (1997) emphasise the effect of the quality of management on firms' efficiency and their market share, Vickers (1995) and Nickell (1996) demonstrate how the intensity of competition may exert downward pressure on costs and motivate firms to innovate in order to acquire the market share of less efficient rivals. Aghion and Schankermann (1999) develop a model in which investment in physical and institutional infrastructure during the transition period facilitates product-market competition which in turn motivates the exit of high-cost firms and acts as an incentive for low-cost firms to engage in restructuring. The second effect is based on the direct impact of exogenous factors such as institutional changes, market trends or technological conditions which affect the entire industry. Caves and Porter (1978) argue that these factors may not have symmetrical impact on all firms thus leading to changes in their relative ranking within the industry.

Much of the literature on the relationship between competitiveness of firms and features of their environment is concerned with issues of location, competition and knowledge spillovers (Romer, 1990; Krugman, 1993; Grossman and Helpman, 1994; Hay and Liu, 1997; Halpern, 2007). Nearly a century ago, Marshall (1920) noted that location in agglomerated areas provides firms with larger demand, better pool of skills and expertise and the possibility of cooperation with the science sector. The endogenous growth literature is more concerned with knowledge spillovers which may arise from cooperation amongst firms and between them and universities and research institutes. To this end, it is postulated that spillovers which may arise through formal and informal channels among firms in the same industry and between different industries may be important mechanisms of overcoming barriers to entry, obstacles to the innovation process or the purchase of specific assets.

Overall, the theoretical models consider how the market share of firms is based on their activities and characteristics and features of their environment. Furthermore, these models emphasise the role of imperfect competition as a process that enables some firms to outperform others. While enterprise restructuring is not explicitly addressed, it is evident that these models focus on those activities of firms which have impact on their market share - and which are identified in as important mechanisms of enterprise restructuring in the transition literature. Finally, the position of firms on the market is likely to be influenced by their relative performance in the past which implies that the competitiveness of firms is a dynamic concept.

3. Literature review

Recent years have whitnessed the flourishing of studies on the competitiveness and performance of firms. The work in this field has mainly been concentrated around factors affecting the productivity of firms (Crepon et al., 1998; Loof et al., 2002; Loof and Heshmati, 2006; Andersson and Loof, 2009; Castellacci, 2010; Hashi and Stojcic, 2010). Other authors have examined determinants of the exporting activity (Damijan et al., 2008; Poschl et al., 2010), profitability (Gorg and Hanley, 2008) and entry and exit at firm level (Melitz and Polanec, 2009). Studies in this tradition have typically followed the multi-stage model of the innovation process, originally developed by Crepon et al. (1998), and known as the CDM model, in which the emphasis is placed on different stages of the innovation process - from the decision to innovate and the decision on how much to spend on innovation to the transformation of innovation inputs into innovation output and the impact of innovation output on the performance of firms measured in terms of sales, productivity or some other criterion. Curiously enough, little attention has been given to the market share of firms which, in addition to the profitability, can be considered as the closest measure of competitiveness, or the ability to compete. This is particularly true for new EU members and candidate countries from Central and Eastern European Countries (CEECs).

The market share of firms has been examined both in terms of its determinants and its impact on various other aspects of firm behaviour such as efficiency, profitability or productivity. Within the latter group of studies, Castellaci (2010) found that innovation driven increases in market share of firms have a positive impact on improvements in their efficiency. Similar finding is reported by Hashi and Stojcic (2010) who have found that product oriented effects of innovations including higher market shares have a positive impact on the sales of new products.

Studies examining the determinants of market share have included different variables measuring firm behaviour such as efficiency, innovations, etc. as well as the various features of firm's external environment such as industry-specific characteristics, trade policies or the actions of rivals. The relationship between market share and the efficiency of firms has been analysed using two-stage models where in the first stage the efficiency of firm is determined by its production function in relation to some frontier while in the second stage the investigation focuses on the impact of efficiency on market share (Hay and Liu, 1997; Halpern and Korosi, 2001). The findings from these studies indicate that the relative position of firms on the market improves as their efficiency increases. Although both studies include a lagged dependent variable in their estimation, the model used by Halpern and Korosi (2001) does not distinguish between short- and long-run impacts of efficiency on the market share while the model used by Hay and Liu (1997) indicates that the impact of changes in efficiency on the relative position of firms will be of higher magnitude in the long run. These findings are consistent with the concept of strategic restructuring (Grosfeld and Roland, 1996) which maintains that the full impact of this type of restructuring will be visible only in the long run.

Another aspect of firm behaviour impacting market shares is the firms' innovation activities. The findings from different studies exhibit a great deal of variation, making it difficult to reach a general conclusion about the impact of innovations on the position of firms within their industry. On the one hand, using R&D expenditure as the measure of innovation activity, Nakao (1993) and Davies and Geroski (1997) do not find any evidence for a relationship between innovation activities and the market share of firms. On the other hand, Robinson (1990) and Banburry and Mitchell (1995), who use measures of innovation output such as the introduction of new products, find a positive relation between the two variables. These findings are in line with the views of evolutionary economics about the need for continuous innovation amongst firms that want to be ahead of their rivals. Firms which introduce product innovations two to three times per year are found to have higher market share than firms which innovate once.

As discussed in the previous Section, the theoretical models postulate that the ability of a firm to outperform its rivals in the past will have a positive impact on its present market share. Studies by Hay and Liu (1997) and Halpern and Korosi (2001) have found positive coefficients for the lagged dependent variable implying that advantages such as customer network externalities, economies of scale or similar factors may be important in explaining the market position of firms over time. However, the findings of Davies and Geroski (1997) indicate that better relative performance of firm in the past has a negative effect on its present position. Davies and Geroski do not offer any explanation for this negative effect but their finding can be interpreted in the light of the so-called 'quiet life' hypothesis whereby firms which had outperformed their rivals in the past would be less willing to undertake difficult and costly actions and instead would be content to enjoy the fruits of their past activities.

In terms of the firm's environment, previous studies have focused on the behaviour of other firms, industry concentration and import penetration. Davies and Geroski (1997) and Hay and Liu (1997) illustrate the effects of two different types of actions of rivals. The former study finds that the higher advertising intensity of rivals negatively influences the market share of a firm. The latter study finds that improvements in efficiency of rivals motivate the firm to improve its efficiency which in turn leads to higher market share. Such a finding is consistent with the view, explained in the previous Section, that competition puts pressure on firms to innovate and reduce their costs, and therefore increase their market share.

When industry concentration and import penetration have been included in the investigation of market shares, the findings of different studies have been different. Baldwin and Goreski (1985) found a negative effect for concentration and a positive effect for import penetration. The explanation offered for the latter finding is that imports mainly consist of outsourced semi-finished products which are being re-exported after finalisation, thus adding to the market share of domestic firms. Halpern and Korosi (2001) reported the opposite finding, that concentration has a positive and import penetration a negative impact on the market share of firms. They explain this with the argument that in concentrated industries improvements in market share may be more easily achieved because of higher market imperfections, while the negative sign of import penetration is interpreted as the evidence that the entry of foreign firms intensifies competition and reduces the market share of domestic rivals. In addition to these studies, Davies and Geroski (1997) investigated how changes in the market share of firms are influenced by the minimum efficient scale, R&D and advertising intensities of their industries. They found that the firms in industries with a higher advertising intensity and minimum efficient scale had a higher market share, while the relationship between market share of the firm and the R&D intensity of its industry was statistically insignificant.

The present literature suffers from a number of problems and shortcomings. First, the results presented above are based on cross-sectional studies. In some cases this was because of the nature of the datasets; in others, the authors did not analyse the longitudinal dimension of their datasets, running separate regressions for different years, or pooling the data (Caves and Porter, 1978; Amable and Verspagen, 1995; Halpern and Korosi, 2001). As a result, the dynamic dimension of market share has frequently been omitted from the analysis. Second, the existing studies have, in general, failed to control for the correlation between unobserved firm and industry specific effects such as managerial quality or technological capacities and the explanatory variables. The results obtained by Hay and Liu (1997), who modelled firm specific time invariant effects with categorical variables for each firm and found that they are significant as a group, suggest that these effects might be important and the results obtained without taking them into consideration are questionable. Furthermore, while the theoretical models of firm behaviour have devoted a great deal of attention to the issue of efficiency, it has received little treatment in empirical studies. We were unable to find studies which deal with individual aspects of firm efficiency such as costs, labour or capital efficiency or studies addressing the location or experience of firms. Finally, there is an evident lack of firm-level studies addressing the determinants of market shares in the transition context. As it will be shown in the next Section, our research attempts to respond to some of these gaps.

4. Model specification

The model we develop draws on the arguments presented in the previous two sections. In imperfect markets some firms are able to outperform their rivals an seize their market share. The models of firm behaviour reviewed in Section 2 indicate that this ability may be influenced by four groups of factors: i) measures undertaken by firms themselves to improve their competitiveness (restructuring measures); ii) their characteristics; iii) features of their environment; and iv) their past levels of competitiveness. This can be expressed as:

$$CI_{it} = f(CI_{it-1}, A_{it}, C_{it}, E_{it}) \qquad (1)$$

where CI reflects firm *i*'s competitive performance, measured as its market share in period *t,* $\mathbf{CI_{it-1}}$ the lagged value of the market share, and A, C and E its activities, characteristics and the features of its environment respectively. The inclusion of the lagged dependent variable is not only in the spirit of the Austrian school (recognising the importance of the accumulated prior knowledge and various externalities) but is also in recognition of the specific conditions of transition - a lengthy and gradual *process* characterised by numerous imperfections such as the asymmetrical distribution of knowledge about the new system and the steps which need to be undertaken by firms in order to survive in the new environment.

In line with the views of Vickers (1995) and Hay and Liu (1997) discussed earlier, we expect that improvements in efficiency would enable firms to seize the market share of their rivals. These improvements may, in the short run, come from managerial efforts to change the behaviour of firm within its existing capacities and, in the long run, from strategically oriented activities such as investment in new technology, expansion of capacities or innovations.[1] Such reasoning draws its theoretical support from the evolutionary and product-life cycle theories who argue that the economies (firms) can increase their competitiveness only to a certain level within their existing capacities after which they would have to innovate and invest in new technology, skills and knowledge in order to improve their situation and the

[1] These have been alternately referred to as 'defensive' and 'strategic' resturucturing (Grosfeld and Roland, 1996).

failure to do so would result in them being outperformed by their rivals. For this reason, our model makes a distinction between short- and long-run activities of firms with the former reflecting elements of defensive restructuring and the latter elements of strategic restructuring.
The modelling of firm behaviour here draws heavily on the endogenous growth literature. To this end, we consider that innovation activities of firms lead to improvements in cost efficiency, as in Aghion and Howitt (1992), and also the productivity of inputs used in production, as in Grossman and Helpman (1994). In this context, our study differs from previous work in this field which mainly focused on the aggregate efficiency of firms estimated from the production function. Cost efficiency is measured by unit labour and unit material costs, defined as the ratio of costs of employees and material costs to sales revenues respectively. We expect that in the short run cost reductions will be undertaken within the existing capacities while in the long run they will be outcome of innovation efforts and improvements in existing capacities. Hence, we expect the unit labour cost and unit material cost to affect market share negatively.

In addition to cost efficiency we control for the productivity of labour and of investment, which are defined as ratios of a firm's turnover to the number of employees and to the net investment in machinery, equipment and buildings, respectively. Labour productivity was shown to be one of the most important factors underlying the competitiveness of firms in transition. It increases as a result of various activities of firms such as investment in human capital, new technology or the innovation process. Finally, as the outdated and inefficient machinery and equipment was identified as one of main reasons for the low efficiency of firms in former centrally-planned economies, new investment was considered essential for raising the overall efficiency of these firms (Grosfeld and Roland, 1996; Wziatek-Kubiak and Winek, 2004). However, the construction of the 'productivity of investment' variable takes into account not only the investment behaviour of firms, but also controls for the effectiveness of this investment, i.e., the correctness of managerial decisions about the choice of technology and putting this technology into optimal use. For both variables we expect positive sign.

We must also take into consideration the possibility that the behaviour of firms will be influenced by their characteristics and the features of their environment. While we control for some of these characteristics in the model, it is reasonable to assume that there are some unobserved characteristics such as the quality of the management, the impact of the ownership structure and exogenous demand shocks, which are likely to affect both restructuring of firms and their competitiveness. The failure to control for these factors may create the problem of endogeneity and cause the estimates to be biased. This is something that should be taken into account in the modelling strategy which will be discussed in more detail in Section 6.

The modelling strategy used here differs from existing work on the impact of innovation activities of firms (especially the CDM-type models) in at least three important ways. First, unlike most previous studies we examine the relationship between the behaviour of firms and their market share thus dealing with the relative (competitiveness) rather than the absolute performance. We approach the ability of firms to compete as a dynamic concept and make a distinction between the impact of their activities, characteristics and features of their environment on competitiveness in the short and long run. Second, in the modelling of firm behaviour we bring together the work on the relationship between efficiency and market share and the innovation literature, particularly the endogenous growth branch. We distinguish between the innovation and non-innovation related improvements in firm behaviour. Unlike much of recent work on innovation, which measures innovation output by sale of new products or by the broad categories of product and process innovations, we focus on two types of process innovations - improvements in cost efficiency and the productivity of inputs. Third, we take into account the potential endogeneity which may arise from the correlation between different dimensions of firm behaviour and some unobserved firm-, industry-, and country-specific elements.

The choice of firm-specific characteristics and features of the environment has been influenced by theoretical arguments as well as the limitations imposed by the nature of the dataset used. The model controls for the age of the firm, agglomeration effects and the technological intensity of the firm's industry. The variable age is constructed as the period of time between the year of observation and the year of firm's incorporation. Age is expected to reflect the firm's general business experience, familiarity with the market system and the development of its customer base. The resource-based view defines experience as one of the firm's human capital resources which enables it to improve its efficiency and effectiveness (Barney, 1991). Furthermore, the Austrian school postulates that the experience of business activities may help a firm to predict the future outcomes of its activities more accurately. It is therefore expected that older firms have some specific knowledge which enables them to outperform their rivals, thus the expected sign should be positive. The technological intensity of a firm's industry is based on the OECD (2007) classification of industries, dividing them into the four categories of low, medium-low, medium-high and high technology intensive industries.[2] These variables control for industry-

[2] The full list of industries and their classification is provided in Table A1 in the Appendix

specific effects such as minimum efficient scale and barriers to entry as well as the type of technology commonly employed in an industry. We therefore expect that the market share of firms in the high technology intensive industries would be more concentrated, and the market share of firms higher, due to the need for large investments in new production processes, products, technology and knowledge.

There are several channels through which the location of a firm may have an impact on its ability to compete (Fujita, 1988; Krugman, 1980, 1991, 1993; Venables, 1996; Hafner, 2008). First, firms in large cities can benefit from a higher level of demand, achieving internal economies of scale more easily and lowering their unit costs (Marshall, 1920). Second, firms in dense urban areas can benefit from between-industry economies such as better access to infrastructure (Krugman, 1980). Third, by locating themselves near other firms from the same industry, firms can enjoy benefits of within-industry economies such as the ease of access to specialised input services and skilled labour, and the R&D and knowledge spillovers from other firms. However, in addition to these centripetal forces which attract firms to large urban areas there are also centrifugal forces that motivate firms to move towards smaller cities. Generally, a higher concentration of firms increases the cost of inputs which can lower the competitiveness of firms, particularly those which compete on prices (Lall, 2001). As a consequence, these firms are likely to locate themselves in smaller urban areas. Therefore, by observing the sign of the variable for location of firm, which is defined as categorical variable taking the value of one if the firm is located in cities with more than 100,000 inhabitants, we may gain an insight into the competitive profile of firms in the sample.

In order to distinguish between different types of agglomeration externalities we introduce two additional variables which aim to capture the 'between' and 'within-industry' economies. These two types of effects may be particularly important for firms in transition economies as they may reduce the cost of obtaining information about market trends or may receive technology and know-how which can be used to improve their production processes and products through horizontal spillovers from firms located in their proximity. In order to capture the spillovers from intersectoral agglomeration of firms such as sharing of basic assets, information, resources and institutions, we introduce the 'urbanisation economies' variable constructed as the ratio of the number of firms in an administrative region to the total number of firms in the country (Malmberg et al., 2000; Becchetti and Rossi, 2000; Holl, 2004). Furthermore, to control for industry-specific knowledge spillovers such as learning about new technologies through contact with early adapters or benefits of information flows about market conditions which accrue to firms from the same industry in geographic poximity of each other, we introduce the 'localisation economies' variable defined as the ratio of the number of firms from the firm's 4-digit NACE industry in a region to the total number of firms in that region (Malmberg et al., 2000). Accordingly, positive signs for these variables imply the presence of agglomeration effects while negative signs would indicate that firms in transition perceive other firms in their industry only as competitors with whom they cannot share any information or learning. The definitions of all variables are provided in Table 1.

Table 1: Description of variables

Dependent variable	
MShare	Market share - turnover of firm i divided by total turnover of its 4-digit industry
Independent variables	
Labprod	Labour productivity – ratio of turnover to number of employees (1000 EUR per employee)
Invprod	Investment productivity – ratio of turnover to the change in fixed assets between two periods
Ulc	Unit labour costs – cost of employees as a share of turnover
Umc	Unit material costs – cost of material as a share of turnover
Lgcit	Dummy for location in large cities (those with more than 100 000 inhabitants)
Age	Number of years since incorporation
Low	Dummy for low technology industries (base group)
Mlow	Dummy for medium-low technology industries
Mhigh	Dummy for medium-high technology industries
High	Dummy for high technology industries
Urbef	Urbanization economies – ratio of total number of firms in an administrative region to total number of firms in the country
Locef	Localization economies – ratio of number of firms a 4-digit industry in an administrative region to total number of firms in that region

5. Data

The empirical work in this paper is based on a large panel of firms from manufacturing industries constructed from the firm-level database Amadeus, compiled by Bureau van Dyke. This database contains the information from financial reports such as balance sheet and profit and loss statements, financial ratios and some general information including the location, age and activity of more than one million companies in 41 European countries. We have extracted the data for firms from four advanced transition economies (the Czech Republic, Slovakia, Poland and Bulgaria) and Croatia for the period 2000-2007.[3] According to Amadeus, the dataset covers all firms that have filed their financial statements with the relevant authority according to the legal provisions in each country. As such the database covers the population of firms registered as companies. Table 2 presents the number of firms in different countries and in different years (also implying that we have an unbalanced panel).

[3] We also had access to the data for Hungary and Slovenia but they were unusable due to the extremely high (over 90%) rates of missing observations for several key variables such as cost of material, age, location and investment.

Table 2: Number of firms in the database in different years

Country/ Year	*CRO*	*CZ*	*SK*	*PL*	*BG*
2000	2257	302	-	946	961
2001	2393	1133	69	1351	1050
2002	2489	2015	250	2008	941
2003	2658	2898	461	2301	979
2004	2777	3886	686	3044	1076
2005	2793	4068	743	3169	1106
2006	2785	3872	662	4267	1093
2007	2731	678	-	-	205
Total	20883	18852	2871	17086	7411

As we can see from Table 2, the number of firms in the database exhibits a high degree of variation across countries and years, being the lowest in Slovakia and highest in Croatia. Furthermore, as Table 3 shows, there is some degree of missing observations for one or more variables. While the provider of database, Bureau-van-Dyke (2010), does not provide any explanation for the former issue, they offer two arguments related to the latter problem. On the one hand, it is said that prior to becoming available in the database, the data goes through time-consuming administrative procedures which can take from a couple of weeks to several years. This seems to explain the low number of observations for 2007 in some countries. On the other hand, they acknowledge that in some countries, particularly transition economies where penalties for such practice are low, firms do not meet their legal obligation of submitting reports to the authorities. While it is possible that this occurs at random, there is a possibility that there is some unobserved process underlying the pattern of missingness, i.e. the data are not missing at random. As we are unable to identify any missingnes mechanism and distinguish between these two possibilities, we have treated the missing observations as missing at random and applied listwise deletion to the dataset. Other studies using the Amadeus database (e.g., Haltiwanger et al., 2003; Warzynski, 2003; Stiebale, 2008) have also disregarded the possibility of non-random missingness (without explicitly referring to it). Given the size of the dataset in this study, we believe that this practice would not significantly reduce the amount of available information and the efficiency of estimation. Table 3 also presents the descriptive statistics of the dataset over the 2000-2007 period.

Table 3: Descriptive statistics for quantitative variables

	CROATIA			CZECH REPUBLIC			BULGARIA		
	Mean	*Std Dev*	*Missing*	*Mean*	*Std Dev*	*Missing*	*Mean*	*Std Dev*	*Missing*
Mshare	0.1	0.1	0.9%	0.1	0.2	0.4%	0.1	0.2	0.3%
Labprod	82.6	523	2.8%	87.4	675	5.6%	41.8	192	2.7%
Invprod	-10.4	354	7.8%	-4.1	810	7.8%	-10.0	372	14.2%
Ulc	0.3	0.9	2.5%	0.4	24.9	1.0%	0.2	0.4	2.6%
Umc	0.7	1.1	1.1%	0.9	70.3	39.3%	0.4	0.8	2.5%
Urbef	0.2	0.2	0.0%	0.2	0.1	0.0%	0.5	0.3	0.0%
Locef	0.03	0.03	0.0%	0.02	0.02	0.0%	0.02	0.02	0.0%
Age	16.0	20.1	3.8%	8.6	4.7	1.8%	18.3	22.3	46.0%
	SLOVAKIA			**POLAND**					
	Mean	*Std Dev*	*Missing*	*Mean*	*Std Dev*	*Missing*			
Mshare	0.3	0.3	0.1%	0.1	0.2	0.1%			
Labprod	219	1988	2.6%	97.5	349	5.0%			
Invprod	14.5	534	4.6%	-12.0	1349	6.4%			
Ulc	0.3	1.3	0.1%	0.2	2.2	2.0%			
Umc	0.6	8.6	17.7%	0.6	1.5	0.1%			
Urbef	0.1	0.03	0.0%	0.1	0.1	0.0%			
Locef	0.02	0.02	0.0%	0.02	0.02	0.0%			
Age	10.2	7.4	0.1%	17.0	23.1	5.3%			

Notes: For abbreviations and description of variables, see Table 1. The missing values were identified in STATA using the '*misschk*[varname]' option.

The missing observations do not present a problem for categorical variables of the sample. As Table 4 demonstrates, none of the five categorical variables has any missing observations in any of the five countries.

Table 4: Descriptive statistics for categorical variables

	CROATIA		CZECH REPUBLIC		BULGARIA		POLAND		SLOVAKIA	
	1(%)	*Missing*	*1(%)*	*Missing*	*1*	*Missing*	*1(%)*	*Missing*	*1(%)*	*Missing*
Lgcit	38.6	0%	23.1	0%	78.6	0%	38.8	0%	12.5	0%
Low	45.2	0%	35.3	0%	53.1	0%	44.3	0%	40.0	0%
Mlow	30.2	0%	33.3	0%	21.0	0%	30.0	0%	29.1	0%
Mhigh	15.8	0%	24.8	0%	16.5	0%	20.9	0%	25.4	0%
High	8.9	0%	6.7	0%	9.5	0%	5.3	0%	5.5	0%

Notes: For abbreviations and description of variables, see Table 1. The missing values were identified in STATA using the '*misschk*[varname]' option.

In longitudinal datasets, such as ours, financial variables may be influenced by inflation. This would primarily affect the values of labour productivity, as other variables are in ratio form. A common method of separating the effect of price increases is to divide nominal variables by a price deflator for the sector or for the economy as a whole. However, given that the providers of the dataset have already converted the variables from the local currencies into Euro and that we do not have information about the exchange rates used, it is inappropriate to try to deflate the Euro figures using some form of price index. Also, in most countries, inflation is reflected in the exchange rate and the conversion into Euro will reduce the effect of inflation. Furthermore, as it will be explained in Section 7, the model includes time dummies which are intended to control for sources of cross-sectional dependence and may also pick-up the effect of inflation as well other time-specific events.

In order to get a better idea of the characteristics of the dataset, it is useful to compare the descriptive statistics of different variables when firms are grouped according to their technological intensity, location or other characteristics. This would indicate if there are systematic differences between countries or between firms with different characteristics. Table 5 summarising the descriptive statistics of the dataset when firms are grouped according to their technological intensities, offers some insights into the profile of firms in the database.

Table 5: Average market share and the behavioural features of firms by technological intensity of their industries

Low technology intensive industries					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.08	0.07	0.09	0.07	0.29
Labour productivity	70	84	39	101	163
Productivity of investment	-7	-16	-10	-14	17
Unit labour costs	0.25	0.27	0.19	0.17	0.23
Unit material costs	0.73	0.46	0.40	0.58	0.48
Medium-low technology intensive industries					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.07	0.05	0.14	0.08	0.30
Labour productivity	93	92	40	94	170
Productivity of investment	-4	-6	-3	4	11
Unit labour costs	0.23	0.24	0.17	0.17	0.21
Unit material costs	0.72	0.53	0.45	0.54	0.47
Medium-high technology intensive industries					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.10	0.05	0.14	0.08	0.24
Labour productivity	87	90	45	91	319
Productivity of investment	-24	17	-16	-32	10
Unit labour costs	0.22	0.26	0.18	0.19	0.23
Unit material costs	0.70	0.47	0.41	0.53	0.47
High technology intensive industries					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.04	0.04	0.07	0.08	0.32
Labour productivity	102	70	48	105	96
Productivity of investment	-23	-8	-13	11	26
Unit labour costs	0.20	0.31	0.18	0.48	0.28
Unit material costs	0.66	0.55	0.29	0.65	0.40

It is evident that there is relatively little variation within and between countries in the market share of firms when grouped by their technological intensity. However, there are variations in the behavioural features of firms when they are grouped by this criteria. We can observe that labour productivity increases with technological intensity of industries. Also, there are cross-country differences in labour productivity with Bulgarian firms ranking the lowest and firms in Slovakia ranking the highest. Somewhat surprisingly, the mean value of investment productivity is negative in four of the five countries. As Table A2 in the Appendix shows, the mean values of its constituent variables (turnover and investment in fixed assets) are positive in all countries. A likely explanation is that for some firms a high level of turnover combined with a low level of disinvestment has resulted in high levels of negative investment productivity thus affecting the overall distribution of this variable in the dataset. Finally, while there appears to be no within-country difference in terms of unit labour and unit material costs, our summary statistics show that the unit cost of production is somewhat higher in Croatia, Czech Republic and Slovakia than in Bulgaria and Poland.

We also compare the behaviour of firms in the dataset with respect to their location in order to see whether agglomeration externalities enable firms to perform better. This is shown in Table 6.

Table 6: Average market share and the behavioural features of firms by their location

Firms located in large cities					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.07	0.06	0.08	0.08	0.35
Labour productivity	90	115	44	111	161
Productivity of investment	-12	-26	-10	-45	3
Unit labour costs	0.22	0.23	0.17	0.19	0.23
Unit material costs	0.71	0.44	0.38	0.49	0.42
Firms located outside thef large cities					
	CRO	*CZ*	*BG*	*PL*	*SK*
Market share	0.08	0.06	0.18	0.08	0.27
Labour productivity	78	79	32	89	207
Productivity of investment	-9	2	-10	9	15
Unit labour costs	0.24	0.27	0.23	0.19	0.23
Unit material costs	0.72	0.51	0.49	0.59	0.48

It can be seen that firms located in agglomerated areas perform equally or better in all aspects of firm behaviour than their counterparts located outside of large cities. It is therefore likely that agglomeration externalities such as better infrastructure, cooperation with research institutions, higher pool of skills and expertise and other factors have important role in shaping the competitiveness of firms in large cities. Yet, we must bear in mind that, with the exception of Bulgaria, the majority of firms in other countries in the database are located outside of large cities (see Table 4).

Finally, Table 4 also shows that the average age of firms in the database ranges between 9 years (in Czech Republic and Slovakia) and 16 years (in other three countries) suggesting that the sample includes mainly firms which were founded during the transition period or emerged in the course of the privatisation of former socialist enterprises.

6. Methodology

As we are dealing with a longitudinal dataset it seems natural to look for a suitable estimator in the family of panel techniques. Among several panel methods available we need to select one capable of dealing with the issues such as firm-specific heterogeneity, the dependence of market share on its past values and the potential endogeneity of covariates representing the firm behaviour (or restructuring), identified in Section 2 as important. The problem of individual heterogeneity, arising from unobserved time-invariant factors can be controlled for in all panel data techniques using the effects models. However, these models require the error term to be uncorrelated with the explanatory variables (Wooldridge, 2006; p. 494). This assumption is violated when the lagged dependent variable is included on the right-hand side of the model as this variable will, by construction, be correlated with the error term. At the same time the non-inclusion of the lagged dependent variable and use of a static panel techniques will result in the estimators obtained being biased and inconsistent if the process is actually dynamic. The assumptions of static effects models will also be violated if any other explanatory variable is correlated with the error term. In this context, we need a model that can capture the possible individual heterogeneity and also the potential endogeneity of lagged dependent variable and of variables representing the restructuring behaviour of firms.

The general approach to the estimation of panel models with a lagged dependent variable and other potentially endogenous variables is to use GMM-type estimators in a dynamic panel model (Greene, 2002, p. 308). The GMM is a general method for estimation of population parameters which unlike other methods does not require assumptions such as normality or homoskedasticity. The only requirements of GMM are assumed population conditions, expressed in terms of expectations or moments. A fundamental moment condition which needs to be satisfied in order to produce unbiased and consistent estimates of coefficients of interest is the restriction on the covariance between the error term and independent variable $E(\varepsilon_{it}, x_{it}) = 0$. When this condition is not satisfied the estimates are likely to be biased and inconsistent. The problem can be overcome by the use of instrumental variables which have to be uncorrelated with the error term but correlated with the endogenous variables. The number of these instruments is not limited and can be very large, by defining more than one moment condition per parameter to be estimated, which maximises the information available for the estimation process. This advantage of GMM is especially exploited in the dynamic panel estimation.

On the basis of GMM, two types of dynamic estimators have been developed – a difference GMM estimator (Arellano and Bond, 1991) and a system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). With only one lagged dependent variable as an explanatory variable, such a model takes the following form:

$$y_{it} = \beta y_{it-1} + \eta_i + v_{it}, \qquad |\beta| < 1 \qquad (2)$$

where η_i stands for the individual time invariant effects and v_{it} for the idiosyncratic errors. The time invariant nature of the former effects implies that they are correlated with the dependent variable and also its past realisations which appear on the right-hand side. In the difference estimator the problem of time invariant effects is solved by differencing the model.

$$y_{it} - y_{it-1} = \beta y_{it-1} - \beta y_{it-2} + v_{it} - v_{it-1}, \qquad |\beta| < 1 \qquad (3)$$

Although the time invariant effects are removed the problem of endogeneity remains as the differenced lagged dependent variable and the error term are correlated through the correlation between y_{it-1} and v_{it-1} (Greene, 2002, p. 308). However, under the assumption of no serial correlation in idiosyncratic errors, Arellano and Bond (1991) have proposed the use of lagged difference $y_{it-2} - y_{it-3}$ or lagged level y_{it-2} as instruments (Greene, 2002, p. 308). Higher lags of levels and of differences of endogenous variables can also be used as instruments although the validity of these instruments would depend on their correlation with the explanatory variables. As Greene (2002, p. 309) suggests, the instruments which are lagged too far are likely to bear less information.

The difference estimator has been found to be biased and inefficient in situations when the lagged levels of series are close to a random walk (Blundell and Bond, 1998; Pugh, 2008; Roodman, 2009b). The "system" GMM estimator has an advantage in this situation – it builds a stacked dataset with twice the observations, one for the levels equation and one for the differenced equation. The introduction of levels equation in the model is explained by the argument that past changes may be more predictive of current levels than the levels can be of future changes when the series are close to random walk. Nevertheless, the system is treated as a single equation and the same linear relationship with the same coefficients is believed to apply to both the transformed (differenced) and untransformed (level) variables (Roodman, 2009b). Another advantage of the system estimator over the difference estimator is its ability to include time-invariant variables which are being differenced together with fixed effects in the latter case. Finally, supplementing instruments for differenced equation with those for the levels equation, the system estimator increases the amount of information used in estimation thus leading to an increase in efficiency.

While being superior to the difference estimator in many aspects, the system estimator is not without its flaws. Its most commonly cited problems are the sensitivity to the number of instruments and the violation of the steady-state assumption. Roodman (2009a) notes that in finite samples a large number of instruments may weaken the ability of relevant diagnostics (Hansen test) to reject the null hypothesis of instrument validity. There is no consensus over the question of optimal number of instruments but it is taken as rule of thumb that this number should not exceed the number of groups (cross-sectional units) used in estimation. Another issue recognised in the context of system estimator is the requirement of the steady-state assumption. According to Pugh (2008), there are two requirements for this condition to hold. First, the coefficient on lagged dependent variable must have an absolute value less than unity so that the process is convergent; and second, this process of convergence should not be correlated with time-invariant effects.

In our estimation we use the system dynamic panel system estimator. There are four reasons which can justify this choice. First, the dynamic panel analysis enables us to control for potential endogeneity of other variables caused by their correlation with the unobserved time-invariant characteristics in the same way as the relationship between these characteristics and the lagged dependent variable is controlled for. Second, given that several variables of interest such as the location of firm or technological intensity of its industry are modelled as dummy variables it is more reasonable to use the system estimator which allows the inclusion of time-invariant variables. Third, as we mentioned earlier in the presence of random walk or near random walk processes the system estimator is more efficient. Finally, as we will explain soon, the dynamic analysis provides us with an opportunity to separate and distinguish the short-run from the long-run effects of explanatory variables

Dynamic estimators can be estimated in one-step and two-step procedures. In the one-step procedure the GMM estimator is developed by imposing some reasonable but arbitrary assumption (such as homoscedasticity) about the weighting matrix. However, this estimator is not robust to heteroskedasticity or cross-correlation. Therefore, the procedure for obtaining a robust estimator involves another step in which the residuals from the first step are used to construct the proxy for the optimal weighting matrix which is then embodied in the feasible GMM estimator, which is robust to the modelled patterns of heteroskedasticity and cross-correlation (Roodman, 2009b, p. 95). However, the standard errors obtained in the two-step procedure are known to be downward biased when the number of instruments is large. This problem can be greatly reduced with the use of Windmeijer's (2005) corrections for the two-step standard errors. Given that Windmeijer's corrected standard errors are found to be superior to the cluster-robust one-step standard errors (Roodman, 2009b, p. 98), we have decide to apply this approach.

Another benefit of dynamic analysis is that it allows us to distinguish between the short -and long-run effects. Supposing that equation (2) includes an additional explanatory variable x , this can be written as:

$$y_{it} = \beta_1 y_{it-1} + \beta_2 x_{it} + \eta_i + v_{it}, \qquad |\beta_1| < 1 \qquad (4)$$

In equation (4), the coefficient β_2 is the estimated coefficient and is known as the short-run multiplier which represents only a fraction of the desired change (Greene, 2002, p. 568). The long-run effect can then be calculated algebraically as the product of the coefficient β_2 and the long-run multiplier . The standard error and the corresponding t-statistic for the coefficient obtained this way can then be calculated using the delta-method (Pugh, 1998, p. 99; Greene, 2002, p. 569; Papke and Wooldridge, 2005, p. 413). However, we must bear in mind that the results obtained with the long-run coefficients are valid only under the assumption of the system's stability, i.e. a lack of structural breaks over the course of time which is major simplification. Having that in mind and applying the above mentioned methodology we next turn to the estimation and interpretation of results.

7. Discussion of findings

In the light of the theoretical arguments from Section 2 and the discussion of methodology in the previous section we specify a model in the form of:

$$CI_{it} = c + CI_{it-1} + \beta X + v_i + u_{it} \qquad (5)$$

where CI stands for the competitiveness index measured by the firm's market share, X is a vector consisting of the elements of firm behaviour, characteristics and features of its environment as defined in Section 3, v_i is a vector of are time-invariant unobserved factors, and u_{it} is the usual idiosyncratic error term. After the substitution of X with the set of variables for restructuring, the model takes the following form:

$$CI_{it} = c + \alpha CI_{it-1} + \beta_1 LABPROD_{it} + \beta_2 INVPROD_{it} + \beta_3 UMC_{it} \qquad (6)$$

In addition to variables in equation (6) our discussion has identified unit labour costs as an important factor in explaining ability of firms to compete. However, this variable and labour productivity both reflect the same theoretical and concept, labour efficiency. Thus we have two proxies for labour efficiency and we estimate the model using each of these proxies separately. Finally, the models also include year dummy variables to control for cross-sectional dependence which, as Roodman (2009b) states, which is likely to arise from factors such as universal time-shocks which affect all cross-sectional units.

The model was estimated using the statistical software STATA 11. The lagged dependent variable and variables representing the restructuring of firms, i.e. productivity of investment and of labour, unit labour and unit material costs are treated as endogenous. In the instrumentation matrix they were instrumented with their own lags and lagged differences while the exogenous variables were imputed as their own instruments. The choice of instruments was done according to the principle that all relevant model diagnostics need to be satisfied. However, in situations where several alternative sets of instruments satisfied the above condition we chose those outcomes which made more economic sense. We present here only the results for variables of interest, while the coefficients for year dummy variables are not presented although we do discuss them under the diagnostics of the model.

7.1. Model diagnostics

The most important issue for validity of results obtained with the dynamic panel technique is the proper choice of instruments. As we established in Section 6, in system GMM estimation the instruments used come from within the system. In the levels equation they are found among the one and more periods lagged differences of endogenous variables or current differences of predetermined variables. In the difference equation the endogenous variables are instrumented with their own levels lagged two or more periods and levels of predetermined variables lagged one or more periods. Also, a large number of instruments can overfit endogenous variables and weaken the tests of instrument validity (Roodman, 2009a). In our estimation this number is far below the N (number of cross-sectional observations) ranging between 53 and 86 instruments (Table 7).

The validity of instruments in dynamic panel estimations is tested with the Hansen test and the Arellano-Bond test for autocorrelation in differences of residuals. The null hypothesis in Hansen test is that the overidentifying restrictions are valid. It has been suggested that as well as low values, very high p-values with this test should be viewed with concern. Roodman(2007, p10) advises that the reported p-values at the conventional significance levels of 0.05 or 0.10 should not be viewed with too much confidence. Very high values, close to unity should be viewed with caution as these may be caused with the high instrument count. The p values in Hansen tests of overidentifying restrictions in Table 7 are 0.36 and 0.47 which may be interpreted as a sign of valid instruments.

A further important diagnostic is the m2/m1 test for autocorrelation in disturbances (Arellano and Bond, 1991). This test examines whether there is no second–order autocorrelation of the error term in the first-differenced equation, where the null hypothesis is of no autocorrelation. The test checks for autocorrelation of first and second order for which reason it is known as the m1/m2 test. It is expected that differences of errors are correlated in terms of the MA(1) process, i.e. there is negative correlation of first order. However, it is also expected that there is no second-order autocorrelation in disturbances, i.e. no MA(2) processes which makes the second and higher lags of potentially endogenous variables valid instruments. As it can be seen from Table 7 the null hypothesis of no autocorrelation in differences of errors is rejected for the autocorrelation of first order but there is no sufficient evidence to reject the null hypothesis of no autocorrelation of second order in differences of errors.

We also check whether the steady-state assumption is satisfied and whether any pattern of cross-sectional dependence is identified. With respect to the former objective, Tables A3-A7 in the Appendix provide difference-in-Sargan test for the levels equation. There is not sufficient evidence to reject the null hypothesis of valid instruments for levels which implies that the steady-state assumption can be accepted and the system estimator can be preferred over the difference one. The same tables also include the dummy variables for individual years which are insignificant at conventional levels of significance implying that the units in our sample are not subject to universal time shocks. In addition, as it has been recognised in the literature that problem of cross-sectional dependence may persist even after inclusion of time dummies (Sarafidis et al., 2009, p. 150), we examine the difference-in-Sargan test statistic for the lagged dependent variable. The corresponding p-values suggest that there is not sufficient evidence to reject the null hypothesis that the instruments on lagged dependent variable are valid, implying that our model is unlikely to suffer from cross-sectional dependence (Tables A3-A7 in the Appendix).

Roodman (2009b) notes that the value of true dynamic estimator should lie between the values obtained by OLS and fixed effects methods. Accordingly, the OLS tends to inflate the coefficient on lagged dependent variable while the fixed effects estimation biases it downwards. As Table A8 in the Appendix demonstrates, in both specifications the obtained coefficient on lagged dependent variable is below the one obtained with OLS but higher than the one obtained with fixed effects. Finally, the test for joint significance of explanatory variables in all three models indicates that our chosen variables have jointly explanatory power. These diagnostics suggest that the model is well specified, allowing us to proceed with the interpretation of results.

8. Main results

The results of the estimation procedure are presented in Table 7.[4] The two columns under each country represent two specifications, one using labour productivity, the other using unit labour costs (labled 1 and 2 respectively). The results are broadly consistent across countries. The coefficient on lagged dependent variable is highly significant and positive which can be taken as the evidence of the dynamic nature of competitiveness. The size of the coefficient varies, from 0.2 in Czech Republic, to 0.7 in Croatia, Slovakia and Poland and to the highest 0.91 in Bulgaria. This means that a one percentage point increase in the market share of the previous period explains between 0.17 and 0.90 percentage points change in the firm's market share in the current period.

[4] Tables showing individual countries' estimations are presented in the Appendix, Tables A3-A7.

Table 7: Competitiveness of firms in advanced transition economies

	CROATIA		CZECH REPUBLIC		SLOVAKIA		POLAND		BULGARIA	
	1	2	1	2	1	2	1	2	1	2
lagged dependent variable	0.73 (0.00)	0.86 (0.00)	0.17 (0.03)	0.24 (0.01)	0.68 (0.00)	0.66 (0.00)	0.72 (0.00)	0.69 (0.00)	0.90 (0.00)	0.91 (0.00)
FIRM BEHAVIOUR (RESTRUCTURING)										
Invprod	0.0002 (0.00)	0.0001 (0.00)	-1e-5 (0.38)	-2e-5 (0.30)	1e-05 (0.56)	0.0001 (0.00)	4e-06 (0.06)	9e-07 (0.78)	1e-5 (0.07)	1e-5 (0.00)
Labprod	0.0001 (0.09)	-	3e-5 (0.07)	-	5e-06 (0.00)	-	2e-5 (0.09)	-	2e-5 (0.53)	-
Ulc	-	-0.01 (0.06)	-	0.04 (0.67)	-	-0.001 (0.65)	-	-0.04 (0.07)	-	-0.02 (0.66)
Umc	-0.003 (0.62)	0.002 (0.19)	0.002 (0.49)	-0.02 (0.74)	-0.04 (0.78)	0.08 (0.52)	0.003 (0.93)	-0.02 (0.65)	-0.04 (0.43)	-0.01 (0.69)
AGGLOMERATION EFFECTS										
Lgcit	-0.004 (0.09)	-0.002 (0.33)	0.01 (0.04)	0.01 (0.10)	0.01 (0.65)	0.02 (0.24)	0.001 (0.79)	0.0003 (0.94)	-0.003 (0.59)	0.001 (0.77)
Urbef	-0.02 (0.03)	-0.01 (0.30)	-0.06 (0.02)	-0.04 (0.09)	-0.21 (0.14)	-0.16 (0.24)	-0.04 (0.00)	-0.04 (0.02)	-0.03 (0.00)	-0.02 (0.00)
Locef	-0.39 (0.00)	-0.17 (0.06)	-1.74 (0.00)	-1.63 (0.00)	-1.93 (0.00)	-1.77 (0.00)	-0.53 (0.00)	-0.62 (0.00)	-0.21 (0.15)	-0.14 (0.08)
INDUSTRY SPECIFIC CHARACTERISTICS										
Mlow	-0.01 (0.01)	-0.003 (0.15)	-0.01 (0.34)	-0.01 (0.34)	0.01 (0.53)	0.01 (0.37)	0.001 (0.64)	0.001 (0.49)	0.004 (0.50)	0.002 (0.71)
Mhigh	0.01 (0.15)	0.01 (0.09)	-0.03 (0.00)	-0.03 (0.01)	-0.01 (0.27)	-0.02 (0.19)	-0.001 (0.78)	0.0002 (0.94)	0.002 (0.51)	0.002 (0.46)
High	-0.01 (0.21)	-0.0002 (0.94)	-0.03 (0.00)	-0.03 (0.03)	-0.01 (0.65)	-0.01 (0.80)	-0.003 (0.52)	-0.002 (0.73)	-0.001 (0.82)	0.004 (0.32)
OTHER CHARACTERISTICS										
Age	-0.001 (0.00)	-0.0002 (0.18)	0.001 (0.07)	0.001 (0.46)	0.001 (0.31)	0.0003 (0.69)	0.0001 (0.00)	0.0001 (0.02)	-3e-5 (0.84)	-0.0001 (0.68)
Cons	0.02 (0.00)	0.01 (0.09)	0.13 (0.00)	0.12 (0.00)	0.18 (0.04)	0.11 (0.12)	0.04 (0.08)	0.06 (0.06)	0.05 (0.08)	0.03 (0.09)
MODEL DIAGNOSTICS										
Observations	20785	20883	18544	18852	2831	2871	16893	17088	7412	7411
Groups	3375	3375	6344	6382	826	826	4925	4941	1575	1574
Wald	3017.55	4103.52	672.67	727.79	1084.18	1063.22	4909.50	4274.16	4769.10	4307.51
Prob>chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sargan/Hansen	36.03	67.09	13.40	10.56	22.30	39.19	35.58	42.54	57.29	87.43
Prob>chi2	0.37	0.47	0.50	0.72	0.67	0.78	0.26	0.25	0.32	0.38
AR(1)	-3.14	-4.28	-3.85	-3.52	-4.61	-5.04	-6.81	-6.65	-6.56	-6.80
Prob>chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.02	-0.39	1.51	1.46	1.19	0.70	1.45	0.55	0.95	0.52
Prob>chi2	0.99	0.70	0.13	0.15	0.23	0.48	0.15	0.58	0.34	0.61
Instrument count	53	86	33	33	42	63	49	55	72	103

Note: p-values in brackets are obtained from two-step dynamic panel procedure with Windmeeijer's corrected robust standard errors.

Turning to the relationship between competitiveness and firm behaviour (restructuring) we find statistically significant and positive coefficients on labour productivity in all countries except Bulgaria. Productivity of investment is also positive and significant everwhere except in the Czech Republic (for both specifications) and in Slovakia and Poland (for one specification). However, the magnitude of these coefficients is very low and on average they explain between 0.01 and 0.02 percentage points of change in the market share of firms in our sample. In addition, we obtain statistically significant coefficient with negative sign on unit labour costs for Croatia and Poland. The size of coefficient suggests that efforts of managers to reduce unit labour costs of their firms by one percentage points increases their market share by between 0.01 and 0.04 percentage points. The significance of these coefficients in both short and long run (to be discussed later) indicates that improvements in the competitiveness of firms come from both adjustments within their existing capacities and their involvement in innovation activities. With respect to the latter the evidence indicates that firms in CEECs participate in innovation activities of the type described in Aghion and Howitt (1992) leading to improvements in cost efficiency as well as those referred to in Grosman and Helpman (1994), leading to higher productivity of inputs

The choice between location in large cities or in smaller urban areas appears to make a difference in market share only for firms in the Czech Republic and Croatia as in all other countries the variable is not statistically significant. The positive sign on the coefficient in the Czech Republic suggests that location in large cities increases the market share of Czech firms by about 1 percentage point. This finding can be interpreted as a sign that Czech firms rely on externalities such as access to skilled labour or collaboration with universities, research laboratories etc. to build their competitiveness. Also, it can be the sign that Czech firms, by locating in large cities, benefit from lower costs arising from mass production, easier access to market and better infrastructure. However, the negative coefficient on the location variable for Croatian firms suggests that firms located outside of large urban areas would have a 0.4 percentage points higher market share than their rivals in large cities. This finding can be interpreted as the evidence that Croatian firms consider as more important the benefits provided by smaller urban areas than those which are typical for large cities such as cooperation with research institutes or universities. Thus we may say that ability of the former group of firms to compete rests on different types of agglomeration externalities than the ones which are important for their counterparts located in large cities.

Contrary to expectations, we did not find any evidence for the effect of urbanization or localization economies. The coefficient on the latter variable is highly significant with negative sign in all specifications while the coefficient on former is significant everywhere except in Slovakia and in Croatia (with specification 2). Accordingly, we do not have sufficient evidence to conclude that firms in the manufacturing sector of transition economies benefit from general agglomeration effects such as the sharing of basic assets, resources and institutions or from the industry-specific agglomeration effects such as knowledge spillovers or innovation. Instead, it appears that higher concentration of firms and particularly of firms from same industry in one region has a negative effect on their market share. Our variables may thus be picking up the effect of competition rather than agglomeration effects.

The age variable is significant in specification 1 for Croatia with negative sign and in both specifications for Poland and Czech Republic with positive sign. Such finding suggests that the knowledge accumulated through years of existence acts as competitive disadvantage for Croatian firms while in the case of Czech Republic and Poland the accumulated knowledge about the market system, the networks of suppliers and customers and other related factors help firms to outperform their rivals. However, this finding can also be interpreted as an indicator that some firms in these two countries have maintained their market shares from the pretransition period.

The variables for technology intensity are insignificant in both specifications, except for the medium-low technology intensive firms in Croatia and medium-high and high technology intensive industries in Czech Republic. In both cases, the variables have negative sign which may be taken as an indicator that in given cases, industries of higher technological intensity are characterised by a higher degree of competition than low technology intensive industries, our baseline category.

Finally, the use of dynamic panel analysis permits us to distinguish between the short and long run effects of factors influencing competitiveness of firms. The calculation f the long run effects are presented in the Appendix, Tables A9-A13. These tables demonstrate that long run coefficients are larger than short run coefficients by between 1.2 and 11 times and in most cases retain their significance. These findings indicate that firms in transition economies compete by making defensive short-run adjustments in their behaviour within their existing capacities and technology constraints but also engage in investment in activities such as the new technology, knowledge and human capital whose impact fwould be visible in improved efficiency of their costs, labour and capital in the long run as predicted by the Schumpeterian and endogenous growth literature.

Bringing all these findings together we can identify several stylised facts about the behaviour of firms in CEECs in the advanced stage of transition. First, in all countries we find some evidence of strategic restructuring. Second, in building their relative position on the market, firms rely mainly on improvements in efficiency of labour as the coefficient on labour productivity has been significant in the majority of cases. Third, it appears that firms in our sample do not utilise benefits of agglomeration in a way which would be typical for firms which compete in terms of quality of their products. Rather, their behaviour in this respect implies price-based competitiveness. Fourth, comparing the findings across different countries, it appears that the most extensive restructuring has taken place in Croatian and Polish firms. In addition to improvements in labour productivity firms in these countries have built their competitiveness also through investment in machinery and equipment and improvements in unit labour costs.

9. Conclusion

Why do some firms perform better than others? Much of the recent literature postulates that the key to answering this question lies in the firms' innovation activities. To this end, three main channels through which innovation activities impact the competitiveness of firms are identified: improvements in cost efficiency, productivity of inputs and quality of products. While the nature of the dataset prevented us from addressing the last mechanism, we have examined how former two affect the ability of firms in four advanced CEECs and Croatia to compete. The results indicate that both cost reductions as in Aghion and Howitt (1992) and productivity improvements as in Grossman and Helpman (1994) have important roles in explaining the competitiveness of firms in transition. Our findings also support the thesis about the importance of learning and accumulated knowledge for the ability of firms to compete. To this end, it appears that in building their competitiveness firms in this study rely more on their own experience and less on cooperation and knowledge sharing with other firms.

Our investigation did not find any significant differences in the behaviour of firms in transition economies which are members of EU and firms from Croatia, the current most advanced EU candidate country. In the struggle to retain, or expand, their market shares in the period under consideration, Croatian firms relied on the same factors and strategies as firms in other countries. Moreover, we found more evidence of strategic restructuring in Croatia than in some of the other countries as, in Croatia, the market share of firms was also related to the productivity of investment in addition to labour productivity and unit labour costs. In that respect, the behaviour of Croatian firms was closest to the behaviour of firms from Poland as this was the only other country in the study where firms demonstrated similar pattern of behaviour.

Summarizing the empirical results of this investigation we can identify three important findings. First, competitiveness is a dynamic phenomenon which is closely related to innovation activities which facilitate strategic restructuring. Second, the behaviour of firms in CEECs is still based on the same foundations as in earlier years of transition, they resemble many characteristics of price-competitive firms and in that respect our findings are in line with earlier transition literature. Finally, the behaviour of Croatian firms does not significantly differ from the behaviour of firms in other CEECs which suggests that Croatian firms are able to catch-up with the former group in the advanced stage of transition.

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Appendices

Table A1: Classification of industries by technological intensity

Description of industry	NACE Code
High technology intensive industries	
Aircraft and spacecraft	353
Pharmaceuticals	2423
Office accounting and computing machinery	30
Radio, TV and communications equipment	32
Medical, precision and optical instruments	33
Medium-high technology intensive industries	
Chemicals excluding pharmaceuticals	24 excl 2423
Electrical machinery and apparatus n.e.c.	31
Motor vehicles, trailers and semi-trailers	34
Railroad equipment and transport equipment, n.e.c.	352+359
Machinery and equipment, n.e.c.	29
Medium-low technology intensive industries	
Coke, refined petroleum products and nuclear fuel	23
Rubber and plastic products	25
Other non-metallic mineral products	26
Basic metals and fabricated metal products	27-28
Building and repairing of ships and boats	351
Low technology intensive industries	
Food products, beverages and tobacco	15-16
Textiles, textile products, leather and footwear	17-19
Wood, pulp, paper, paper products, printing and publishing	20-22
Manufacturing n.e.c, Recycling	36-37

Source: OECD, 2007

Table A2: Summary statistics for productivity of investment and its constituent variables

Name	Turnover			Tangible Fixed Assets			Invprod		
	Mean	St Dev	Miss (%)	Mean	St Dev	Miss (%)	Mean	St Dev	Miss (%)
Croatia	4523	45040	0%	2392	24383	0%	-10.4	354	7.8%
Czech Republic	10096	85223	0%	3374	24356	0%	-4.1	810	7.8%
Bulgaria	2016	6631	0%	953	4180	0%	-10.0	372	14.2%
Slovakia	12316	28824	0%	4642	17134	0%	14.5	534	4.6%
Poland	12560	64922	0%	4634	150998	0%	-12.0	1349	6.4%

Table A3: Estimation of Market Share for Croatia

```
. xtabond2 MSHARE l.MSHARE INVPROD LABPROD UMC lgcit mlow mhigh high URBEF LOCE
> F AGE yr3-yr9, gmm(l.MSHARE, lag(1 1)) gmm(INVPROD LABPROD, lag(2 2) collapse
> ) gmm(UMC, lag(2 3)) iv(lgcit URBEF LOCEF mlow mhigh high AGE yr3-yr9) twoste
> p robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-ste
> p estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     20785
Time variable : Year                            Number of groups   =      3375
Number of instruments = 53                      Obs per group: min =         1
Wald chi2(18) =   3017.55                                      avg =      6.16
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .7246705    .072113    10.05   0.000     .5833316    .8660094
     INVPROD |   .0002375   .0000808     2.94   0.003     .0000791    .0003958
     LABPROD |   .0001126   .0000667     1.69   0.091    -.0000181    .0002434
         UMC |   -.003473   .0069209    -0.50   0.616    -.0170378    .0100918
       lgcit |  -.0038601   .0023236    -1.66   0.097    -.0084143    .0006941
        mlow |  -.0060429   .0024699    -2.45   0.014    -.0108838   -.001202
       mhigh |    .004655   .0032373     1.44   0.150    -.0016899        .011
        high |  -.0051248   .0040963    -1.25   0.211    -.0131535    .0029039
       URBEF |  -.3859633    .109613    -3.52   0.000    -.6008009   -.1711257
       LOCEF |  -.0174073   .0079565    -2.19   0.029    -.0330018   -.0018128
         AGE |  -.0005781   .0001858    -3.11   0.002    -.0009423   -.0002138
         yr3 |   .0008521   .0019013     0.45   0.654    -.0028743    .0045785
         yr4 |   .0017858   .0018878     0.95   0.344    -.0019143    .0054858
         yr5 |   .0005833   .0023647     0.25   0.805    -.0040515    .0052181
         yr6 |  -.0008151   .0024484    -0.33   0.739    -.0056138    .0039837
         yr7 |  -.0057546   .0033052    -1.74   0.082    -.0122328    .0007235
         yr8 |  -.0011546   .0031954    -0.36   0.718    -.0074175    .0051083
         yr9 |  -.0035513   .0035809    -0.99   0.321    -.0105696    .0034671
       _cons |   .0242485   .0092539     2.62   0.009     .0061112    .0423857
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit URBEF LOCEF mlow mhigh high AGE yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.L.MSHARE
    L2.(INVPROD LABPROD) collapsed
    L(2/3).UMC
Instruments for levels equation
  Standard
    _cons
    lgcit URBEF LOCEF mlow mhigh high AGE yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE
    DL.(INVPROD LABPROD) collapsed
    DL.UMC
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.14  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   0.02  Pr > z =  0.987
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(34)   = 153.10  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(34)   =  36.03  Prob > chi2 =  0.374
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(18)   =  15.01  Prob > chi2 =  0.661
    Difference (null H = exogenous): chi2(16)   =  21.02  Prob > chi2 =  0.178
  gmm(L.MSHARE, lag(1 1))
    Hansen test excluding group:     chi2(20)   =  18.96  Prob > chi2 =  0.524
    Difference (null H = exogenous): chi2(14)   =  17.07  Prob > chi2 =  0.252
  gmm(INVPROD LABPROD, collapse lag(2 2))
    Hansen test excluding group:     chi2(31)   =  32.16  Prob > chi2 =  0.409
    Difference (null H = exogenous): chi2(3)    =   3.88  Prob > chi2 =  0.275
  gmm(UMC, lag(2 3))
    Hansen test excluding group:     chi2(13)   =  15.64  Prob > chi2 =  0.269
    Difference (null H = exogenous): chi2(21)   =  20.39  Prob > chi2 =  0.496
  iv(lgcit URBEF LOCEF mlow mhigh high AGE yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(20)   =  19.27  Prob > chi2 =  0.505
    Difference (null H = exogenous): chi2(14)   =  16.77  Prob > chi2 =  0.269
```

```
. xtabond2 MSHARE l.MSHARE INVPROD ULC UMC lgcit mlow mhigh high URBEF LOCEF AGE
>  yr3-yr9, gmm(l.MSHARE, lag(1 1)) gmm(INVPROD, lag(2 5) coll) gmm(ULC, lag(2 .
> )) gmm(UMC, lag(2 3)) iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3-yr9) twoste
> p robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
> space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step
>  estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     20883
Time variable : Year                            Number of groups   =      3375
Number of instruments = 89                      Obs per group: min =         1
Wald chi2(18) =   4157.19                                      avg =      6.19
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .8585691    .062633    13.71   0.000     .7358106    .9813276
             |
     INVPROD |   .0001325   .0000491     2.70   0.007     .0000362    .0002288
         ULC |  -.0049641   .0025948    -1.91   0.056    -.0100498    .0001216
         UMC |   .0016906   .0012949     1.31   0.192    -.0008473    .0042286
       lgcit |  -.0019098   .0019302    -0.99   0.322    -.0056929    .0018733
        mlow |  -.0026977   .0018427    -1.46   0.143    -.0063093    .0009139
       mhigh |   .0045453   .0026643     1.71   0.088    -.0006766    .0097673
        high |  -.0004135   .0031963    -0.13   0.897    -.0066781    .0058512
       URBEF |  -.0058635   .0056742    -1.03   0.301    -.0169847    .0052576
       LOCEF |  -.1726855   .0919024    -1.88   0.060    -.3528109      .00744
         AGE |   .0002073   .0001569     1.32   0.186    -.0001002    .0005148
         yr3 |   .0019606   .0015272     1.28   0.199    -.0010327    .0049539
         yr4 |   .0024746   .0014662     1.69   0.091    -.0003991    .0053483
         yr5 |   .0019189   .0018632     1.03   0.303    -.0017329    .0055708
         yr6 |   .0009896   .0019032     0.52   0.603    -.0027406    .0047198
         yr7 |  -.0001416   .0021716    -0.07   0.948    -.0043979    .0041147
         yr8 |   .0033759   .0022556     1.50   0.134    -.0010451    .0077968
         yr9 |   .0023472    .002176     1.08   0.281    -.0019176    .0066121
       _cons |   .0120018   .0071642     1.68   0.094    -.0020398    .0260435
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.L.MSHARE
    L(2/5).INVPROD collapsed
    L(2/.).ULC
    L(2/3).UMC
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE
    DL.INVPROD collapsed
    DL.ULC
    DL.UMC
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.32  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.39  Pr > z =  0.695
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(70)   = 203.58  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(70)   =  67.67  Prob > chi2 =  0.557
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(45)    =  40.14  Prob > chi2 =  0.678
    Difference (null H = exogenous): chi2(25)    =  27.54  Prob > chi2 =  0.330
  gmm(L.MSHARE, lag(1 1))
    Hansen test excluding group:     chi2(57)    =  50.30  Prob > chi2 =  0.723
    Difference (null H = exogenous): chi2(13)    =  17.37  Prob > chi2 =  0.183
  gmm(INVPROD, collapse lag(2 5))
    Hansen test excluding group:     chi2(66)    =  62.46  Prob > chi2 =  0.601
    Difference (null H = exogenous): chi2(4)     =   5.21  Prob > chi2 =  0.266
  gmm(ULC, lag(2 .))
    Hansen test excluding group:     chi2(34)    =  27.78  Prob > chi2 =  0.765
    Difference (null H = exogenous): chi2(36)    =  39.89  Prob > chi2 =  0.301
  gmm(UMC, lag(2 3))
    Hansen test excluding group:     chi2(49)    =  40.49  Prob > chi2 =  0.801
    Difference (null H = exogenous): chi2(21)    =  27.18  Prob > chi2 =  0.165
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(56)    =  52.76  Prob > chi2 =  0.598
    Difference (null H = exogenous): chi2(14)    =  14.91  Prob > chi2 =  0.384
```

Table A4: Estimation of Market Share for Czech Republic

```
. xtabond2 MSHARE l.MSHARE INVPROD LABPROD UMC lgcit mlow mhigh high URBEF LOCE
> F AGE yr3-yr9, gmm(l.MSHARE, lag(1 3) collapse) gmm(INVPROD, lag(2 2) collaps
> e) gmm(LABPROD UMC, lag(2 6) collapse) iv(lgcit mlow mhigh high AGE URBEF LOC
> EF yr3-yr9) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     18544
Time variable : Year                            Number of groups   =      6344
Number of instruments = 33                      Obs per group: min =         1
Wald chi2(18) =    672.67                                      avg =      2.92
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .1729925   .0833217     2.08   0.038      .009685       .3363
     INVPROD |  -.0000134   .0000153    -0.88   0.381    -.0000435    .0000166
     LABPROD |   .0000257   .0000144     1.79   0.074    -2.48e-06    .0000539
         UMC |   .0019515   .0028254     0.69   0.490    -.0035863    .0074892
       lgcit |   .0133109   .0065545     2.03   0.042     .0004644    .0261575
        mlow |  -.0049458   .0051948    -0.95   0.341    -.0151275    .0052359
       mhigh |   -.030486     .00871    -3.50   0.000    -.0475573   -.0134147
        high |  -.0253406   .0084761    -2.99   0.003    -.0419534   -.0087278
       URBEF |  -1.736715   .2084701    -8.33   0.000    -2.145309   -1.328121
       LOCEF |  -.0593256   .0262107    -2.26   0.024    -.1106977   -.0079535
         AGE |   .0013933   .0007808     1.78   0.074    -.0001371    .0029236
         yr3 |  -.0253369   .0071366    -3.55   0.000    -.0393244   -.0113495
         yr4 |  -.0444292   .0088358    -5.03   0.000    -.0617471   -.0271113
         yr5 |  -.0573736   .0105976    -5.41   0.000    -.0781445   -.0366027
         yr6 |   -.066865     .01268    -5.27   0.000    -.0917173   -.0420127
         yr7 |   -.066547   .0120349    -5.53   0.000     -.090135    -.042959
         yr8 |  -.0593157   .0117446    -5.05   0.000    -.0823347   -.0362968
         yr9 |   .1280169   .0151839     8.43   0.000      .098257    .1577769
       _cons |   .1288181   .0187362     6.88   0.000     .0920958    .1655404
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/3).L.MSHARE collapsed
    L2.INVPROD collapsed
    L(2/6).(LABPROD UMC) collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE collapsed
    DL.INVPROD collapsed
    DL.(LABPROD UMC) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.85  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.51  Pr > z =  0.131
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(14)   = 129.99  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(14)   =  13.40  Prob > chi2 =  0.495
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(10)   =   7.59  Prob > chi2 =  0.669
    Difference (null H = exogenous): chi2(4)    =   5.81  Prob > chi2 =  0.214
  gmm(L.MSHARE, collapse lag(1 3))
    Hansen test excluding group:     chi2(10)   =   5.46  Prob > chi2 =  0.858
    Difference (null H = exogenous): chi2(4)    =   7.93  Prob > chi2 =  0.094
  gmm(INVPROD, collapse lag(2 2))
    Hansen test excluding group:     chi2(12)   =  12.66  Prob > chi2 =  0.394
    Difference (null H = exogenous): chi2(2)    =   0.73  Prob > chi2 =  0.693
  gmm(LABPROD UMC, collapse lag(2 6))
    Hansen test excluding group:     chi2(2)    =   4.28  Prob > chi2 =  0.118
    Difference (null H = exogenous): chi2(12)   =   9.12  Prob > chi2 =  0.693
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(0)    =   0.19  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(14)   =  13.21  Prob > chi2 =  0.510
```

```
. xtabond2 MSHARE l.MSHARE INVPROD ULC UMC lgcit mlow mhigh high URBEF LOCEF AG
> E yr3-yr9, gmm(l.MSHARE, lag(1 3) collapse) gmm(INVPROD, lag(2 2) collapse) g
> mm(ULC UMC, lag(2 6) collapse) iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3-y
> r9) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     18852
Time variable : Year                            Number of groups   =      6382
Number of instruments = 33                      Obs per group: min =         1
Wald chi2(18) =    727.79                                      avg =      2.95
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .2439092   .0941547     2.59   0.010     .0593693    .4284491
     INVPROD |  -.0000198   .0000192    -1.03   0.302    -.0000575    .0000178
         ULC |   .0449128   .1058603     0.42   0.671    -.1625695    .2523952
         UMC |  -.0178536   .0536387    -0.33   0.739    -.1229835    .0872763
       lgcit |    .014281   .0087226     1.64   0.102     -.002815    .0313771
        mlow |  -.0052216   .0054382    -0.96   0.337    -.0158802     .005437
       mhigh |  -.0313717   .0121757    -2.58   0.010    -.0552355   -.0075078
        high |  -.0292361   .0133825    -2.18   0.029    -.0554653   -.0030069
       URBEF |  -1.625092   .2508719    -6.48   0.000    -2.116792   -1.133392
       LOCEF |  -.0435823   .0260555    -1.67   0.094    -.0946502    .0074855
         AGE |   .0012306   .0016466     0.75   0.455    -.0019967    .0044579
         yr3 |  -.0251094     .00737    -3.41   0.001    -.0395542   -.0106645
         yr4 |  -.0454973   .0100117    -4.54   0.000    -.0651198   -.0258747
         yr5 |  -.0568143    .009744    -5.83   0.000    -.0759122   -.0377164
         yr6 |  -.0656528   .0141003    -4.66   0.000    -.0932889   -.0380166
         yr7 |  -.0643253   .0121625    -5.29   0.000    -.0881634   -.0404872
         yr8 |  -.0568021   .0118703    -4.79   0.000    -.0800674   -.0335368
         yr9 |   .1305605   .0160421     8.14   0.000     .0991186    .1620025
       _cons |   .1213751   .0217417     5.58   0.000     .0787621     .163988
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/3).L.MSHARE collapsed
    L2.INVPROD collapsed
    L(2/6).(ULC UMC) collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE collapsed
    DL.INVPROD collapsed
    DL.(ULC UMC) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.52  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.46  Pr > z =  0.146
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(14)   =  84.70  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(14)   =  10.56  Prob > chi2 =  0.720
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(10)   =   6.94  Prob > chi2 =  0.731
    Difference (null H = exogenous): chi2(4)    =   3.62  Prob > chi2 =  0.460
  gmm(L.MSHARE, collapse lag(1 3))
    Hansen test excluding group:     chi2(10)   =   6.38  Prob > chi2 =  0.782
    Difference (null H = exogenous): chi2(4)    =   4.18  Prob > chi2 =  0.383
  gmm(INVPROD, collapse lag(2 2))
    Hansen test excluding group:     chi2(12)   =   9.93  Prob > chi2 =  0.622
    Difference (null H = exogenous): chi2(2)    =   0.63  Prob > chi2 =  0.730
  gmm(ULC UMC, collapse lag(2 6))
    Hansen test excluding group:     chi2(2)    =   0.75  Prob > chi2 =  0.687
    Difference (null H = exogenous): chi2(12)   =   9.81  Prob > chi2 =  0.633
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(0)    =   0.26  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(14)   =  10.30  Prob > chi2 =  0.740
```

Table A5 Estimation of Market Share for Slovakia

```
. xtabond2 MSHARE l.MSHARE INVPROD LABPROD UMC lgcit mlow mhigh high URBEF LOCEF
>  AGE yr4-yr7 if Year>2000, gmm(l.MSHARE, lag(2 .) coll) gmm(INVPROD, lag(3 4)
> coll) gmm(LABPROD, lag(3 5)) gmm(UMC, lag(3 5)  coll) iv(lgcit mlow mhigh high
> ) iv(AGE URBEF LOCEF yr4-yr7) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
> space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step
>  estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =      2831
Time variable : Year                            Number of groups   =       826
Number of instruments = 42                      Obs per group: min =         1
Wald chi2(15) =   1084.18                                      avg =      3.43
Prob > chi2   =     0.000                                      max =         6
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .6814945   .0959677     7.10   0.000     .4934011    .8695878
             |
     INVPROD |   .0000121   .0000209     0.58   0.561    -.0000288    .0000531
     LABPROD |   5.53e-06   1.79e-06     3.09   0.002     2.02e-06    9.04e-06
         UMC |  -.0383543   .1389877    -0.28   0.783    -.3107652    .2340565
       lgcit |   .0084884   .0184508     0.46   0.645    -.0276746    .0446514
        mlow |   .0068983    .010944     0.63   0.528    -.0145516    .0283482
       mhigh |   -.014253   .0116159    -1.23   0.220    -.0370197    .0085137
        high |  -.0090723   .0198523    -0.46   0.648    -.0479821    .0298374
       URBEF |  -.2110409   .1415635    -1.49   0.136    -.4885003    .0664185
       LOCEF |  -1.935242   .5544676    -3.49   0.000    -3.021979   -.8485057
         AGE |   .0007707   .0007627     1.01   0.312    -.0007242    .0022655
         yr4 |  -.0054832   .0182951    -0.30   0.764    -.0413409    .0303745
         yr5 |  -.0484474    .009686    -5.00   0.000    -.0674316   -.0294632
         yr6 |   -.040553   .0053831    -7.53   0.000    -.0511038   -.0300023
         yr7 |  -.0184141   .0043211    -4.26   0.000    -.0268833   -.0099449
       _cons |   .1818206   .0879154     2.07   0.039     .0095095    .3541317
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high)
    D.(AGE URBEF LOCEF yr4 yr5 yr6 yr7)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/.).L.MSHARE collapsed
    L(3/4).INVPROD collapsed
    L(3/5).LABPROD
    L(3/5).UMC collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high
    AGE URBEF LOCEF yr4 yr5 yr6 yr7
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.L.MSHARE collapsed
    DL2.INVPROD collapsed
    DL2.LABPROD
    DL2.UMC collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.61  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.19  Pr > z =  0.233
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(26)    =  25.10  Prob > chi2 =  0.513
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(26)    =  22.30  Prob > chi2 =  0.672
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(17)    =  17.64  Prob > chi2 =  0.412
    Difference (null H = exogenous): chi2(9)     =   4.66  Prob > chi2 =  0.863
  gmm(L.MSHARE, collapse lag(2 .))
    Hansen test excluding group:     chi2(22)    =  18.85  Prob > chi2 =  0.654
    Difference (null H = exogenous): chi2(4)     =   3.44  Prob > chi2 =  0.486
  gmm(INVPROD, collapse lag(3 4))
    Hansen test excluding group:     chi2(23)    =  17.90  Prob > chi2 =  0.763
    Difference (null H = exogenous): chi2(3)     =   4.40  Prob > chi2 =  0.221
  gmm(LABPROD, lag(3 5))
    Hansen test excluding group:     chi2(7)     =   5.99  Prob > chi2 =  0.541
    Difference (null H = exogenous): chi2(19)    =  16.31  Prob > chi2 =  0.636
  gmm(UMC, collapse lag(3 5))
    Hansen test excluding group:     chi2(22)    =  20.09  Prob > chi2 =  0.578
    Difference (null H = exogenous): chi2(4)     =   2.21  Prob > chi2 =  0.697
  iv(lgcit mlow mhigh high)
    Hansen test excluding group:     chi2(22)    =  19.51  Prob > chi2 =  0.613
    Difference (null H = exogenous): chi2(4)     =   2.79  Prob > chi2 =  0.594
  iv(AGE URBEF LOCEF yr4 yr5 yr6 yr7)
    Hansen test excluding group:     chi2(19)    =  17.39  Prob > chi2 =  0.563
    Difference (null H = exogenous): chi2(7)     =   4.90  Prob > chi2 =  0.672
```

```
. xtabond2 MSHARE l.MSHARE INVPROD ULC UMC lgcit mlow mhigh high URBEF LOCEF AGE
>  yr4-yr7 if Year>2000, gmm(l.MSHARE, lag(2 .) collapse) gmm(INVPROD, lag(3 .)
> coll) gmm(ULC UMC, lag(3 .)) iv(lgcit mlow mhigh high AGE URBEF LOCEF) iv(yr4-
> yr7) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
> space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step
>  estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =      2871
Time variable : Year                            Number of groups   =       826
Number of instruments = 63                      Obs per group: min =         1
Wald chi2(15) =   1063.22                                      avg =      3.48
Prob > chi2   =     0.000                                      max =         6
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .6639791   .1020606     6.51   0.000      .463944    .8640142
             |
     INVPROD |   .0000942   .0000315     2.99   0.003     .0000324     .000156
         ULC |  -.0010771   .0023433    -0.46   0.646    -.0056698    .0035156
         UMC |   .0808056   .1252651     0.65   0.519    -.1647095    .3263207
       lgcit |   .0211811   .0178806     1.18   0.236    -.0138642    .0562264
        mlow |   .0093534   .0105104     0.89   0.374    -.0112466    .0299533
       mhigh |  -.0155744   .0117773    -1.32   0.186    -.0386574    .0075087
        high |  -.0053183   .0211343    -0.25   0.801    -.0467409    .0361042
       URBEF |  -.1555816   .1317962    -1.18   0.238    -.4138973    .1027341
       LOCEF |  -1.771958   .5138758    -3.45   0.001    -2.779136   -.7647799
         AGE |   .0003003   .0007481     0.40   0.688    -.0011659    .0017665
         yr4 |   .0022352    .018593     0.12   0.904    -.0342065    .0386769
         yr5 |  -.0378076   .0092174    -4.10   0.000    -.0558733   -.0197419
         yr6 |  -.0363497   .0049558    -7.33   0.000    -.0460628   -.0266365
         yr7 |  -.0113119   .0044284    -2.55   0.011    -.0199915   -.0026323
       _cons |   .1137342   .0739375     1.54   0.124    -.0311806     .258649
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF)
    D.(yr4 yr5 yr6 yr7)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/.).L.MSHARE collapsed
    L(3/.).INVPROD collapsed
    L(3/.).(ULC UMC)
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF
    yr4 yr5 yr6 yr7
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.L.MSHARE collapsed
    DL2.INVPROD collapsed
    DL2.(ULC UMC)
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.04  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.70  Pr > z =  0.482
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(47)   =  38.15  Prob > chi2 =  0.818
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(47)   =  39.19  Prob > chi2 =  0.784
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(32)   =  23.51  Prob > chi2 =  0.862
    Difference (null H = exogenous): chi2(15)   =  15.68  Prob > chi2 =  0.403
  gmm(L.MSHARE, collapse lag(2 .))
    Hansen test excluding group:     chi2(45)   =  36.68  Prob > chi2 =  0.807
    Difference (null H = exogenous): chi2(2)    =   2.51  Prob > chi2 =  0.284
  gmm(INVPROD, collapse lag(3 .))
    Hansen test excluding group:     chi2(42)   =  35.63  Prob > chi2 =  0.745
    Difference (null H = exogenous): chi2(5)    =   3.56  Prob > chi2 =  0.614
  gmm(ULC UMC, lag(3 .))
    Hansen test excluding group:     chi2(3)    =   1.17  Prob > chi2 =  0.761
    Difference (null H = exogenous): chi2(44)   =  38.03  Prob > chi2 =  0.724
  iv(lgcit mlow mhigh high AGE URBEF LOCEF)
    Hansen test excluding group:     chi2(40)   =  36.56  Prob > chi2 =  0.626
    Difference (null H = exogenous): chi2(7)    =   2.63  Prob > chi2 =  0.917
  iv(yr4 yr5 yr6 yr7)
    Hansen test excluding group:     chi2(43)   =  35.97  Prob > chi2 =  0.768
    Difference (null H = exogenous): chi2(4)    =   3.23  Prob > chi2 =  0.521
```

Table A6 Estimation of Market Share for Poland

```
. xtabond2 MSHARE l.MSHARE INVPROD LABPROD UMC lgcit mlow mhigh high AGE URBEF
> LOCEF yr3-yr8, gmm(l.MSHARE, lag(1 5) collapse) gmm(LABPROD, lag(2 3)) gmm(IN
> VPROD, lag(2 2)) gmm(UMC, lag(2 2) collapse) iv(lgcit mlow mhigh high AGE URB
> EF LOCEF yr3-yr8) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-ste
> p estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     16893
Time variable : Year                            Number of groups   =      4925
Number of instruments = 49                      Obs per group: min =         1
Wald chi2(17) =   4909.50                                      avg =      3.43
Prob > chi2   =     0.000                                      max =         7
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .7243541   .0411651    17.60   0.000     .6436719    .8050362
     INVPROD |   3.90e-06   2.10e-06     1.86   0.063    -2.17e-07    8.01e-06
     LABPROD |   .0000207   .0000123     1.68   0.092    -3.41e-06    .0000448
         UMC |   .0025243   .0271572     0.09   0.926    -.0507029    .0557514
       lgcit |   .0006916   .0026071     0.27   0.791    -.0044183    .0058015
        mlow |   .0008435   .0018008     0.47   0.640    -.0026861    .0043731
       mhigh |  -.0006101   .0021972    -0.28   0.781    -.0049165    .0036964
        high |  -.0026671   .0041213    -0.65   0.518    -.0107447    .0054105
         AGE |   .0001087   .0000391     2.78   0.005     .0000321    .0001852
       URBEF |  -.5283295    .106924    -4.94   0.000    -.7378966   -.3187623
       LOCEF |  -.0395119   .0150856    -2.62   0.009    -.0690791   -.0099447
         yr3 |  -.0067443   .0026616    -2.53   0.011     -.011961   -.0015277
         yr4 |   -.007928   .0029899    -2.65   0.008    -.0137881   -.0020678
         yr5 |  -.0076454   .0035132    -2.18   0.030    -.0145313   -.0007596
         yr6 |  -.0098098   .0036741    -2.67   0.008     -.017011   -.0026087
         yr7 |  -.0155982   .0039877    -3.91   0.000    -.0234139   -.0077824
         yr8 |  -.0227017   .0043319    -5.24   0.000    -.0311921   -.0142113
       _cons |   .0347331   .0198471     1.75   0.080    -.0041665    .0736326
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/5).L.MSHARE collapsed
    L(2/3).LABPROD
    L2.INVPROD
    L2.UMC collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE collapsed
    DL.LABPROD
    DL.INVPROD
    DL.UMC collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.81  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.45  Pr > z =  0.148
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(31)   = 203.06  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(31)   =  35.58  Prob > chi2 =  0.262
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(16)   =  23.98  Prob > chi2 =  0.090
    Difference (null H = exogenous): chi2(15)   =  11.60  Prob > chi2 =  0.709
  gmm(L.MSHARE, collapse lag(1 5))
    Hansen test excluding group:     chi2(27)   =  29.68  Prob > chi2 =  0.328
    Difference (null H = exogenous): chi2(4)    =   5.89  Prob > chi2 =  0.207
  gmm(LABPROD, lag(2 3))
    Hansen test excluding group:     chi2(13)   =  15.38  Prob > chi2 =  0.284
    Difference (null H = exogenous): chi2(18)   =  20.20  Prob > chi2 =  0.322
  gmm(INVPROD, lag(2 2))
    Hansen test excluding group:     chi2(20)   =  27.76  Prob > chi2 =  0.115
    Difference (null H = exogenous): chi2(11)   =   7.82  Prob > chi2 =  0.730
  gmm(UMC, collapse lag(2 2))
    Hansen test excluding group:     chi2(29)   =  33.87  Prob > chi2 =  0.244
    Difference (null H = exogenous): chi2(2)    =   1.71  Prob > chi2 =  0.425
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8)
    Hansen test excluding group:     chi2(18)   =  19.70  Prob > chi2 =  0.350
    Difference (null H = exogenous): chi2(13)   =  15.87  Prob > chi2 =  0.256
```

```
. xtabond2 MSHARE l.MSHARE INVPROD ULC UMC lgcit mlow mhigh high AGE URBEF LOCE
> F yr3-yr8, gmm(l.MSHARE, lag(1 .)) gmm(ULC, lag(2 2) collapse) gmm(INVPROD, l
> ag(2 2)) gmm(UMC, lag(2 2) collapse) iv(lgcit mlow mhigh high AGE URBEF LOCEF
>  yr3-yr8) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-ste
> p estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =     17088
Time variable : Year                            Number of groups   =      4941
Number of instruments = 55                      Obs per group: min =         1
Wald chi2(17) =   4274.16                                      avg =      3.46
Prob > chi2   =     0.000                                      max =         7
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .6852191   .0442066    15.50   0.000     .5985757    .7718624
     INVPROD |   9.39e-07   3.34e-06     0.28   0.778    -5.60e-06    7.48e-06
         ULC |  -.0367381   .0204826    -1.79   0.073    -.0768832     .003407
         UMC |  -.0213944   .0474386    -0.45   0.652    -.1143724    .0715836
       lgcit |   .0003159   .0040188     0.08   0.937    -.0075609    .0081927
        mlow |   .0014514   .0020921     0.69   0.488     -.002649    .0055517
       mhigh |   .0002207   .0027905     0.08   0.937    -.0052485    .0056899
        high |  -.0017513   .0050985    -0.34   0.731    -.0117442    .0082416
         AGE |   .0001025    .000045     2.27   0.023     .0000142    .0001908
       URBEF |   -.616349   .1109961    -5.55   0.000    -.8338973   -.3988007
       LOCEF |  -.0379504   .0156109    -2.43   0.015    -.0685471   -.0073536
         yr3 |  -.0065824   .0021714    -3.03   0.002    -.0108383   -.0023266
         yr4 |   -.009524   .0027806    -3.43   0.001    -.0149738   -.0040742
         yr5 |  -.0119839   .0036505    -3.28   0.001    -.0191388   -.0048291
         yr6 |  -.0138176   .0035882    -3.85   0.000    -.0208503   -.0067848
         yr7 |   -.019339   .0039387    -4.91   0.000    -.0270587   -.0116193
         yr8 |  -.0260982   .0044356    -5.88   0.000    -.0347918   -.0174046
       _cons |   .0636503   .0337678     1.88   0.059    -.0025333    .1298339
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/.).L.MSHARE
    L2.ULC collapsed
    L2.INVPROD
    L2.UMC collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.MSHARE
    DL.ULC collapsed
    DL.INVPROD
    DL.UMC collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.65  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.55  Pr > z =  0.581
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(37)   = 591.57  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(37)   =  42.54  Prob > chi2 =  0.245
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(24)   =  30.98  Prob > chi2 =  0.154
    Difference (null H = exogenous): chi2(13)   =  11.57  Prob > chi2 =  0.563
  gmm(L.MSHARE, lag(1 .))
    Hansen test excluding group:     chi2(10)   =   7.76  Prob > chi2 =  0.652
    Difference (null H = exogenous): chi2(27)   =  34.78  Prob > chi2 =  0.144
  gmm(ULC, collapse lag(2 2))
    Hansen test excluding group:     chi2(36)   =  41.83  Prob > chi2 =  0.233
    Difference (null H = exogenous): chi2(1)    =   0.72  Prob > chi2 =  0.396
  gmm(INVPROD, lag(2 2))
    Hansen test excluding group:     chi2(26)   =  35.10  Prob > chi2 =  0.110
    Difference (null H = exogenous): chi2(11)   =   7.45  Prob > chi2 =  0.762
  gmm(UMC, collapse lag(2 2))
    Hansen test excluding group:     chi2(35)   =  41.68  Prob > chi2 =  0.203
    Difference (null H = exogenous): chi2(2)    =   0.87  Prob > chi2 =  0.648
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8)
    Hansen test excluding group:     chi2(24)   =  31.39  Prob > chi2 =  0.143
    Difference (null H = exogenous): chi2(13)   =  11.15  Prob > chi2 =  0.598
```

Table A7 Estimation of Market Share for Bulgaria

```
. xtabond2 MSHARE l.MSHARE INVPROD LABPROD UMC lgcit mlow mhigh high AGE URBEF
> LOCEF yr3-yr9, gmm(l.MSHARE, lag(2 2)) gmm(INVPROD LABPROD, lag(3 5)) gmm(UMC
> , lag(3 .) collapse) iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3-yr9) twoste
> p robust orthogonal
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-ste
> p estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =      7412
Time variable : Year                            Number of groups   =      1575
Number of instruments = 72                      Obs per group: min =         1
Wald chi2(18) =   4769.10                                      avg =      4.71
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |   .8954303   .0614485    14.57   0.000     .7749935    1.015867
     INVPROD |     .00001   5.53e-06     1.81   0.070    -8.29e-07    .0000209
     LABPROD |   .0000196   .0000312     0.63   0.530    -.0000416    .0000808
         UMC |  -.0393604   .0493742    -0.80   0.425     -.136132    .0574112
       lgcit |  -.0025714   .0047346    -0.54   0.587    -.0118511    .0067084
        mlow |   .0040701   .0060372     0.67   0.500    -.0077625    .0159028
       mhigh |   .0021807   .0032858     0.66   0.507    -.0042594    .0086207
        high |  -.0012644   .0054725    -0.23   0.817    -.0119903    .0094615
         AGE |  -.0000373   .0001872    -0.20   0.842    -.0004042    .0003295
       URBEF |  -.2090469   .1452153    -1.44   0.150    -.4936636    .0755698
       LOCEF |  -.0246419   .0080047    -3.08   0.002    -.0403308   -.0089529
         yr3 |  -.0057342   .0037446    -1.53   0.126    -.0130735    .0016052
         yr4 |   .0152586   .0039321     3.88   0.000     .0075518    .0229655
         yr5 |  -.0021721   .0037279    -0.58   0.560    -.0094786    .0051343
         yr6 |  -.0055851   .0036356    -1.54   0.124    -.0127107    .0015406
         yr7 |  -.0026601   .0037234    -0.71   0.475    -.0099579    .0046377
         yr8 |   .0017768   .0035572     0.50   0.617    -.0051951    .0087487
         yr9 |    .304863    .024866    12.26   0.000     .2561265    .3535994
       _cons |   .0452679   .0261639     1.73   0.084    -.0060124    .0965482
------------------------------------------------------------------------------
Instruments for orthogonal deviations equation
  Standard
    FOD.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L2.L.MSHARE
    L(3/5).(INVPROD LABPROD)
    L(3/.).UMC collapsed
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.L.MSHARE
    DL2.(INVPROD LABPROD)
    DL2.UMC collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.56  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.95  Pr > z =  0.340
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(53)   = 186.15  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(53)   =  57.29  Prob > chi2 =  0.319
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(34)   =  37.25  Prob > chi2 =  0.322
    Difference (null H = exogenous): chi2(19)   =  20.05  Prob > chi2 =  0.392
  gmm(L.MSHARE, lag(2 2))
    Hansen test excluding group:     chi2(44)   =  54.38  Prob > chi2 =  0.136
    Difference (null H = exogenous): chi2(9)    =   2.92  Prob > chi2 =  0.968
  gmm(INVPROD LABPROD, lag(3 5))
    Hansen test excluding group:     chi2(12)   =  13.05  Prob > chi2 =  0.365
    Difference (null H = exogenous): chi2(41)   =  44.24  Prob > chi2 =  0.337
  gmm(UMC, collapse lag(3 .))
    Hansen test excluding group:     chi2(46)   =  49.72  Prob > chi2 =  0.327
    Difference (null H = exogenous): chi2(7)    =   7.57  Prob > chi2 =  0.372
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(39)   =  39.11  Prob > chi2 =  0.465
    Difference (null H = exogenous): chi2(14)   =  18.18  Prob > chi2 =  0.199
```

```
. xtabond2 MSHARE l.MSHARE INVPROD ULC UMC lgcit mlow mhigh high AGE URBEF LOCE
> F yr3-yr9, gmm(l.MSHARE, lag(2 3)) gmm(INVPROD, lag(3 5)) gmm(ULC UMC, lag(3
> .)) iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3-yr9) twostep robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-ste
> p estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: ID2                             Number of obs      =      7411
Time variable : Year                            Number of groups   =      1574
Number of instruments = 103                     Obs per group: min =         1
Wald chi2(18) =   4307.51                                      avg =      4.71
Prob > chi2   =     0.000                                      max =         8
------------------------------------------------------------------------------
             |              Corrected
      MSHARE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      MSHARE |
         L1. |    .912427   .0501251    18.20   0.000     .8141837    1.01067
     INVPROD |   .0000101   2.45e-06     4.13   0.000     5.31e-06    .0000149
         ULC |  -.0206739   .0468319    -0.44   0.659    -.1124627     .071115
         UMC |  -.0096227   .0241577    -0.40   0.690    -.0569709    .0377255
       lgcit |   .0013012   .0045014     0.29   0.773    -.0075214    .0101239
        mlow |   .0018109   .0048693     0.37   0.710    -.0077327    .0113545
       mhigh |   .0023942   .0032682     0.73   0.464    -.0040113    .0087997
        high |   .0044788   .0044897     1.00   0.318    -.0043209    .0132785
         AGE |   -.000071   .0001694    -0.42   0.675     -.000403    .0002611
       URBEF |  -.1402568   .0794142    -1.77   0.077    -.2959058    .0153922
       LOCEF |  -.0201112   .0065773    -3.06   0.002    -.0330025   -.0072199
         yr3 |  -.0081501   .0034012    -2.40   0.017    -.0148163   -.0014839
         yr4 |   .0145126   .0038389     3.78   0.000     .0069885    .0220367
         yr5 |  -.0043447   .0032864    -1.32   0.186     -.010786    .0020965
         yr6 |   -.005251   .0036309    -1.45   0.148    -.0123674    .0018654
         yr7 |  -.0024424   .0037957    -0.64   0.520    -.0098818     .004997
         yr8 |  -.0001534   .0041497    -0.04   0.971    -.0082865    .0079798
         yr9 |   .3116336   .0255245    12.21   0.000     .2616065    .3616606
       _cons |   .0293302   .0176282     1.66   0.096    -.0052204    .0638808
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/3).L.MSHARE
    L(3/5).INVPROD
    L(3/.).(ULC UMC)
Instruments for levels equation
  Standard
    _cons
    lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.L.MSHARE
    DL2.INVPROD
    DL2.(ULC UMC)
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.52  Pr > z =  0.605
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(84)   = 359.22  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(84)   =  87.43  Prob > chi2 =  0.377
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(59)   =  75.10  Prob > chi2 =  0.077
    Difference (null H = exogenous): chi2(25)   =  12.34  Prob > chi2 =  0.984
  gmm(L.MSHARE, lag(2 3))
    Hansen test excluding group:     chi2(72)   =  77.01  Prob > chi2 =  0.322
    Difference (null H = exogenous): chi2(12)   =  10.43  Prob > chi2 =  0.579
  gmm(INVPROD, lag(3 5))
    Hansen test excluding group:     chi2(65)   =  77.25  Prob > chi2 =  0.142
    Difference (null H = exogenous): chi2(19)   =  10.19  Prob > chi2 =  0.948
  gmm(ULC UMC, lag(3 .))
    Hansen test excluding group:     chi2(27)   =  26.28  Prob > chi2 =  0.503
    Difference (null H = exogenous): chi2(57)   =  61.16  Prob > chi2 =  0.329
  iv(lgcit mlow mhigh high AGE URBEF LOCEF yr3 yr4 yr5 yr6 yr7 yr8 yr9)
    Hansen test excluding group:     chi2(70)   =  77.09  Prob > chi2 =  0.262
    Difference (null H = exogenous): chi2(14)   =  10.35  Prob > chi2 =  0.737
```

Table A8: Comparison of coefficients of lagged dependent variable

	Croatia		Czech Republic		Slovakia		Poland		Bulgaria	
Specification	1	2	1	2	1	2	1	2	1	2
FE	0,45	0,46	0,26	0,26	0,17	0,18	0,41	0,40	0,43	0,44
GMM	0,72	0,86	0,17	0,24	0,68	0,66	0,72	0,69	0,89	0,91
OLS	0,95	0,95	0,92	0,93	0,89	0,89	0,85	0,85	0,92	0,92

Table A9: Calculation of long-run coefficients with delta-method for Croatia

```
. nlcom (lrlabprod: _b[LABPROD]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_
> b[l.MSHARE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l
> .MSHARE])) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.
> MSHARE])) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE
> ]))  (lrmhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]
> ))

   lrlabprod:  _b[LABPROD]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrlabprod	.0004091	.0002353	1.74	0.082	-.0000521	.0008703
lrINVPROD	.0008625	.00033	2.61	0.009	.0002157	.0015092
lrUMC	-.0126139	.0252714	-0.50	0.618	-.0621449	.036917
lrlgcit	-.01402	.0077304	-1.81	0.070	-.0291714	.0011314
lrURBEF	-.0632234	.0229941	-2.75	0.006	-.1082909	-.0181558
lrLOCEF	-1.401823	.1334392	-10.51	0.000	-1.663359	-1.140287
lrAGE	.0020996	.0002669	7.87	0.000	.0015765	.0026228
lrmlow	-.0219479	.0075627	-2.90	0.004	-.0367706	-.0071252
lrmhigh	.0169072	.0117445	1.44	0.150	-.0061116	.039926
lrhigh	-.0186133	.0130948	-1.42	0.155	-.0442787	.0070521

```
. nlcom (lrULC: _b[ULC]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_b[l.MSHA
> RE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l.MSHARE]
> )) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.MSHARE])
> ) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE]))  (lr
> mhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]))

       lrULC:  _b[ULC]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrULC	-.0353307	.0165121	-2.14	0.032	-.0676937	-.0029677
lrINVPROD	.0009313	.0005132	1.81	0.070	-.0000746	.0019372
lrUMC	.0120499	.0082232	1.47	0.143	-.0040672	.0281671
lrlgcit	-.0132331	.0124948	-1.06	0.290	-.0377224	.0112561
lrURBEF	-.0412655	.0329773	-1.25	0.211	-.1058999	.0233688
lrLOCEF	-1.213892	.2337629	-5.19	0.000	-1.672059	-.7557255
lrAGE	.0014697	.0005496	2.67	0.007	.0003924	.002547
lrmlow	-.0188838	.0114759	-1.65	0.100	-.0413761	.0036086
lrmhigh	.032233	.0199109	1.62	0.105	-.0067915	.0712576
lrhigh	-.0016528	.0226465	-0.07	0.942	-.0460391	.0427335

Table A10: Calculation of long-run coefficients with delta-method for Czech Republic

```
. nlcom (lrLABPROD: _b[LABPROD]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_
> b[l.MSHARE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l
> .MSHARE])) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.
> MSHARE])) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE
> ]))  (lrmhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]
> ))

   lrLABPROD:  _b[LABPROD]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrLABPROD	.0000311	.0000171	1.81	0.070	-2.54e-06	.0000647
lrINVPROD	-.0000163	.0000183	-0.89	0.374	-.0000521	.0000196
lrUMC	.0023597	.0034441	0.69	0.493	-.0043907	.00911
lrlgcit	.0160953	.0076824	2.10	0.036	.0010382	.0311525
lrURBEF	-.0717353	.0304648	-2.35	0.019	-.1314452	-.0120254
lrLOCEF	-2.099999	.1665819	-12.61	0.000	-2.426493	-1.773504
lrAGE	.0016847	.0008986	1.87	0.061	-.0000766	.003446
lrmlow	-.0059803	.0062864	-0.95	0.341	-.0183014	.0063408
lrmhigh	-.036863	.009501	-3.88	0.000	-.0554847	-.0182414
lrhigh	-.0306413	.0096614	-3.17	0.002	-.0495773	-.0117054

```
    Difference (null H = exogenous): chi2(14)   =  10.30  Prob > chi2 =  0.740

. nlcom (lrULC: _b[ULC]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_b[l.MSHA
> RE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l.MSHARE]
> )) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.MSHARE])
> ) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE]))  (lr
> mhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]))

       lrULC:  _b[ULC]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrULC	.0594014	.1427818	0.42	0.677	-.2204458	.3392485
lrINVPROD	-.0000262	.000026	-1.01	0.314	-.0000772	.0000248
lrUMC	-.023613	.0721647	-0.33	0.744	-.1650533	.1178272
lrlgcit	.018888	.0105647	1.79	0.074	-.0018185	.0395945
lrURBEF	-.0576417	.0329226	-1.75	0.080	-.1221687	.0068854
lrLOCEF	-2.149335	.3493898	-6.15	0.000	-2.834126	-1.464544
lrAGE	.0016276	.0020831	0.78	0.435	-.0024553	.0057105
lrmlow	-.006906	.0069216	-1.00	0.318	-.0204722	.0066602
lrmhigh	-.0414919	.0139562	-2.97	0.003	-.0688456	-.0141382
lrhigh	-.0386675	.0187012	-2.07	0.039	-.0753211	-.0020138

Table A11: Calculation of long-run coefficients with delta-method for Slovakia

```
. nlcom (lrlabprod: _b[LABPROD]/(1-_b[l.MSHARE])) (lrinvprod: _b[INVPROD]/(1-_b[
> l.MSHARE])) (lrumc: _b[UMC]/(1-_b[l.MSHARE])) (lrlgcit: _b[lgcit]/(1-_b[l.MSHA
> RE])) (lrurbef: _b[URBEF]/(1-_b[l.MSHARE])) (lrlocef: _b[LOCEF]/(1-_b[l.MSHARE
> ])) (lrAGE: _b[AGE]/(1-_b[l.MSHARE])) (lrmlow: _b[mlow]/(1-_b[l.MSHARE])) (lrm
> high: _b[mhigh]/(1-_b[l.MSHARE])) (lrhigh: _b[high]/(1-_b[l.MSHARE]))

   lrlabprod:  _b[LABPROD]/(1-_b[l.MSHARE])
   lrinvprod:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrumc:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrurbef:  _b[URBEF]/(1-_b[l.MSHARE])
     lrlocef:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrlabprod	.0000174	6.98e-06	2.49	0.013	3.69e-06	.0000311
lrinvprod	.0000381	.0000615	0.62	0.535	-.0000825	.0001587
lrumc	-.1204196	.4420075	-0.27	0.785	-.9867385	.7458992
lrlgcit	.0266508	.056424	0.47	0.637	-.0839382	.1372399
lrurbef	-.6625973	.4564575	-1.45	0.147	-1.557238	.2320429
lrlocef	-6.076008	.9124678	-6.66	0.000	-7.864412	-4.287604
lrAGE	.0024197	.0023914	1.01	0.312	-.0022673	.0071067
lrmlow	.0216583	.0334966	0.65	0.518	-.0439938	.0873104
lrmhigh	-.0447495	.0345774	-1.29	0.196	-.11252	.0230209
lrhigh	-.028484	.0638268	-0.45	0.655	-.1535822	.0966142

```
. nlcom (lrulc: _b[ULC]/(1-_b[l.MSHARE])) (lrinvprod: _b[INVPROD]/(1-_b[l.MSHARE
> ])) (lrumc: _b[UMC]/(1-_b[l.MSHARE])) (lrlgcit: _b[lgcit]/(1-_b[l.MSHARE])) (l
> rurbef: _b[URBEF]/(1-_b[l.MSHARE])) (lrlocef: _b[LOCEF]/(1-_b[l.MSHARE])) (lrA
> GE: _b[AGE]/(1-_b[l.MSHARE])) (lrmlow: _b[mlow]/(1-_b[l.MSHARE])) (lrmhigh: _b
> [mhigh]/(1-_b[l.MSHARE])) (lrhigh: _b[high]/(1-_b[l.MSHARE]))

       lrulc:  _b[ULC]/(1-_b[l.MSHARE])
   lrinvprod:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrumc:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrurbef:  _b[URBEF]/(1-_b[l.MSHARE])
     lrlocef:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrulc	-.0032055	.0069222	-0.46	0.643	-.0167728	.0103618
lrinvprod	.0002803	.0001129	2.48	0.013	.0000591	.0005015
lrumc	.2404779	.3574882	0.67	0.501	-.4601862	.941142
lrlgcit	.063035	.0512314	1.23	0.219	-.0373767	.1634468
lrurbef	-.4630116	.3893631	-1.19	0.234	-1.226149	.300126
lrlocef	-5.273356	.7951271	-6.63	0.000	-6.831777	-3.714936
lrAGE	.0008936	.0021988	0.41	0.684	-.0034159	.0052031
lrmlow	.0278357	.0305651	0.91	0.362	-.0320707	.0877421
lrmhigh	-.0463494	.0316633	-1.46	0.143	-.1084084	.0157095
lrhigh	-.0158274	.0643195	-0.25	0.806	-.1418912	.1102364

Table A12: Calculation of long-run coefficients with delta-method for Poland

```
. nlcom (lrlabprod: _b[LABPROD]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_
> b[l.MSHARE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l
> .MSHARE])) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.
> MSHARE])) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE
> ]))  (lrmhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]
> ))

   lrlabprod:  _b[LABPROD]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrlabprod	.0000751	.0000437	1.72	0.086	-.0000105	.0001607
lrINVPROD	.0000141	7.81e-06	1.81	0.070	-1.16e-06	.0000294
lrUMC	.0091577	.0989439	0.09	0.926	-.1847688	.2030842
lrlgcit	.0025091	.009494	0.26	0.792	-.0160989	.0211171
lrURBEF	-.1433429	.0503514	-2.85	0.004	-.2420298	-.0446559
lrLOCEF	-1.916696	.1654351	-11.59	0.000	-2.240943	-1.592449
lrAGE	.0003943	.0001259	3.13	0.002	.0001475	.0006411
lrmlow	.00306	.0066053	0.46	0.643	-.0098861	.0160061
lrmhigh	-.0022132	.0078758	-0.28	0.779	-.0176495	.0132232
lrhigh	-.0096759	.0144637	-0.67	0.504	-.0380241	.0186724

```
. nlcom (lrULC: _b[ULC]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_b[l.MSHA
> RE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l.MSHARE]
> )) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.MSHARE])
> ) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE]))  (lr
> mhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]))

       lrULC:  _b[ULC]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrULC	-.1167099	.0660672	-1.77	0.077	-.2461993	.0127794
lrINVPROD	2.98e-06	.0000106	0.28	0.778	-.0000177	.0000237
lrUMC	-.0679661	.1472948	-0.46	0.644	-.3566586	.2207265
lrlgcit	.0010035	.0128015	0.08	0.938	-.0240869	.026094
lrURBEF	-.1205613	.047145	-2.56	0.011	-.2129638	-.0281587
lrLOCEF	-1.958025	.157841	-12.41	0.000	-2.267388	-1.648663
lrAGE	.0003255	.0001388	2.35	0.019	.0000535	.0005976
lrmlow	.0046108	.0067546	0.68	0.495	-.008628	.0178496
lrmhigh	.000701	.0088895	0.08	0.937	-.016722	.018124
lrhigh	-.0055635	.0159018	-0.35	0.726	-.0367305	.0256034

Table A13: Calculation of long-run coefficients with delta-method for Bulgaria

```
. nlcom (lrLABPROD: _b[LABPROD]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_
> b[l.MSHARE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l
> .MSHARE])) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.
> MSHARE])) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE
> ]))  (lrmhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]
> ))

   lrLABPROD:  _b[LABPROD]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrLABPROD	.0002726	.0003181	0.86	0.391	-.0003508	.0008961
lrINVPROD	.0001378	.0001213	1.14	0.256	-.0001	.0003756
lrUMC	-.4256601	.6527542	-0.65	0.514	-1.705035	.8537146
lrlgcit	.0001193	.059447	0.00	0.998	-.1163946	.1166333
lrURBEF	-.3234271	.2239451	-1.44	0.149	-.7623514	.1154972
lrLOCEF	-2.627668	2.471662	-1.06	0.288	-7.472037	2.216701
lrAGE	-.0018684	.0036766	-0.51	0.611	-.0090744	.0053376
lrmlow	.0283921	.064688	0.44	0.661	-.098394	.1551782
lrmhigh	.0257969	.0423295	0.61	0.542	-.0571675	.1087613
lrhigh	.0117663	.0701748	0.17	0.867	-.1257739	.1493065

```
. nlcom (lrULC: _b[ULC]/(1-_b[l.MSHARE]))  (lrINVPROD: _b[INVPROD]/(1-_b[l.MSHA
> RE]))  (lrUMC: _b[UMC]/(1-_b[l.MSHARE]))  (lrlgcit: _b[lgcit]/(1-_b[l.MSHARE]
> )) (lrURBEF: _b[URBEF]/(1-_b[l.MSHARE])) (lrLOCEF: _b[LOCEF]/(1-_b[l.MSHARE])
> ) (lrAGE: _b[AGE]/(1-_b[l.MSHARE]))  (lrmlow: _b[mlow]/(1-_b[l.MSHARE]))  (lr
> mhigh: _b[mhigh]/(1-_b[l.MSHARE]))  (lrhigh: _b[high]/(1-_b[l.MSHARE]))

       lrULC:  _b[ULC]/(1-_b[l.MSHARE])
   lrINVPROD:  _b[INVPROD]/(1-_b[l.MSHARE])
       lrUMC:  _b[UMC]/(1-_b[l.MSHARE])
     lrlgcit:  _b[lgcit]/(1-_b[l.MSHARE])
     lrURBEF:  _b[URBEF]/(1-_b[l.MSHARE])
     lrLOCEF:  _b[LOCEF]/(1-_b[l.MSHARE])
       lrAGE:  _b[AGE]/(1-_b[l.MSHARE])
      lrmlow:  _b[mlow]/(1-_b[l.MSHARE])
     lrmhigh:  _b[mhigh]/(1-_b[l.MSHARE])
      lrhigh:  _b[high]/(1-_b[l.MSHARE])
```

MSHARE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lrULC	-.2360761	.5448058	-0.43	0.665	-1.303876	.8317236
lrINVPROD	.0001154	.000069	1.67	0.095	-.0000199	.0002506
lrUMC	-.1098821	.2822839	-0.39	0.697	-.6631484	.4433841
lrlgcit	.0148588	.0540391	0.27	0.783	-.0910559	.1207734
lrURBEF	-.2296506	.1137897	-2.02	0.044	-.4526744	-.0066268
lrLOCEF	-1.601599	1.032173	-1.55	0.121	-3.624622	.4214234
lrAGE	-.0008103	.0023329	-0.35	0.728	-.0053827	.0037621
lrmlow	.0206792	.0489254	0.42	0.673	-.0752128	.1165712
lrmhigh	.0273396	.0361924	0.76	0.450	-.0435962	.0982754
lrhigh	.0511435	.0617667	0.83	0.408	-.069917	.172204