# On the Growth of Micro, Small and Medium-Sized Firms in Central and Eastern Europe: A Dynamic Panel Analysis

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The purpose of this paper is to explore the main determinants of growth in small and medium-sized enterprises (SMEs) in Central and Eastern Europe. The empirical research has suggested that firm growth is determined not only by the traditional characteristics of size and age but also by other firm specific factors such as indebtedness, internal financing, future growth opportunities, process and product innovation, and organizational changes. Limited empirical evidence has been provided as to which of these determining factors is associated with SMEs growth and performance in transition economies. Using a panel dataset of 4,561 small and medium-sized enterprises from seven transition economies we find evidence that firm size and age can explain to a large extent the growth in SMEs in these countries. When we control for other firm specific characteristics and macroeconomic factors, the size-age-growth relation remains stable and significant. We also find evidence that high-growth firms rely more on external sources of capital to support their growth in sales as compared to low-growth firms where the opposite holds. Firms growing faster during the observed period show a significantly larger sensitivity to cash flows.

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*Keywords*: Transition Economy, Small and Medium-Sized Enterprise, Growth, Panel Data Analysis

## 1. Introduction

This paper explores the main determinants of growth in small and medium-sized enterprises in Central and Eastern Europe (CEE). An increasing body of literature indicates that small and medium-sized enterprises (SMEs) are of major importance for macro-economic growth. During much of the past decade SMEs in Europe have seen an impressive growth. Between 2002 and 2008, SMEs in the EU-27 grew strongly and turned out to be the job engine for much of the European economy. The number of SMEs increased by 2.4 million (or 13 percent), whereas the number of large enterprises increased by only 2,000 (or 5 percent).[1] This growth was also reflected in employment figures; in absolute numbers, 9.4 million jobs were created in the SME-sector in the same period.

At the same time, large enterprises outperform SMEs with respect to labour productivity and profitability. For example, in 2008, gross value added at factor cost per occupied person was 39,000 euro for SMEs and 59,000 euro for large enterprises. This lower average labour productivity of SMEs can be explained by differences in sectoral orientation between micro, small, medium-sized and large enterprises, in capital intensity, the degree to which firms can reap economies of scale as well as difference in the qualification and skill levels of the personnel of smaller and larger enterprises. As a result, SMEs, especially micro enterprises, have shown lower profitability as compared to large enterprises.

According to the European Union definition, SMEs are defined as enterprises in the non-financial business economy (NACE C-I, K) that employ less than 250 persons.[2] The enterprises that employ 250 or more persons are defined as large scale enterprises (LSEs). Within the SME-sector,

[1] See European SMEs under Pressure, Annual Report on EU SMEs 2009, European Commission, available at http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/pdf/dgentr_annual_report2010_100511.pdf.

[2] This definition is mostly used for statistical reasons. In the European definition of SMEs three additional criteria are added: the economic unit to be more or less autonomous, annual turnover to be less than EUR 50 million, and balance sheet total to be less than EUR 43 million (Commission Recommendation 2003/361/EC).

three size classes can be distinguished: micro enterprises, employing less than 10 persons (including self-employed), small enterprises, employing at least 10 but less than 50 persons (including self-employed), and medium-sized enterprises that employ between 50 and 250 persons (including self-employed). In general, SMEs range from the self-employed bookkeeper without personnel to the fast growing, innovative, and much internationalised ICT firm, and everything in between.

In both national and EU policies, fast-growing SMEs receive a lot of attention.[3] These enterprises contribute more than others to production growth and growth of employment. Empirical research systematically finds that rapidly growing firms generate a disproportionately large share of all new net jobs compared with non-high-growth firms. For example, Henrekson and Johansson (2010) find that the contribution of fast-growing enterprises to net employment growth is especially high during recessions. Fast-growing enterprises also stimulate growth of production in other enterprises, for instance through subcontracting relations.

Anecdotal evidence points at insufficient market demand as the prime obstacle faced by SMEs followed by difficulties in accessing finance. Especially micro firms increasingly face problems in getting access to external finance. Due to the recent financial and economic crisis banks are now even more risk averse, ask higher risk premiums and require more collateral. Thus, increased attention has been paid to the key factors determining SMEs' growth and success. While a significant amount of research has been done on the determinants of growth in large firms, much less is known in regard to SMEs, especially manufacturing SMEs, given that their growth and prosperity are potentially subjected to different constraints and contingencies related to their specificity as business organizations (Raymond *et al.*, 2005). The specific characteristics that fundamentally distinguish SMEs from large enterprises relate to their environment, structure, strategy and decision making process; but also relate to their flexibility, proximity to markets, and quickness to react and reorient themselves. However, there are also areas where SMEs do outperform large enterprises: this is the case as regards the propensity to invest, which is – for the EU non-financial business economy as a whole – highest for micro firms.[4]

In this paper we analyze the effect of different factors, both economy-wide (gross domestic product, inflation and tax rate) and firm specific (age, size, internal finance, capital structure, growth opportunities, liquidity, and factor productivity) on the growth of small and medium-sized enterprises in transition economies. Using a panel data analysis for a set of 4,561 SMEs in Central and Eastern Europe, we find that firm growth is related not only to the traditional determinants of age and size but also to other firm specific characteristics associated with its financial structure, liquidity constraints, and productivity. For example, leverage, future growth opportunities, internally generated funds, and capital productivity are found to be important factors in determining a firm's growth and performance. We also find that size and age sensitivity of growth is different for fast-growing and slow-growing firms. Economy-wide variables such as gross domestic product, inflation and corporate income tax rate also seem to be relevant determinants of growth in both types of SMEs.

The rest of the paper is organized as follows: the next section outlines our conceptual framework and summarises the findings of the research literature on the determinants of SME growth. The econometric model and the data panel analysis are presented in section 3. Here we also discuss the econometric results from the panel regressions. Some concluding remarks are offered in

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[3] Eurostat and OECD define the high-growth enterprises (HGEs) as enterprises with on average at least 20% annual employment growth over the last three years, and which have at least 10 employees at the start of the observation period. An important subgroup of high-growth enterprises is formed by the so-called gazelles. Eurostat and OECD define gazelles as HGEs younger than five years. They represent roughly between 10 and 15 % of HGEs in Europe. OECD (2009) reports the share of gazelles to be particularly high in Eastern European countries such as Bulgaria, Hungary and Estonia.

[4] For micro enterprises, gross investment in tangible goods amounts to 24% of value added, compared to 19% for all firms. While for a large part, this is due to particular service industries (real estate, leasing, etc), the fact remains that the propensity to invest in micro enterprises overall is still higher than could be expected on the basis of their profitability, underlining their importance for the European Union economy.

the final section.

**2. Literature Review**

Although large firms tend to capture the major share of employment and economic activity, small firms can act as catalysts for the development of many industrial sectors. In fact, in recent decades, the share of small firms in the economy has increased as a result of growing global competition, greater uncertainty, and technological advances (Audretsch and Elston, 2002). However, there is general consensus that such firms face a series of financial constraints.

In financial markets, information asymmetries represent a critical barrier in gaining access to finance. Firm size is a key variable in the analysis of financial restrictions (Beck *et al.*, 2005). The presence of both large and small firms is important for market competition and, hence, for economic growth, in order to ensure industrial dynamics, but firms must have access to financial markets. However, agency costs, information asymmetries and fixed transaction costs result in capital market imperfections. The firms that are typically most severely affected by these imperfections are small firms, as their internal information can be more opaque than their larger counterparts. Small firms seeking bank loans face higher transaction costs and higher risk premiums since they are more opaque and have less collateral to offer (Beck and Demirguc-Kunt, 2006). Similar results have been found by Beck *et al*. (2005), and Schiffer and Weder (2001).[5]

In the last few decades, a number of empirical studies have been devoted to examining the impact of financial constraints on investment decisions and firm growth. For example, Oliveira and Fortunato (2006) find that small firms face greater financial constraints and that these have a negative impact on their growth. Audretsch and Elston (2002) also show that medium-sized firms face greater financial constraints than large firms. Birks and Ennew (1996) assert that young firms are more financially constrained. Müeller and Zimmermann (2008) also observe that SMEs face additional disadvantages. First, small firms cannot exploit economies of scale in the same way as large firms. Second, they face more financial constraints. The authors claim that since young companies have not accumulated sufficient cash and are unable to rely on bank financing, they have to depend on the original equity investment of their owners. When using a dataset for a panel of Bulgarian firms to study the empirical relationship between access to external finance and productivity, Gatti and Love (2008) find that access to credit has a significant and positive impact on firm productivity in Bulgaria. In the case of Italy, Nucci *et al.* (2004) report evidence pointing to the causal effect of financial structure on a firm's propensity to innovate and on its productivity. Furthermore, the authors show that the relationship between leverage and productivity is non-linear, but rather is dependent on certain firm specific characteristics such as the share of short-run bank debt and the lower liquidity in relation to total assets.[6]

A rich literature has tackled the issue of how the mix between internal and external funds is linked with firm real performance and growth. According to the financial constraints and pecking order hypotheses, the lack of internal liquidity is a key determinant of firms' ability to invest and accomplish the desired expansion plans (Almeida *et al.* 2004; Faulkender and Petesen 2006; Pàl and Ferrando 2006). A similar view is proposed by the trade-off theory put forward by Acharya *et al*. (2005), which asserts that the dependence of investment on cash or debt is largely affected by whether the firm is facing an income shortage or, conversely, a high income state. A different approach to the issue of the relationship between firm financial policy and performance has been

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[5] Palepu *et al*. (2010) find that debt financing varies considerably among European countries. Firms from Southern and Eastern Europe, where bankruptcy laws are more borrower-friendly, face more constraints when obtaining bank credits such as covenants, shorter debt maturity, and greater use of collateral. For SMEs in CEE the situation is further complicated because firms there do not have access to public debt markets. As a result, small and medium-sized firms in these countries will find bank borrowing crucial to their expansion.

[6] Morone and Testa (2008) investigate a sample of 2,600 Italian SMEs to find that, on average, young firms are more likely to experience positive growth; moreover, turnover growth is positively associated with firms' size, process innovation, product innovation and organisational changes. In contrast, marketing innovation does not considerably affect Italian SMEs growth.

adopted by the corporate finance literature. In this view, external debt can be considered an effective way to reduce the agency cost problems that may lead to the underperformance of firms (Jensen, 1986). Especially when cash flow is high, indeed, conflicts of interests may cause managers to undertake unprofitable investment or waste internal liquidity on organizational inefficiencies. In these circumstances, resorting to external capital may provide managers the right incentives to avoid cash wasting policies, and thus finally result in better firm performance.

A different approach suggests that financial constraints may also explain the relation between firm size and growth. It is worth to mention the contributions of Carpenter and Petersen (2002), Elston (2002), Wagenvoort (2003), Fagiolo and Luzzi (2006), Hutchinson and Xavier (2006). Carpenter and Petersen (2002) show that the internal finance theory of growth can help to account for stylized facts of firm growth. The authors follow the approach of Fazzari *et al*. (1988a),[7] but instead of examining how financial constraints could affect investment they investigate how these constraints could affect the growth of total assets. Considering an unbalanced panel data set of small quoted firms in the United States they find that a firm facing binding cash flow constraints exhibits approximately a one-to-one relationship between the growth of its assets and internal finance. In a more recent study, Wagenvoort (2003) estimates Carpenter and Petersen's (2002) model across European Union countries for different size classes of firms. He finds that higher growth-cash flow sensitivities are a sign of bigger financial problems and that growth to cash flow sensitivity of SMEs are broadly similar across European Union countries.

Based on Hall (1987) and Evans (1987a, 1987b) firm growth specifications, Elston (2002) develop an alternative model which controls other factors related to growth including liquidity constraints measured by cash flow.[8] He finds that cash flow, after controlling for size and age, positively affects growth of German Neuer-Markt firms. On the other hand, Audretsch and Elston (2002) show that medium-sized German firms are more liquidity constrained (in their investment behavior) than either the smallest or the largest ones. Finally, Hutchinson and Xavier (2006) investigate how the quantity of internal finance constrains the growth of SMEs across the entire manufacturing sector of a leading transition country, Slovenia, and an established market economy, Belgium. They find that firms in Slovenia are more sensitive to internal financial constraints than their Belgian counterparts.

Firm size and firm growth have been considered two of the key ingredients that make a company a viable and profitable economic entity. This is the reason why these issues have a long standing tradition in economics, and the number of contributions devoted to their analysis is large, even if the empirical support of these conjectures appears to be, often, questionable (Bottazzi *et al*., 2006). A negative relationship between age and growth, as predicted by Jovanovic's (1982) model, has been revealed in a number of empirical studies and in different country contexts (see Evans, 1987b and Dunne *et al*., 1989 for the U.S.; Dunne and Hughes, 1994 for the UK; Hamshad, 1994 for France; Farinas and Moreno, 2000 for Spain; Becchetti and Trovato, 2002 for Italy; Nurmi, 2003 for Finland). By grouping firms according to their age, Evans (1987a, 1987b) showed that firm age is an important factor in explaining firm growth. Although several previous studies had supported Gibrat's law hypothesizing growth is independent of size, he found that firm growth decreases with firm size and age. Exceptions are provided by Das (1995) who studied firm growth in the computer hardware industry in India, and Elston (2002). Both studies found a positive effect of firm age on a firm's growth. In Heshmati (2001) study the negative relationship between age and growth of

[7] Fazzari *et al*. (1988a) examine the sensitivity of a firm's investments to internal cash flows. The authors find positive relationship between the amount of investment and the level of internally generated cash flows, thus concluding that firms with greater investment opportunities are more financially constrained and as a result need to maintain a large amount of internal capital. A subsequent research by Kaplan and Zingales (1997), however, argues that investment-cash flows sensitivities are not a good measure of financial constraints and that high cash flows among firms may be the result of limited investment opportunities and hence, sales growth.

[8] The empirical research dealing with SME growth and its financing finds that growth processes are significantly affected by the availability of cash flow to finance them. As Sarno (2008) shows in his study on Southern Italian SMEs, the reasons for the considerable sensitivity of growth to cash flow lie not only in the conditions of particular opacity in the firm's relationship with financial markets but also in property dilution effects which discourage the financing through the issue of equity.

Swedish firms holds for growth measured in employment terms, while it is positive in asset and sales firm growth models.[9]

However, the empirical literature has suggested that firm growth is determined not only by the traditional characteristics of size and age but also by other firm specific characteristics. For example, high growth tends to be associated with a firm's entrepreneurial behavior. Thus, growth tends to be considered a logical consequence of innovative, pro-active and risk-taking behavior on the part of the firm's management, as these are the dimensions which define an entrepreneurial orientation (EO). The relationship between the EO of the firm and its performance has been thoroughly investigated from both a conceptual (see Lumpkin and Dess, 1996) and an empirical point of view (Lumpkin and Dess, 2001; Wiklund and Shepherd, 2005). A recent study by Wiklund *et al*. (2009) claims that entrepreneurial orientation of a company is essential for the flexibility and quick decision making of a small company. They believe that the general tendency in today's business environment is the shortening of product and business model life cycles. Consequently, the future profit streams from existing operations are uncertain and businesses need to constantly seek new opportunities. Therefore, they may benefit from adopting an entrepreneurial strategic orientation.[10]

Limited empirical evidence has been provided so far on which of these determining factors are associated with SMEs growth and performance in transition economies. This study makes significant contributions to the existing literature in several ways. First, we investigate the effects of traditional firm characteristics of size and age on firm growth in the context of surviving SMEs in Central and Eastern Europe. The goal is to assess whether stylized facts of firm growth might be better explained by analyzing the relationship between size, age and growth in fast-growing SMEs as compared to slow-growing ones. Second, our dynamic model of firm growth also addresses the effect of economy-wide factors and firm specific characteristics (such as capital structure, liquidity and capital productivity) on firm growth. This differs from the large body of literature that has focused on traditional firm growth analysis, attempting to explain the relationship between firm size, age and growth. Third, we consider a balanced panel data set that covers all size and age classes within the SMEs-sector, including the very small (micro) firms and younger enterprises. Finally, we apply the dynamic panel data techniques developed by Arellano and Bover (1995), and Blundel and Bond (1998), which is known as the system GMM-estimator. The GMM methods control for biases due to unobserved firm-specific effects and lagged endogenous variables.

## 3. Empirical Analysis and Results

This study aims to fill the gap in the current debate on the determinants of growth in SMEs in Central and Eastern Europe. Our analysis is based on dynamic panel data analysis of a set of small and medium-sized enterprises from seven transition economies (Bulgaria, Croatia, Czech Republic, Poland, Romania, Serbia and Slovakia). In this paper we explore whether and to what extent the growth in SMEs in transition economies can be explained by both traditional and firm specific characteristics. As mentioned before, fast-growing enterprises receive a lot of attention in the research literature. Therefore, the question we address in this paper is whether the growth and performance of fast-growing SMEs is determined by the same firm specific characteristics as slow-growing SMEs. We argue that size and age sensitivity of growth is significantly different for

[9] Firms with growth ambitions require capital to fuel their growth. Regardless of size or age, access to capital is a matter of paramount importance. According to Timmons (1994) small, young firms tend to draw capital from internal sources, personal sources, and informal investment. As firms grow, they face additional capital requirements and must turn to external sources such as banks, public debt and equity markets. This is consistent with Myers and Majluf's (1984) assertion that SMEs have a 'pecking order' of preferred capital sources in which retained earnings will be the first source accessed, followed by bank debt, private external equity and then public debt or equity.

[10] Moreno and Casillas (2008) find that EO and growth are positively related, although their relationship is complex. They assert that the propensity for innovation is the dimension of EO that exercises the greatest influence on the type of expansion strategy used by the firm, encouraging the development of new products-technologies relationship through a strategic behavior; these strategic behaviors are the principal driving force behind growth. Along with them, the conditions of the environment (highly dynamic and not very hostile) and the availability of resources favor rapid growth of the firm.

SMEs that grow faster compared to firms that grow slower.

### 3.1. Data set

In this research we have adopted the European Commission's SME definition. The sample of SMEs considered in our study has been extracted from AMADEUS database[11] and includes 4,561 firms from seven Central and Eastern European (CEE) countries.[12] We only considered the time period 2001 - 2005, as the dataset covers a substantially lower number of firms with complete data in the previous years and we wanted to work with comparable sample sizes in all the years under analysis. For the purpose of this paper, cleaning procedures have been applied. First, observations with either missing or non-positive values for the variables used in the analysis were excluded. Second, given the requirements of the econometric methodology adopted only firms with at least four consecutive years of data were selected. Third, for the empirical part of this paper the data were limited to surviving firms.[13] Finally, firms that were failing (either because of bankruptcy or because they were being absorbed) during the period 2001-2005 were not selected. As a result, the definitive number of firms that make up our sample amounts to 4,561 for which we have full accounting data over the period 2001 – 2005, resulting in 22,805 observations of balanced panel data. This data set includes individual firm level data with all size and age classes, including micro firms and younger SMEs.

The total sample was split into two sub-samples including fast-growing and slow-growing SMEs. Eurostat and OECD define high-growth enterprises (HGEs) as enterprises with, on average, at least 20% annual employment growth over the last three years, and which have at least 10 employees at the start of the observation period. For the purposes of this study we used growth in sales revenues instead of growth in the number of employees.[14] We eliminated observations that presented disproportionate growth rates (that is, values lower than −200% or larger than 200% in any of the observed years), in order to avoid problems that misreported data may introduce into the analysis. As a result, the number of available observations in the balanced panel data is 3,255 per year.

Geographical distribution of sample firms by age, size and sector is shown in Table 1. The data shows that 14.7 percent of all firms in the sample are small enterprises and 82.9 percent are medium enterprises. The micro firms account for only 2.5 percent. Within the sample Poland is the country with the largest number of small enterprises (179 out of 669), and the Czech Republic – with the largest number of medium-sized enterprises (1009 out of 3,780). In regard to the age structure of our sample, we observe that nearly 22.6 percent of all SMEs are younger enterprises (of which 7.8 percent are firms with less than 5 years of existence), whereas 14.1 percent of firms can be classified as older SMEs (with more than 20 years of existence). The average firm age for the whole sample is 14.8 years. It is worth noting that the selected firms are representative of SMEs from different transition economies and their economic sectors. As the data in Table 1 show, manufacturing, wholesale and

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[11] For more details see http://www.bvdep.com/en/AMADEUS.html. The AMADEUS database allows us to choose among a wide variety of public and private companies in 43 European countries. For the scope of our research we selected only micro, small and medium-sized companies.

[12] The original number of countries included in the sample was 13: Bosnia and Herzegowina (BA), Bulgaria (BG), Croatia (HR), Czech Republic (CZ), Hungary (HU), Macedonia (FYROM) (MK), Montenegro (ME), Poland (PL), Romania (RO), Serbia (RS), Slovakia (SK), Slovenia (SI), and Ukraine (UA). In order to obtain non-spurious regression results we applied some filters to the data to remove companies with missing observations or lack of full data record; thus our sample was limited to companies from only seven CEE countries.

[13] This can generate a survival bias, as high-growth firms may be over-represented in our data (Lotti *et al.*, 2003). Unfortunately, we do not have any direct empirical evidence which might allow us to distinguish between missing values and entry-exit events. Hence, we performed a preliminary descriptive analysis on size-growth distributions of firms that were excluded from our database because some missing values did appear in their records. We did not find any statistically significant distribution difference between "included" firms and "excluded" ones. Therefore, we argue that survival biases should not seriously affect the results of our analysis.

[14] We define a small and medium-sized enterprise as a high-growth firm if it has, on average, at least 20% annual growth in sales over three consecutive years. Using growth in the number of employees doesn't change the structure of our sample; it includes 3,280 high-growth firms and 1,281 low-growth firms.

retail trade, and real estate and renting prevail over other industries (35.1 percent, 28.5 percent and 10.4 percent, respectively), whereas firms from services sector such as financial intermediation, and hotels and restaurants, account for less than 3 percent of the whole sample of small and medium-sized firms. If we refer to the geographical location of the selected firms that match the criteria listed above, the data in Table 1 show that 25.6 percent of all firms are located in the Czech Republic, followed by Poland (24.6 percent) and Romania (23.3 percent). The smallest number of firms is from Slovakia (only 3.1 percent), with Bulgaria, Croatia and Serbia making up for the rest. As a whole the dataset is well balanced including all size and age classes, as well as different regions and economic sectors.

**Table 1**
**Geographical distribution of sample firms by size, age and sector**

| | Bulgaria | Croatia | Czech Republic | Poland | Romania | Serbia | Slovakia | Total |
|---|---|---|---|---|---|---|---|---|
| **Size (as of 2005)** | | | | | | | | |
| Micro (< 10 employees) | 5 | 25 | 28 | 21 | 15 | 3 | 15 | 112 |
| Small (< 50 employees) | 31 | 162 | 130 | 179 | 113 | 27 | 27 | 669 |
| Medium (< 250 employees) | 108 | 431 | 1,009 | 924 | 933 | 275 | 100 | 3,780 |
| Total: | 144 | 618 | 1,167 | 1,124 | 1,061 | 305 | 142 | 4,561 |
| **Age** | | | | | | | | |
| < 5 years | 0 | 7 | 0 | 20 | 46 | 5 | 2 | 80 |
| 5 - 10 years | 41 | 139 | 186 | 261 | 346 | 20 | 38 | 1,031 |
| 11 - 20 years | 84 | 324 | 932 | 542 | 669 | 162 | 95 | 2,808 |
| > 20 years | 19 | 148 | 49 | 301 | 0 | 118 | 7 | 642 |
| Total: | 144 | 618 | 1,167 | 1,124 | 1,061 | 305 | 142 | 4,561 |
| **Sector** | | | | | | | | |
| Agriculture, Fishing& Mining | 0 | 22 | 108 | 15 | 4 | 23 | 4 | 176 |
| Construction | 14 | 67 | 69 | 76 | 128 | 33 | 7 | 394 |
| Financial Intermediation | 4 | 8 | 16 | 20 | 0 | 0 | 5 | 53 |
| Hotels and Restaurants | 1 | 25 | 11 | 2 | 12 | 3 | 0 | 54 |
| Manufacturing | 32 | 137 | 462 | 365 | 438 | 114 | 49 | 1,597 |
| Public Administration, Education, Health and Social Work | 1 | 2 | 20 | 17 | 2 | 4 | 2 | 48 |
| Real Estate, Renting and Business Activities | 22 | 47 | 96 | 198 | 76 | 18 | 18 | 475 |
| Transport, Storage and Communication | 7 | 28 | 47 | 41 | 61 | 14 | 3 | 201 |
| Utilities | 1 | 21 | 42 | 47 | 11 | 19 | 3 | 144 |
| Wholesale and Retail Trade | 53 | 250 | 275 | 320 | 290 | 62 | 48 | 1,298 |
| Other | 9 | 11 | 21 | 23 | 39 | 15 | 3 | 121 |
| Total: | 144 | 618 | 1,167 | 1,124 | 1061 | 305 | 142 | 4,561 |

*Source*: AMADEUS database (2008). Authors calculations.

*Dependent variable*

There is little agreement in the existing literature on how to measure growth, and scholars have used a variety of different measures. These measures include, for example, growth of sales, employees, assets, profit, equity, and others (see Davidsson and Wiklund, 2000). Moreover, the time span, over which growth is analyzed in the literature, varies considerably, and ranges from one to

several years. Also, growth has been measured in absolute or relative terms. Perhaps the most common means of operationalizing firm growth is through relatively objective and measurable characteristics – such as growth in sales turnover, total assets and employment growth. These measures are relatively uncontroversial (methodologically) and data tend to be easily available, increasing the scope for cross-study comparability (Freel and Robson, 2004). In this study we use three growth models to examine more accurately the effect of the explanatory variables on a firm's growth and performance – growth in sales revenues, employment and total assets.[15]

*Explanatory variables*

Evans (1987a, b) proposed a model in which it is assumed that firm growth is a function of firm size and age. However, firm growth is determined not only by firm size and age but also by other firm specific characteristics. Some empirical studies, therefore, have proposed a model including firm specific characteristics other than firm size and age (see Honjo and Haranda, 2006; Wiboonchutikula, 2002; Wiklund *et al*., 2009; Sogorb-Mira, 2005; Hall *et al*., 2000 and 2006; Garcıa-Teruel and Martınez-Solano, 2008; Oliveira and Fortunato, 2006.) In this study, the choice of explanatory variables is theoretically driven and aims to proxy for firm specific characteristics that are likely to determine the growth of a firm. Table 2 shows a summarized description of the dependant and explanatory variables used in the empirical analysis and their expected impact on firm growth.

In general, a stable and predictable macroeconomic environment creates greater growth opportunities for SMEs. Thus, we expect growth in real GDP per capita (RGDP_G) used as a proxy for the level of economic activity, to be positively correlated with a firm's growth. Similarly, a significant inflation effect will be observed to reflect the fact that firm growth in sales and assets is measured in nominal terms. Thus, a positive correlation between this variable (INFL) and firm growth is expected. Many SMEs in transition economies report that the existing economy-wide financing and institutional obstacles such as high interest rates, limited access to export finance and long-term loans, high income tax rates, heavy bureaucracy and corruption, constrain their growth (Beck *et al.*, 2005). To investigate whether or not some of these obstacles affect the firm growth we introduce in our analysis statutory tax rate as a proxy for tax burden on businesses in CEE countries. The inclusion of this variable is also motivated by our desire to explore the effect of prevailing tax policy on enterprises' revenues and assets growth. Keen *et al.* (2006) find that firms in some Eastern European countries like Ukraine experience strengthened revenues after adopting a flat tax rate. In general, we expect a negative correlation between this variable (TAX_RATE) and firm growth.

As explained in Section 2, a number of traditional and firm specific characteristics such as age and size, financial constraints, capital structure, liquidity, production efficiency and propensity for innovations, may help explain the growth in small and medium-sized enterprises. Our goal is to investigate whether the performance of fast-growing SMEs is determined by the same firm specific characteristics as growth in slow (or no) growing firms across CEE countries. As already discussed, it is difficult for SMEs to access capital markets, and financial constraints are more binding for SMEs. Therefore, *internal financing* plays an important role in achieving the growth of SMEs by overcoming financial constraints. In order to capture the influence of financial constraints on firm growth we use a cash flow to assets variable (CF_RATIO).[16] According to hierarchy theory (Myers and Majluf,

[15] In the previous studies of firm growth, employment growth has often been used as a growth measure. Evans (1987a, b), for example, measured firm growth by employment. From the viewpoint of a government stimulating the creation of employment, this measure is more suitable, but apparently firms themselves do not seek only employment growth. On the other hand, Lang *et al*. (1996) used three measures: net investment, capital expenditure growth and employment growth. In addition, Heshmati (2001) examined the growth of small firms using the following measures: employment growth, assets growth and sales growth.

[16] The rationale for this measure is that a low cash flow ratio may imply, especially for small firms, strong liquidity constraints. In fact, firms holding a large cash flow ratio are more likely to be able to finance their investments internally (Fazzari *et al*., 1988b). Furthermore, in presence of imperfect capital markets, a high cash flow ratio might also function as a "screening device" to gain better access to external financing. Thus, in presence of credit rationing, larger cash flow ratios

1984), firms prefer using internally generated resources before resorting to the market. In these circumstances, firms with large cash flows will grow faster, and thus a positive relationship between cash flow and firm growth is expected.

**Table 2**
**Dependent and explanatory variables**

| Variable | Definition | Explanation | Expected Sign |
|---|---|---|---|
| **Dependant Variables** | | | |
| GROWTH(Revenues) | Growth in Operating Revenues, (in percent) | Log difference of firm's revenues in periods *t* and *t - 1* | |
| GROWTH(Assets) | Growth in Total Assets, (in percent) | Log difference of firm's total assets in periods *t* and *t - 1* | |
| **Explanatory variables** | | | |
| **Macroeconomic variables** | | | |
| INFL | Inflation, proxy for the level of future real activity (in percent) | Percentage change the Consumer Price Index in period *t* | + |
| RGDP_G | Real GDP per capita, proxy for the level of economic activity (in percent) | Growth rate of real GDP per capita in period *t* | + |
| TAX_RATE | Statutory tax rate, proxy for tax burden on business (in percent) | Statutory corporate income tax rate in period *t* | - |
| **Firm-specific variables** | | | |
| TOT_ASSETS | Total Assets, proxy for firm size (in euro, thousands) | Log difference of firm's total assets in periods *t* and *t - 1* | + |
| AGE | Number of years of existence | Logarithm of firm's age (number of years of existence) in period *t* | - |
| INTA_ASSETS | Intangible Assets/Total Assets, proxy for future growth opportunities | Difference between the ratio of intangible to total assets in periods *t* and *t - 1* | - |
| CUR_RATIO | Current Ratio, proxy for short-term liquidity | Difference between the ratio of current assets to current liabilities in periods *t* and *t - 1* | + |
| LEVER | Total Debt/Total Asset, proxy for a firm's degree of leverage | Difference between the ratio of total debt to total assets in periods *t* and *t - 1* | -/+ |
| CAP_PROD | Operating Revenues/Tangible Assets, proxy for capital productivity | Difference between the ratio of operating revenues to tangible assets in periods *t* and *t - 1* | + |
| CF_RATIO | (Net Profit + Depreciation)/Total Assets, proxy for internal liquidity | Difference between the firm's cash flow in periods *t* and *t - 1* | + |
| EMPLOYE | Number of employees, proxy for firm size | Log difference of firm's employees in periods *t* and *t - 1* | + |
| TIME | Temporal dummies | A dummy used to control for different time periods | + |
| COUNTRY | Country dummies | A dummy used to control for specific country characteristics | + |

In addition, capital structure is different among SMEs, and *leverage* may be related to firm

might then be used to get additional external funding, especially when firms have some convenience to "go external" for tax reasons (Fagiolo and Luzzi, 2006).

growth. In fact, Leung and Yu (1996) found that there is a negative relationship between growth and leverage. In our study the variable that proxies for a firm's capital structure (LEVERAGE) is taken as the ratio of total debt to total assets and it is expected to be negatively related to growth.

Since small firms usually have a higher proportion of current liabilities in their balance sheet as compared to large firms, a firm's ability to sustain short-term *liquidity* may be a relevant determinant of its growth. In order to capture this relation a variable (CUR_RATIO) is constructed by taking the ratio of current assets to current liabilities. We assume that firms that are able to maintain high liquidity levels will face less severe financial constraints and will grow faster. Thus, a positive relationship between current liquidity and firm growth is expected.

Following Hall *et al.* (2006) a variable that captures the effect of future *growth opportunities* (INT_ASSETS) is constructed by taking the ratio of intangible assets to total assets. Intangible assets include R&D expenditures, trademarks, patents and copyrights. As these are investments with long-term payoffs they may not have an immediate (positive) effect on firm growth; thus we may expect a negative relationship between these two variables.

Empirical literature uses different proxies for firm size, e.g., total sales, tangible assets and value added, corresponding to the different ways of looking at the issue. In this study we use *total assets* (TOT_ASSETS) and *number of employees* (EMPLOYE) as size variables in order to test for scale effects in the relation to growth and firm size. The empirical evidence shows that the larger the firm (in terms of assets or number of employees) the greater its potential for growth (Wiklund and Shepherd, 2005). Thus, we expect that the firm size will be positively correlated with growth. The traditional firm characteristic of *age* (AGE) is defined as the number of years a firm is operating in an industry (since the date of incorporation) and is expected to have a negative relationship with firm growth. Thus, one may expect that younger firms are likely to grow faster than older ones. Following Wiboonchutikula (2002) we estimate growth in SMEs using different *productivity factors* as incremental explanatory variables - the capital productivity (output/capital) and the labor productivity (output/labor). These two variables (CAP_PRODUCT and LAB_PRODUCT) not only present the basic operational structure of a firm but also allow us to examine the association between the efficiency of a firm's operations and its growth. We expect that these two variables may have different effects on growth across firms of different size and age.[17]

In addition, we include *country* dummies (COUNTRY) and *time* dummies (TIME) in order to control for specific country characteristics and different time periods that might serve as an incentive for an increase in production and growth. On the one hand, country dummies control for those sample countries that experience a greater increment in growth because of increased market demand or the fact that they form part of fast-growing transition economies. Time dummies, on the other hand, control for growth in production that is attributable to general economic growth.

The correlation matrix of dependent and explanatory variables is presented in Table 3 (total sample) and is used to examine the possible degree of collinearity among these variables. As we observe in Table 3, the correlation coefficients are not sufficiently large to cause collinearity problems in the regressions and are statistically significant at the usual levels of significance. To mitigate the problem with possible multicollinearity we gradually exclude the variables (TOT_ASSETS, INTA_ASSETS and INFL) that are found to be highly correlated with the rest of explanatory variables.[18]

Table 4 presents summary statistics for the whole sample of 4,561 firms. We can see that the sample is made up of micro, small and medium-sized firms with average assets of €11.95 million and

[17] Although the labor productivity function was included in our preliminary regressions we decided to drop this variable for two reasons: first, both capital and labor productivities basically represent one and the same firm characteristic – production efficiency, and second, it is highly correlated with capital productivity and other explanatory variables in our model, which may cause collinearity problems in the regression analysis.

[18] We rely on likelihood ratio tests (LRTs) to drop in each step one (or more) covariate(s) and eventually get to our preferred model (see Model specification 6 in Table 5).

**Table 3**
**Correlation matrix of the model variables (total sample)**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | OP_REVEN | 1.0000 | | | | | | | | | | | |
| 2. | TOT_ASSETS | 0.4725*** | 1.0000 | | | | | | | | | | |
| 3. | AGE | -0.0144** | 0.0549*** | 1.0000 | | | | | | | | | |
| 4. | LEVER | 0.0303*** | -0.0529*** | -0.0675*** | 1.0000 | | | | | | | | |
| 5. | CUR_RATIO | -0.0077 | 0.0054 | -0.0002 | -0.0140** | 1.0000 | | | | | | | |
| 6. | INTA_ASSETS | -0.0082 | -0.0064 | -0.0134*** | 0.1886*** | -0.0011 | 1.0000 | | | | | | |
| 7. | CAP_PROD | 0.0610*** | 0.0029 | -0.0238*** | 0.0424*** | -0.0005 | -0.0014 | 1.0000 | | | | | |
| 8. | CF_RATIO | -0.0091 | -0.0065 | -0.0118* | 0.2607*** | -0.0010 | 0.6270*** | -0.0016 | 1.0000 | | | | |
| 9. | EMPLOYE | -0.0618*** | -0.0367*** | 0.2361*** | -0.1265*** | -0.0169** | -0.0264*** | -0.0817*** | -0.0347*** | 1.0000 | | | |
| 10. | INFL | -0.1370*** | -0.1008*** | -0.1184*** | -0.0285*** | 0.0024 | 0.0077 | -0.0295*** | 0.0074 | 0.0078 | 1.0000 | | |
| 11. | RGDP_G | 0.0117* | -0.0240*** | -0.0443*** | 0.0004 | 0.0038 | -0.0197*** | 0.0019 | -0.0160** | 0.0432*** | 0.3719*** | 1.0000 | |
| 12. | TAX_RATE | -0.0263*** | -0.0304*** | -0.1887*** | -0.0491*** | -0.0004 | 0.0179*** | 0.0074 | 0.0211*** | -0.0651*** | -0.1862*** | -0.4236*** | 1.0000 |

Notes: The dependent variable in model (1) is Operating Revenues (OP_REVEN). The explanatory variables in model (1) are: Total Assets (TOT_ASSETS), Leverage (LEVER), Current Ratio (CUR_RATIO), Growth Opportunities (INTA_ASSETS), Capital Productivity (CAP_PROD), Cash Flow (CF_RATIO), Number of Employees (EMPLOYE), Age (AGE), Growth in real GDP per capita (RGDP_G), Inflation (INFL), and Tax Rate (TAX_RATE). Dummy variables for country and time effects are not included in the correlation matrix. All variables are taken as ratios or in percent, except Total Assets and Operating Revenues (in euro, thousands). The correlation matrices for fast-growing and slow-growing sub-samples present similar degree of correlation among the explanatory variables. * indicates that correlation is significant at the 10 percent level, ** indicates that correlation is significant at the 5 percent level ,*** indicates that correlation is significant at the 1 percent level.

**Table 4**
**Summary of sample statistics**

| Variable | Obs. | 50th Percentile | 75th Percentile | 90th Percentile | Mean | St. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| GROWTH(Revenues) | 16,275 | 0.1339 | 0.3131 | 0.6166 | 0.1954 | 0.4153 | -1.9996 | 1.9998 |
| GROWTH(Assets) | 18,047 | 0.1319 | 0.3254 | 0.6039 | 0.2084 | 0.4057 | -2.3653 | 6.7749 |
| OP_REVEN | 22,476 | 7,710.5 | 14,317 | 26,295 | 13,947.13 | 33,111.68 | 1 | 1,200,000 |
| TOT_ASSETS | 22,666 | 4,956.5 | 10,273 | 23,574 | 11,946.87 | 31,911.78 | 20 | 927,756 |
| AGE | 22,805 | 11.7 | 14 | 28 | 15.1896 | 14.3103 | 1 | 159 |
| LEVER | 22,296 | 0.2119 | 0.3745 | 0.5408 | 0.2510 | 0.2029 | 0 | 0.9949 |
| CUR_RATIO | 22,578 | 1.2771 | 1.9624 | 3.3798 | 1.9072 | 2.7581 | 0 | 87.3896 |
| INTA_ASSETS | 21,902 | 0.0004 | 0.0030 | 0.0114 | 0.0077 | 0.0414 | 0 | 0.9627 |
| CAP_PROD | 21,759 | 4.8643 | 14.1165 | 47.2144 | 40.8505 | 268.8213 | 0.00006 | 9,177 |
| CF_RATIO | 19,881 | 0.0959 | 0.1845 | 0.3031 | 0.1277 | 0.1554 | -4.8441 | 1.8702 |
| EMPLOYE | 22,805 | 150 | 175 | 215 | 128.1762 | 66.1080 | 1.0 | 250 |
| INFL | 22,805 | 2.6 | 9.1 | 15.3 | 5.4406 | 5.4215 | -0.1 | 22.5 |
| RGDP_G | 22,805 | 4.5 | 5.4 | 6.7 | 4.9615 | 1.5899 | 1.4 | 9.3 |
| TAX_RATE | 22,805 | 25 | 27 | 31 | 22.7826 | 5.4179 | 10 | 31 |

Notes: The dependent variable in model (1) is Operating Revenues (OP_REVEN). The explanatory variables in model (1) are: Total Assets (TOT_ASSETS), Leverage (LEVER), Current Ratio (CUR_RATIO), Growth Opportunities (INTA_ASSETS), Capital Productivity (CAP_PROD), Cash Flow (CF_RATIO), Number of Employees (EMPLOYE), Age (AGE), Growth in real GDP per capita (RGDP_G), Inflation (INFL), and Tax Rate (TAX_RATE). Dummy variables for country and time effects are not included in the correlation matrix. All variables are taken as ratios or in percent, except Total Assets and Operating Revenues (in euro, thousands).

average sales revenues of €13.957 million. The growth rates in assets and revenues are, on average, 20.84 percent and 19.54 percent, respectively, and represent a relatively high-growth achieved by these firms over the period 2001 – 2005. SMEs in our sample exhibit a low degree of leverage, with a debt to total assets ratio of 25 percent. Current ratio as a measure of short-term liquidity is relatively high (a median of 1.28) and shows that the average firm in our sample has no problem with meeting its current obligations. In addition, a firms operating efficiency as measured by capital productivity ratio, is relatively high (€1 invested in tangible assets generates €40.85 in sales revenues on average).

At the same time the future growth opportunities (as measured by the share of intangible assets in total assets) associated with these firms are relatively low (a median of 0.0004). The reason may be that small and medium-sized firms invest fewer funds in R&D, patents and copyrights as compared to large firms. The statistics for internally generated funds by the firms in our sample shows that €1 invested in total assets generates €0.13 of free cash flow on average. The number of older firms in our sample is relatively high, with an average period of existence of 15.19 years. The data in Table 4 provide evidence of a positive economic environment for most of the countries included in the sample (a median of 4.5 percent growth in real GDP per capita and 2.6 percent inflation over the observed period). The corporate income tax rate is relatively high in transition economies (a median of 25 percent) and still represents a significant burden on SMEs development and growth.

### 3.2.Econometric model and empirical results

The structure of our dataset allows us to use a panel data methodology for our empirical research. This type of analysis can control firm heterogeneity, and reduce collinearity among the variables that are contemplated (Arellano and Bover, 1990). Likewise, this technique enables us to eliminate the potential biases in the resulting estimates due to correlation between unobservable individual effects and the explanatory variables included in the model. Our panel data model may be represented as follows:

$$Growth_{it} = \alpha_0 + \beta\ Size_{it} + \gamma\ Age_{it} + \theta\ X_{it} + \rho\ Y_t + \mu\ Dummy_i + \varepsilon_{it} \quad (1)$$

where $Growth_{it}$ is defined as the difference between the logarithms of firm *i*'s sales revenues in periods *t* and *t-1* (see Honjo and Haranda, 2006). The other two measures of growth used in the regression model (1) are the percentage change in total assets and in number of employees. Firm *i*'s size is proxied by the absolute value of total assets and the number of employees in period *t*. $Age_{it}$ is the logarithm of the number of years of existence of firm *i* in period *t*. *X* is the set of firm *i*'s specific characteristics (leverage, current ratio, intangible assets, capital productivity, and cash flow ratio[19]), and *Y* is the set of macroeconomic variables (real gross domestic product per capita, inflation, and tax rate). To control for country specific and time effects we use dummy variables that take on a value of 1 if the stated condition holds, or 0 otherwise. $\varepsilon_{it}$ is the disturbance term of the growth equation.

To estimate the dynamic regression model (1) using panels containing many firms and a small number of time periods, we use GMM-system estimator developed by Arellano and Bover (1995), and Blundell and Bond (1998). This estimator controls for the presence of unobserved firm-specific effects and for the endogeneity of explanatory variables. The instruments used depend on the assumption made as to whether the variables are endogenous or predetermined, or exogenous.[20] Instrument validity was tested using a Sargan test of over-identifying restrictions. The GMM estimators reported here generally produced more reasonable estimates of the autoregressive

[19] The empirical literature measuring the presence of financing constraints is extremely broad and there is no consensus as to the identity of these variables. For example, some measures used are the ratio of cash flow to assets (Alti, 2003; Almeida *et al.*, 2004; Hutchinson and Xavier, 2006; Lang *et al.*, 1996), the ratio of cash flow to sales (Fagiolo and Luzzi, 2006), the ratio of debt to assets (Petersen and Rajan, 1994), or the ratio of debt to profits (Coad, 2007). In our study we take the first approach.

[20] In our case instruments are used to eliminate any endogeneity effect that is present between the growth variable and all explanatory variables in equation (1). Essentially these instruments are second difference for the firm-specific explanatory variables except for age, which is first difference of log, and employees and total assets, which is first difference of their percentage change.

dynamics than the basic first-differenced estimators.

The results for GMM estimators are presented in Tables 5 (total sample), Table 6 (fast-growing firms) and Table 7 (slow-growing firms). We run the benchmark model (1) for several different specifications (see Table 5). Model specification (1) explores the relationship between a firm's growth and the traditional characteristics of size and age. As expected the variables that proxy for firm size and age have a statistically significant impact on a firm's growth. The relationship between size and growth is strongly positive, whereas the estimated coefficient for age has a negative sign; thus, in line with previous empirical research we find evidence that younger firms are likely to grow faster than older ones. Model specification (2) shows that the size-age-growth relation remains stable and significant after controlling for other firm specific characteristics included in model (1). The data in Table 5 for the total sample show that leverage (as measured by the ratio of total debt to total assets) has a significant impact on a firm's growth in sales (the estimated coefficients of LEVER variable are positive and statistically significant at 1 percent level). This result does support the findings of similar empirical studies that SMEs rely on internally generated funds for assets growth but need access to external capital to support their growth in sales (Honjo and Haranda, 2006).

**Table 5**
**GMM-system results for operating revenues (2001-2005)**

| Explanatory variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|---|---|---|---|
| OP_REVEN (lagged) | -0.030*** | -0.029*** | -0.017*** | -0.022*** | -0.022*** | -0.022*** | -0.021*** | -0.009** |
| TOT_ASSETS | 0.544*** | 0.469*** | 0.454*** | | | | | 0.461*** |
| AGE | -0.050*** | -0.045*** | -0.044*** | -0.059*** | -0.059*** | -0.060*** | -0.055*** | 0.005*** |
| LEVER | | 0.299*** | 0.309*** | 0.353*** | 0.352*** | 0.343*** | 0.383*** | 0.296*** |
| CUR_RATIO | | 0.0001 | 0.0001 | 0.0001 | | | | 0.0001 |
| INTA_ASSETS | | -0.741*** | -0.652*** | -0.367* | -0.367* | | | -0.700*** |
| CAP_PROD | | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** |
| CF_RATIO | | -0.153*** | -0.152*** | -0.149*** | -0.149*** | -0.148*** | | -0.154*** |
| EMPLOYE | | 0.058*** | 0.061*** | 0.074*** | 0.073*** | 0.074*** | 0. 082*** | 0.052*** |
| INFL | | | 0.003 | | | | | |
| RGDP_G | | | 0.024*** | 0.037*** | 0.036*** | 0.037*** | 0.044*** | |
| TAX_RATE | | | -0.004* | -0.009*** | -0.009*** | -0.009*** | -0.013*** | |
| TIME | No | No | No | No | No | No | No | Yes |
| COUNTRY | No | No | No | No | No | No | No | Yes |
| Number of observations | 7,177 | 6,161 | 6,161 | 6,161 | 6,167 | 6,259 | 7,130 | 6,161 |
| Arellano-Bond test - Prob>$z$ | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0002 | |
| Sargan test - Prob>$\chi^2$ | 0.0859 | 0.1908 | 0.7911 | 0.5759 | 0.5831 | 0.5841 | 0.2616 | |

Notes: All variables except dummies and ratios are in logs. Model 1 – including TOT_ASSETS and AGE variables; Model 2 – including all firm specific variables; Model 3 – including both firm specific and macroeconomic variables; Model 4 – excluding TOT_ASSETS and INFL variables; Model 5 – excluding TOT_ASSETS, CUR_RATIO and INFL variables; Model 6 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS and INFL variables; Model 7 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS, CF_RATIO and INFL variables; and Model 8 – including time and country dummies. *, **, and *** represent significance at 10, 5, and 1 percent, respectively. For Arellano-Bond test *Ho* is: no autocorrelation. Rejecting the null hypothesis (p-value <0.05) of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders implies that the moment conditions are not valid. For Sargan test *Ho* is: overidentifying restrictions are valid. If p-value >0.05, we confirm the null hypothesis that the overidentifying restrictions are valid. Rejecting the null hypothesis implies that we need to reconsider our model or our instruments.

In regard to a firm's capability to generate internal funds Audretsch and Elston (2002) find that small and medium-sized firms appear to be more financially constrained using data on German firms, while Honjo and Haranda (2006) find no such evidence using a sample of Japanese firms.[21] In our study we find evidence for a strong and negative relationship between a firm's cash flow and its sales growth (see Model specification 2). This result contradicts Fazzari *et al.* (1988a) finding that firms that are more likely to be constrained, i.e. those with greater investments opportunities and rapid growth, retain greater proportion of their earnings (have higher cash flows.) Yet, our results are consistent with those of Kaplan and Zingales (1997); contrary to Fazzari *et al.* (1988a), they find that financially unconstrained firms (those with higher cash flows) have slow sales growth and limited investments. They show empirically that cash flow-investment sensitivities are not useful measure of financial constraints. Another finding is that the most successful (the high-growth) firms rely primarily on internal cash flows to fund their investments. One reason for the negative sensitivity of cash flows to firm growth in our sample could be the firms desire to pile 'idle cash" and the lack of good investment opportunities (and as a result of this a slower growth).

Thus, we conclude that SMEs, especially younger firms, that are able to grow faster than an average firm may need access to external capital to support their growth in sales but will rely more on internally generated funds to finance their investments in productive assets. Contrary to our expectations, short-term liquidity is found to have no statistically significant effect on growth in sales revenues. Thus, we cannot support the hypothesis that firms with more growth opportunities will keep higher liquidity levels and thus will face less severe financing constraints. The two size variables (TOT_ASSETS and EMPLOYE) show strong explanatory power in our model. The estimated results are consistent with those of the recent empirical studies (see e.g., Wiklund and Shepherd, 2005) that find a positive relationship between firm growth and size (as measured by its total assets and the number of employees). The firm specific variables that also seem to have a significant effect on firm growth are intangible assets (as proxy for future growth opportunities) and capital productivity factor (see Model specification 2). We may conclude that firms with better productivity efficiency will grow faster; at the same time our results do not support the hypothesis that firms with a greater share of intangible assets in the firm's total assets will grow faster than an average firm. One reason may be that these are investments with no immediate effect but rather will have long-term payoffs.

In Model specification (3) we control also for different macroeconomic effects. The data in Table 5 show that variables that proxy for economy-wide factors (in this case, real GDP per capita and tax rate), are statistically significant and with the expected signs. A positive GDP-growth relationship is clear evidence that a stable macroeconomic environment creates greater growth opportunities for SMEs. A significant inflation effect most likely reflects the fact that firm sales growth is given in nominal terms. As INFL variable is found to be statistically insignificant, we suggest that the gross domestic product may be capturing other important country specific characteristics. The negative effect of TAX_RATE indicates that the high rates of corporate tax in many transition economies are perceived as a significant obstacle for SMEs growth. This supposition should be viewed with caution because SMEs growth is primarily driven by their future profitability and investment opportunities. Although tax rates affect the cash available from earnings, a high tax rate may not be necessarily an overwhelming impediment to growth. Empirical literature on transition economies argues that the tax rate policy is a way to exhibit fundamental shift towards greater market orientation and thus attract more foreign direct investments (Keen *et al.*, 2006). Countries like Ireland and the Baltic states are good examples of the benefits of such policies in the past. Thus, a low tax rate may be a stimulus for larger investments and an important determinant of revenue growth. A further investigation of the relationship between foreign direct investments and firm growth may shed some light on this matter. When we drop INFL and TOT_ASSETS variables from model (3) due to a possible

[21] Whereas it is not found that cash flow is significantly related to firm growth in their model, Honjo and Haranda (2006) argue that internal finance has less influence on firm growth, particularly of older SMEs that have already passed the early stages after establishment. Rather, internal finance may have more influence on the growth of younger SMEs.

multicollinearly (see Table 3), the results in Table 5 show that estimated coefficients remain stable and with the appropriate signs (see Model specification 4). Next, we drop in each step one (or more) variable(s) that is found to be statistically insignificant and eventually get to our preferred model (see Model specifications 6 and 7). In model specification (8) we use both country and time dummies in order to control for country specific characteristics and different time periods that might serve as an incentive for an increase in production and growth. The country specific effects are found to have no impact on firm growth whereas the time effects are statistically significant for the years 2004 and 2005.[22] Our dynamic model of firm growth also addresses the effect of persistence of chance or serial correlation on firm growth. As expected the time-lagged value of the growth variable (OP_REVEN) is negative and statistically significant for all the model specifications.[23] The results of the Arellano-Bond and Sargan tests (shown at the bottom of the table) confirm that all models are well specified.

We also expect that size and age sensitivity of growth is significantly different for fast-growing and slow-growing firms in the sample. Firms growing faster, i.e. firms with at least 20% growth in sales in the last three years, are expected to show a significantly larger sensitivity to size and age. Also, we assume that their growth rates may be determined by different firm specific characteristics than slow-growing firms. The results of our regression analysis for the two sub-samples of firms are shown in Tables 6 and 7. We find evidence that a firm growth depends strongly on the traditional characteristics of size and age, no matter how fast or slow a firm is growing. When we account for the effects of other firm specific characteristics, the results indicate that growth in fast-growing firms is influenced by the same firm specific characteristics as those in the total sample (all explanatory variables are statistically significant except current liquidity.)

The variable used as a proxy for future growth opportunities (INT_ASSETS) has (marginally) statistically significant effect only in case of fast-growing firms. Growth shows a negative sensitivity to cash flows, whereas leverage has a positive and significant effect on firm growth in all model specifications (see Table 6). We interpret this result as evidence in support of the hypothesis that fast-growing firms rely more on external sources of capital to support their growth in sales as compared to slow-growing firms which rely more on their internal cash flows in order to finance new investments and increase in production (cash flow-growth relationship is positive and statistically significant). Firms growing faster during the observed period show a significantly larger sensitivity to cash flow.[24]

No other firm specific variables than cash flow ratio show a statistically significant effect on growth in slow-growing firms (see Table 7.) Employment variable, a proxy for firm size, is found to have a (marginally) statistically significant effect in some model specifications but this result should be treated with caution because of possible multicollinearly. As observed in the total sample, firms both in fast-growing and slow-growing samples show high sensitivity to changes in macroeconomic conditions (see Model specification 3 in Tables 6 and 7). Again, country dummies are found to have no impact on firm growth whereas the time effects are statistically significant for the years 2004 and 2005 (see Model specification 8).

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[22] The estimates of time dummies tell us that all else being equal in a particular (significant) year all firms in the sample experienced more growth (or decline) in sales equal to the estimated coefficient. This effect stems purely from some panel-wide effects that happened in years 2004 and 2005.

[23] With respect to serial correlation in proportionate growth rates (coefficient of $Growth_{it-1}$), factors which make a firm grow abnormally quickly or slowly can be ascribed to persistence of chance. The estimated coefficient for serial correlation is negative and significant at 1% level of significance. This means that past growth encourages (or discourages) present growth.

[24] Molinari *et al.*, 2009 assert that this finding is consistent with two different, but opposite, views: on the one hand, firms with higher growth opportunities are riskier from an external investor's viewpoint, and therefore they may incur credit rationing with higher probability than low-growth firms. This will force high-growth firms to use their internal cash flow in order to finance new investments. On the other hand, the result can be interpreted as support for the view that cash flow contains information about investment, profit and growth opportunities of a firm; detecting a positive relation between growth and cash flow is therefore not a symptom of the presence of financial constraints to a firm's decision to expand but, rather, a signal that a virtuous selection mechanism is at play in the market.

**Table 6**
**GMM-system results for operating revenues (2001-2005), Fast-growing sub-sample**

| Explanatory variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|---|---|---|---|
| OP_REVEN (lagged) | -0.030*** | -0.029*** | -0.017*** | -0.023*** | -0.024*** | -0.024*** | -0.023*** | -0.010** |
| TOT_ASSETS | 0.585*** | 0.504*** | 0.488*** | | | | | 0.495*** |
| AGE | -0.053*** | -0.047*** | -0.046*** | -0.066*** | -0.066*** | -0.067*** | -0.075*** | 0.007*** |
| LEVER | | 0.344*** | 0.341*** | 0.410*** | 0.409*** | 0.408*** | 0.441*** | 0.332*** |
| CUR_RATIO | | 0.001 | 0.001 | -0.001 | | | | 0.001 |
| INTA_ASSETS | | -0.951*** | -0.806** | -0.455 | -0.456 | | | -0.886*** |
| CAP_PROD | | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** |
| CF_RATIO | | -0.154*** | -0.153*** | -0.151*** | -0.150*** | -0.150*** | | -0.155*** |
| EMPLOYE | | 0.071*** | 0.061*** | 0.088*** | 0.088*** | 0. 088*** | 0. 099*** | 0.065*** |
| INFL | | | 0.001 | | | | | |
| RGDP_G | | | 0.024*** | 0.038*** | 0.037*** | 0.038*** | 0.045*** | |
| TAX_RATE | | | -0.004* | -0.009*** | -0.009*** | -0.010*** | -0.014*** | |
| TIME | No | No | No | No | No | No | No | Yes |
| COUNTRY | No | No | No | No | No | No | No | Yes |
| Number of observations | 5,758 | 5,028 | 5,028 | 5,028 | 5,032 | 5,075 | 5,726 | 5,028 |
| Arellano-Bond test - Prob > *z* | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0002 | |
| Sargan test - Prob > $\chi^2$ | 0.2759 | 0.5184 | 0.9522 | 0.9831 | 0.9856 | 0.9907 | 0.8715 | |

Notes: Model 1 – including TOT_ASSETS and AGE variables; Model 2 – including all firm specific variables; Model 3 – including both firm specific and macroeconomic variables; Model 4 – excluding TOT_ASSETS and INFL variables; Model 5 – excluding TOT_ASSETS, CUR_RATIO and INFL variables; Model 6 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS and INFL variables; Model 7 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS, CF_RATIO and INFL variables; and Model 8 – including time and country dummies. All variables except dummies and ratios are in logs. *, **, and *** represent significance at 10, 5, and 1 percent, respectively. For Arellano-Bond test *Ho* is: no autocorrelation. Rejecting the null hypothesis (p-value <0.05) of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders implies that the moment conditions are not valid. For Sargan test *Ho* is: overidentifying restrictions are valid. If p-value >0.05, we confirm the null hypothesis that the overidentifying restrictions are valid. Rejecting the null hypothesis implies that we need to reconsider our model or our instruments.

**Table 7**
**GMM-system results for operating revenues (2001-2005), Slow-growing sub-sample**

| Explanatory variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|---|---|---|---|
| OP_REVEN (lagged) | -0.020 | -0.036** | -0.054*** | -0.040** | -0.042** | -0.040** | -0.040** | -0.084*** |
| TOT_ASSETS | 0.238*** | 0.218*** | 0.201 *** | | | | | 0.200*** |
| AGE | -0.038*** | -0.033*** | -0.027** | -0.036*** | -0.038*** | -0.039*** | -0.039*** | 0.003** |
| LEVER | | 0. 075 | 0.099 | 0.083* | 0.060 | 0.051 | 0.051 | 0.055 |
| CUR_RATIO | | 0.0001 | 0.001 | 0.0001 | 0.0001 | 0.0001 | | 0.0001 |
| INTA_ASSETS | | -0.231 | -0.256 | -0.042 | -0.042 | | | -0.199 |
| CAP_PROD | | 0.0001 | 0.0005 | 0.0001 | | | | 0.0002 |
| CF_RATIO | | 0.095 *** | 0.098 *** | 0.060** | 0.062** | 0.059** | 0.059** | 0.092*** |
| EMPLOYE | | 0.0002 | 0.0003 | 0.0005** | 0.0005** | 0.0005** | 0.0005** | 0.0001 |
| INFL | | | 0.019*** | | | | | |
| RGDP_G | | | 0.023*** | 0.028*** | 0.028*** | 0.028*** | 0.028*** | |
| TAX_RATE | | | -0.007** | -0.006** | -0.006** | -0.007** | -0.007** | |
| TIME | No | No | No | No | No | No | No | Yes |
| COUNTRY | No | No | No | No | No | No | No | Yes |
| Number of observations | 1,419 | 1,158 | 1,158 | 1,158 | 1,166 | 1,193 | 1,195 | 1,158 |
| Arellano-Bond test - Prob > *z* | 0.0019 | 0.0044 | 0.0094 | 0.0061 | 0.0064 | 0.0067 | 0.0067 | |
| Sargan test - Prob > $\chi^2$ | 0.2165 | 0.3021 | 0.2808 | 0.3001 | 0.2870 | 0.3016 | 0.3018 | |

Notes: Model 1 – including TOT_ASSETS and AGE variables; Model 2 – including all firm specific variables; Model 3 – including both firm specific and macroeconomic variables; Model 4 – excluding TOT_ASSETS and INFL variables; Model 5 – excluding TOT_ASSETS, CUR_RATIO and INFL variables; Model 6 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS and INFL variables; Model 7 – excluding TOT_ASSETS, CUR_RATIO, INTA_ASSETS, CF_RATIO and INFL variables; and Model 8 – including time and country dummies.All variables except dummies and ratios are in logs. *, **, and *** represent significance at 10, 5, and 1 percent, respectively. For Arellano-Bond test *Ho* is: no autocorrelation. Rejecting the null hypothesis (p-value <0.05) of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders implies that the moment conditions are not valid. For Sargan test *Ho* is: overidentifying restrictions are valid. If p-value >0.05, we confirm the null hypothesis that the overidentifying restrictions are valid. Rejecting the null hypothesis implies that we need to reconsider our model or our instruments.

When growth in total assets is used as a dependant variable in our dynamic panel analysis we obtain similar results to those in Table 5 (not reported here).[25] As expected the variables that proxy for firm size and age have a significant impact on a firm's growth in assets even after controlling for firm specific effects. The variables are statistically significant at 1 and 5 percent level of significance and have the expected signs. The relationship between a firm's degree of leverage and its growth is statistically insignificant at the usual levels, whereas the cash flow sensitivity of growth is positive and strong. This result is consistent with our hypothesis that SMEs in transition economies, especially younger firms, which are more financially constrained, rely more on internally generated funds to support their growth in assets than older ones. The effect of short-term liquidity on firm growth is statistically insignificant; thus, our results do not support the hypothesis that firms with more growth opportunities will keep higher liquidity levels and thus will face less severe financing constraints. When we control for macroeconomic effects in our sample, the results show that the size-age-growth relation remains stable and significant.

We run same model specifications for fast-growing and slow-growing firms as in Tables 6 and 7 (not presented here). The results allow us to reveal some specific characteristics of growth determinants across the two types of firms. The growth in assets of high-growth firms depends on such firm characteristics as current liquidity, future growth opportunities, and capital productivity. At the same time low-growth firms are much more sensitive to cash flow than high-growth firms. Current liquidity seems to be the only firm specific variable that has no impact on growth in slow-growing firms. As expected, the performance of both types of firms is strongly influenced by changes in the macroeconomic conditions in transition economies during different time periods.

## 4. Conclusion

This paper investigates the main determinants of growth in SMEs in transition economies. While previous empirical studies concentrate on a particular country this research investigates the effects of traditional firm characteristics of size and age on firm growth in the context of surviving SMEs across several CEE countries. We address the question whether stylized facts of firm growth might be better explained by comparing the size-age-growth relation in high-growth firms to slow-growth firms. Using a panel data analysis for a set of 4,561 surviving SMEs in Central and Eastern Europe, we find that firm growth is related not only to the traditional determinants of size and age but also depends on other firm specific characteristics associated with its financial structure, future growth opportunities, and capital productivity. In line with previous research, firm size and age are found to be strong determinants of growth in a firm's revenues and assets. We find that the size-age-growth relation remains stable and significant even after controlling for other firm specific characteristics such as leverage, current ratio, intangible assets, capital productivity, and cash flow ratio. Most of these variables (except current ratio) have a significant impact on a firm's growth and performance. Macroeconomic conditions in transition economies also play an important role in explaining the growth in small and medium-sized firms. We find evidence for a strong correlation between growth in GDP per capita and sales increase. The negative effect of tax variable indicates that the high rates of corporate tax in many transition economies are still an important obstacle for SMEs to grow quickly. However, there is an opposite view that argues for irrelevance of tax rate to SMEs growth. Thus, further research is needed to address better the possible effects of tax policy on a firm's activities.

In both national and EU policies, fast-growing firms receive significant attention. These firms are known to contribute more than others to production growth and growth of employment. Thus, one may expect that size and age sensitivity of growth will be significantly different for high-growth and

[25] We run the same model specifications using growth in number of employees as the dependant variable but the panel regressions yield unsatisfactory results – most of the variables in model (1) show no explanatory power. Thus, we are unable to support or reject the findings of previous empirical studies that traditional firm characteristics may well explain firm growth when it is measured by growth in the number of firm employees.

slow-growth firms in transition economies. Firms growing faster, i.e. firms with at least 20% growth in sales or employees in the last three years, show a significantly larger sensitivity to size and age. The results also indicate that growth in these two types of firms is determined by different firm specific characteristics. In case of high-growth firms, the only determinant that has no significant impact on firm growth is the current liquidity. Thus, we cannot support the hypothesis that firms with more growth opportunities will keep higher liquidity levels and thus will face less severe financing constraints. We also argue that younger high-growth firms that are able to grow faster than matured firms will need access to external capital to support their growth in sales but will rely more on their capability to generate internal funds for assets growth. Firms growing faster during the observed period also show a significantly larger sensitivity to cash flow than slow-growing firms.

When we analyze the sample of slow-growth firms, the cash flow-growth relation is found to be significant and positive, whereas leverage and other firm specific characteristics to have only a marginal impact on firm growth in sales. Thus, contrary to some previous research (see e.g., Molinari *et al.,* 2009) we assert that fast-growing firms prefer to use external capital to support their growth in sales whereas slow-growing firms rely more on their internal funds to finance new investments. When growth in total assets is used as a dependant variable in our dynamic panel analysis we obtain similar results except for cash flow sensitivity of growth. The increase in assets of high-growth firms strongly depends on such firm characteristics as current liquidity, future growth opportunities and capital productivity. At the same time, the cash flow sensitivity of growth in this type of firm is much lower than in low-growth firms. As a result, fast-growing firms will be forced to seek external capital to finance their investment in tangible assets.

Our results are relevant for policy makers and firm managers of SMEs in transition economies. The evidence shows that small and medium-sized firms in these countries still rely on internally generated sources to support their growth and find it very difficult to obtain external finance. Also, there is a significant difference in the determinants of growth in high-growth and low-growth SMEs. Policy makers should pay increased attention to these two groups of SMEs, with a special emphasis on fast-growing (younger) enterprises. Policy actions such as removing unnecessary administrative burdens and improving incentive structures, influencing the choice of labour market participants between wage-employment and self-employment will foster start-ups and innovative enterprises and will create an environment that is more beneficial for SMEs development and growth. Increasing capital and labor productivity and investing more funds in research and development (or making more efficient use of them) will help SMEs in transition economies improve their competitiveness on the EU market and enhance their growth potential.

Some further research is needed to explain the differences among small, medium-sized and large firms in their growth determinants. It is also worth investigating the borrowing environment in CEE countries and the alternatives to equity and bank financing. Possible factors to consider are bankruptcy laws and degree of creditor's protection, prevailing interest rates, and the use of supplier and off-balance sheet financing.

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