



**HAL**  
open science

# Firm Growth Dynamics and Financial Constraints: Evidence from Serbian Firms

Milos Markovic, Michael A. Stemmer

► **To cite this version:**

Milos Markovic, Michael A. Stemmer. Firm Growth Dynamics and Financial Constraints: Evidence from Serbian Firms. 2017. halshs-01489222

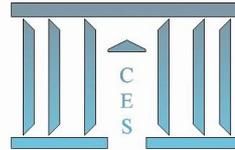
**HAL Id: halshs-01489222**

**<https://shs.hal.science/halshs-01489222>**

Submitted on 14 Mar 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



**Firm Growth Dynamics and Financial Constraints:  
Evidence from Serbian Firms**

Milos MARKOVIC, Michael A. STEMMER

2017.12



# Firm Growth Dynamics and Financial Constraints: Evidence from Serbian Firms <sup>\*</sup>

Milos Markovic<sup>†</sup> and Michael A. Stemmer<sup>‡</sup>

February 7, 2017

## Abstract

Using a unique dataset of unlisted Serbian firms during the period between 2005 and 2012, we analyze the impact of internal financial constraints on firm growth with respect to several firm-level characteristics. We also assess potential effects created by the 2008-2009 Global Financial Crisis. To do so, we rely on panel data models, which estimate via GMM cash flow sensitivities of firm growth, following the dynamic specification of Guariglia et al. (2011). Controlling for investment opportunities, our results show that Serbian firms face high financial constraints and exhibit generally a high reliance on retained earnings for firm growth. We do not find evidence for a crisis effect, potentially due to ex ante accumulated internal funds. Conventional firm characteristics such as age, size or overall performance largely determine the dependency on cash for firm growth. Moreover, foreign-owned companies seem to escape the financing gap by tapping other resources. A comparison with Belgian firms contrasts our results with an advanced country setting.

**Keywords:** Financial constraints, firm growth, transition countries, dynamic panel data, GMM

**JEL Classification:** C23, D92, E44, G32, L25, O16

---

<sup>\*</sup>We are grateful to Jean-Claude Berthélemy, Mathilde Maurel, Sandra Poncet and participants at seminars at Université Paris 1 Panthéon-Sorbonne and Paris School of Economics for fruitful discussions and comments.

<sup>†</sup>Université Paris 1 Panthéon-Sorbonne. E-mail: milos.markovic@gmail.com.

<sup>‡</sup>Université Paris 1 Panthéon-Sorbonne. E-mail: michael.stemmer@univ-paris1.fr.

# 1 Introduction

Almost a decade after the onset of the Global Financial Crisis (GFC), the global economy currently finds itself on a crossroad where a normalization process with robust economic growth rates in the US entices the Federal Reserve to tighten monetary policy further, while still considerably low inflation rate expectations and a continued lack of growth force the ECB to keep unconventional monetary policies expanded. However, the effectiveness of the latter to battle stagnant growth does not come without criticism from various sides and constant demand for additional support of the real economy cannot be ignored. Recent comments came from the IMF that argued that in Europe a particular emphasis should be put on the support of innovative small and medium-size enterprises (SMEs), which play an important role in the European economy and are considered to be the backbone of innovation and growth.<sup>1</sup> Moreover, they even do so in times of economic recession. Research has shown that SMEs are particularly resilient to economic shocks and reveal positive employment effects (Honjo and Harada (2006); Henrekson and Johansson (2010)). In the EU, the sector employs 66.5 per cent of the entire workforce and creates 57.6 per cent of value added (Muller et al. (2014)).

The relative importance of the SME sector in the Central and Eastern European region (CEE) is comparable to the rest of Europe. However, the immediate adversities of the GFC were deeper entrenched in Eastern Europe, putting the region's SME sector on an even weaker recovery path. Employment went down by 0.5 per cent in the EU27 while there was a 2.7 per cent average reduction in the number of employees working in SMEs. At the same time, the cumulative average growth rate and number of employees in the period from 2009 until 2013 in all countries of the region were negative, implying that none of them reached pre-crisis levels in terms of the two key sector performance indicators.<sup>2</sup> Simultaneously, the SME sector in the rest of Europe recovered to the 2008 levels three years after the crisis breakout – in 2012.<sup>3</sup>

Undoubtedly, the crisis inflicted tremendous damage on the financial sector and the wave of the shock transited in many countries quickly to the real economy, primarily through reduced credit supply.<sup>4</sup> The capital scarcity teamed up with sudden tightening of credit conditions and the resulting reluctance of banks to take any risk, yielding an overall

---

<sup>1</sup>The demand has recently been articulated by IMF Deputy MD Min Zhu during the debate on “The New Growth Context” at the 2015 World Economic Forum in Davos.

<sup>2</sup>The value of the unweighted cumulative average growth rate of the SME employment and value added in CEE region was -1.83 per cent and -2.73 per cent.

<sup>3</sup>This occasion confirms the intuition of Correa and Iooty (2010) who study the effects of crisis on real activity in Eastern Europe and find strong evidence that growth-driving small and innovative portions of these economies (i.e. SMEs) were affected considerably more than large and well-established companies.

<sup>4</sup>See for example Bernanke et al. (1996) for a thorough review on the effects of credit market frictions on business cycle amplification and the “accelerator effect” it has on it.

standstill of financial intermediation business in that period. Private sector yield spreads in developed markets rose sharply and companies were in a situation where they had to use either existing credit lines or invest by using their own cash reserves, which brought about a dramatic drop in overall investment volume in Europe (Campello et al. (2010); Duchin et al. (2010)). The performance of companies that find it difficult to raise funds externally due to varying reasons (i.e. financially constrained firms) suffered the most. However, contradicting these results, other researchers (e.g. Kahle and Stulz (2013); Hetland and Mjos (2012)) find evidence that the lending supply shock is not necessarily the dominant causal factor for financial and investment policies during the crisis and that investment levels of financially constrained firms were not more affected than investment levels of financially unconstrained firms.

In this paper, we explore a unique dataset of unlisted Serbian non-financial SMEs and large companies during the period from 2005 to 2012 in search for empirical evidence of a financial development dependent disparity in the provision of firm financing, which affects firm growth dynamics. Our research is inspired by the internal finance theory of growth formulated in the seminal paper of Carpenter and Petersen (2002)<sup>5</sup> who introduce a model where small firms with no access to debt (i.e. binding financial constraints) will exhibit a perfectly positive relationship between firm growth and cash flow. Relating to the “pecking order”-theory of Myers and Majluf (1984), firms prefer internal funds to equity finance and debt financing. To analyze this relationship for the Serbian firm sample, our empirical approach is based on the dynamic firm growth model formulated by Guariglia et al. (2011). We believe that the reason behind the previous observation that none of the SME sectors in CEE countries has reached pre-crisis production levels as opposed to counterparts from more financially developed European countries lies in internal and external financial constraints. These constraints are induced by firm characteristics and financial structures, which are not developed enough (in relative terms) to provide appropriate financial support for business activity. Such structural impairments to financial intermediation may tend to further magnify financial constraints with respect to firm characteristics, causing additional deferral of investment and overreliance on internally generated cash flow.<sup>6</sup> In order to provide further evidence on potential structural differences and to set our results into perspective, we briefly analyze data on Belgium firms at a later stage in Section 7. Analog to Hutchinson and Xavier (2006), we consider Belgium as an example of a well-developed economy with a fully-fledged financial sector.

We find that Serbian companies are generally financially constrained, yet to a varying degree according to different firm-level characteristics. Young SMEs are the most depen-

---

<sup>5</sup>They introduce a model where small firms with no access to debt (i.e. binding financial constraints) will exhibit a perfectly positive relationship between firm growth and internal finance.

<sup>6</sup>Throughout the chapter, we use cash flow, retained earnings or internal funds interchangeably.

dent on internal funds, whereas older, large and micro-size firms do not seem to be overly reliant on retained earnings. Firm performance seems in general to play an important role in the provision of funding, where faster growing firms or more productive ones do not, according to our model, exhibit internal financial constraints. The same holds for foreign firms, which, due to institutional reasons, tend to crowd other companies out of the market. Eventually, financial constraints for the identified firms seem to be a constant issue and we do not find evidence of larger funding gaps inflicted by the financial crisis.

The paper is organized as follows. The next two sections provide a quick overview of the theory our analysis is based upon, presents the underlying hypotheses and previous research done in the field. Section 4 and 5 explain data and the estimation strategy. Results are discussed thereafter. The paper concludes with a summary of the findings as well as policy recommendations.

## **2 Theory and Research Questions**

### **2.1 Some Theory on Financial Constraints**

The pecking order theory of finance by Myers and Majluf (1984) offers a suitable setting for explaining conceptually the mechanism in which constrained external access to finance can impair the performance of different companies based on their own characteristics and of the financial system in which they operate. The theory stipulates that informational asymmetries between the lender and borrower regarding investment opportunities (i.e. growth potential) a firm is facing will lead to differences in costs of using external versus internal funds to finance such investment<sup>7</sup>. A lack of information about the quality of the borrower and her projects results in the cost of capital containing the “lemons” premium to compensate for lack of certainty (i.e. risk) undertaken and potential moral hazard by the borrower (Akerlof (1970)). Generally, the fiercer the “dispute”, the higher the premium required by capital providers (i.e. the cost of external funds). The market mechanism in which the price of capital is determined is dysfunctional. This is reflected in the inability of the price of loans to clear credit markets in times of disequilibrium since, as formulated by Stiglitz and Weiss (1981), interest rates affect the nature of the loan transaction through adverse selection of the borrower (tendency of the lender not to extend loans to borrowers with unknown capacity to repay), and the incentives effect where the subsequent actions of the borrower depend on the terms prescribed by the lender (Hubbard (1998)). The original work by Fazzari et al. (1988) is the first to empirically test this theory on firm investment.

---

<sup>7</sup>Akerlof (1970) provides a solid foundation of the mechanism in which the informational asymmetry affects the general market allocation.

In their more recent pioneering paper, Carpenter and Petersen (2002) combine the above mentioned financing constraints theory with firm growth. They analyze an unbalanced panel containing a large sample of small US companies in the period from 1980-1992, thereby establishing the so-called “internal finance theory of growth”. Further investigated in subsequent research by e.g. Cummins et al. (2006) and Carpenter and Guariglia (2008), the theory stipulates that the sensitivity of investment to cash flow could be unrelated to the presence of financial constraints but should rather be associated with the fact that cash flow itself may be a proxy for investment opportunities. This is reflected by periods of high cash flow (i.e. profitable periods) generally coinciding with periods of increased investment opportunities.<sup>8</sup> The Carpenter and Petersen (2002) model predicts that, in the presence of binding financial constraints, firms would exhibit perfectly positive (one-for-one) relationships between the level of internal finance and growth. In a situation where firms would have access to debt markets, firms would be able to raise more debt based on the higher availability of cash, which is effectively increasing their collateral value. Therefore, an increase in internal funds of one dollar would lead to a slightly more than one dollar increase in total assets (i.e. growth). However, as this model consequently assumes that investment opportunities are highly elastic to the supply of finance, arguably a rather debatable conjecture, we can conclude that this approach (relating a firm’s total assets to its cash flow) indicates the potential existence of internal financial constraints.

## 2.2 Research Questions

Against the backdrop of the internal finance theory stated above, we formulate our research to answer the following set of questions (i.e. hypotheses):

1. **To what extent are Serbian firms constrained by internal finance availability for growth?**

We argue that the underdevelopment in the financial market causes investments and thus firm growth of an average Serbian company to be constrained to internally generated cash. The relative underdevelopment is reflected primarily in the reduced credit supply induced by informational asymmetries (i.e. credit rationing) and the lack of appropriate market mechanisms (i.e. financial instruments) in Serbia. A useful measure of financial market development, the amount of private credit to GDP, was proposed by Arellano et al. (2012). This indicator stood at the level of 43 per cent in Serbia, while it was, for instance, at 58 per cent at the end of 2014 for Belgium, a country of similar size yet with a developed financial market. Research also supports the view of the Serbian financial market suffering from imperfections, which go in favor of our hypothesis. Namely, Dimitrijevic and Najman (2008) find significant

---

<sup>8</sup>To put it differently, whatever portion of investment is not explained by the investment opportunities will be explained by the variation in cash flow since cash flow is positively correlated with investment opportunities.

pre-crisis reluctance of Serbian banks to invest in the reduction of informational asymmetries as they show persistent competitiveness only in the market segments, which are traditionally unconstrained by external finance. It is, however, important to note that even though the observation of high sensitivity of growth to cash flow is seen as a sign of financial constraints, it can be accompanied with relatively high growth rates for companies restricted by internal finance as long as they are able to generate sufficient internal liquidity to finance their own investment. This refers in particular to market segments, which have solid growth prospects, as documented recently by Guariglia et al. (2011).

**2. Does the sensitivity of growth to internal finance increase in Serbia during the crisis period?**

Intensive financial market distress, such as the one that was witnessed during the GFC, tend to magnify the financial market flaws through increased informational asymmetry caused by overall risk aversion and ambiguity in times of severe market contraction that is marked with an acute shortage of credit supply. This effect is exacerbated in countries with a lower financial development level where various shortcomings of the financial system (from regulatory to behavioral) create diverging incentives for borrowers and suppliers of capital. Hence, we expect the sensitivity of growth to cash flow to be stronger in the crisis period in Serbia.

**3. Is the sensitivity of growth to internal finance (proxied by cash flow) more prominent in case of young and small firms?**

Recently, Clarke et al. (2012) reported that only 38 per cent of small companies in Eastern Europe and Asia were using external debt financing in 2008 and 2009, while this share was much higher (64 per cent) for large companies. This is a consequence of the capital market contraction where credit rationing mechanism causes reduction of financing to the companies which are unknown to the capital suppliers (i.e. where the informational asymmetry is higher). Much of earlier research confirms the notion of companies subject to binding financial constraints being smaller, younger and coming from less developed financial markets (Bernanke and Gertler (1995); Schiantarelli (1996); Beck and Martinez-Peria (2008); Becker and Sivadasan (2010); Arellano et al. (2012)). Our goal is to analyze whether this holds in the context of Serbia as well.

**4. How does firm ownership in Serbia affect financial constraints?**

Financial market underdevelopment and strong foreign bank presence may further

exacerbate the aforementioned market frictions. Sharing this experience with other transition countries, since the beginning of the opening up process Serbia's economy has been largely dominated by foreign bank branches<sup>9</sup> (Dimitrijevic and Najman (2008); Cull and Martínez-Pería (2013); Kujundzic and Otasevic (2012)). Literature on foreign bank presence, however, is large (for an overview, see Claessens and van Horen (2013)) and views on whether and to what extent foreign banks contribute to economic performance and financial development of countries diverge. In some markets, research shows that foreign banks lower the overall costs and increase the quality of financial intermediation, increase access to financial services, and thus enhance the financial and economic performance of their borrowers (Claessens et al. (2001); Clarke et al. (2003); Martínez-Pería and Mody (2004); Claessens (2006)).<sup>10</sup> However, recent literature also suggests that both the GFC as well as the bank-dependent market structure in CEE countries may have actually impeded the exploitation of positive effects. Some studies show that the presence of foreign banks can be destabilizing when the parent bank is hit by a shock, especially when the foreign affiliate is not financed by local deposits (Cetorelli and Goldberg (2012b) and Cetorelli and Goldberg (2012a); Ongena et al. (2013); de Haas and van Lelyveld (2014)). This is expected to cause overall increase in risk aversion of a domestic affiliate causing a shift of credit supply to those groups of companies, which are perceived as less risky. While we cannot formally test the channels of credit, foreign-owned companies can be seen as firms which banks would prefer in normal and distressed times, especially having in mind the close relationship they maintain (Giannetti and Ongena (2012)), effectively lowering their level of financial constraints.

Another reason behind the low-risk profile of foreign companies is the fact that they are appreciated by banks for their quality of corporate governance, especially in emerging markets such as Serbia.<sup>11</sup> Recent evidence coming from Nguyen et al. (2015) also suggests that this seems to hold in particular during turbulent times. Authors show that corporate governance helped alleviate the credit supply shock caused by the GFC for those with good corporate governance practice.

State-owned firms, on the other hand, may profit from the close proximity to the government and banks under state control through easier access to finance. Moreover, there may

---

<sup>9</sup>During the period of 2007 to 2011, the market share of foreign-owned banks (in per cent of total assets) was consistently above 70 per cent (Cihak et al. (2012)).

<sup>10</sup>These effects are thought to result from an increase in banking competition, the introduction and spillover of new and more sophisticated technologies, and from enhanced domestic regulatory reforms. Moreover, some evidence from several new EU member countries and Turkey shows that larger foreign bank presence in economies with less developed financial markets helped to ease access to finance during the crisis to otherwise constrained companies and boosted the economic recovery process (Clarke et al. (2012))

<sup>11</sup>Francis et al. (2013) supports this view by analyzing 14 different emerging economies.

be larger political willingness for granting direct or indirect subsidies and still existing soft budget constraints within these firms, as evidence for other transition countries suggests (e.g. Konings and Vandenbussche (2004); Lízal and Svejnar (2002)), what further eases financial constraints. We will test whether several classifications of firm ownership have an impact on financial constraints of Serbian firms.

We contribute to the related literature in several ways. First, we add to the growth determinants literature from a financial constraints' perspective by testing the effect of internal finance on firm growth in terms of total assets. Previous work examining the cash flow to investment sensitivity consists most importantly of literature by Fazzari et al. (1988), Kaplan and Zingales (1997, 2000), and Bond et al. (2003). Papers focusing on growth, besides Carpenter and Petersen (2002), include Wagenvoort (2003), and Hutchinson and Xavier (2006). While the former analyzes a cross-section of European countries, our effort may essentially be considered as an update to the latter since Hutchinson and Xavier (2006) compare Slovenia and Belgium in terms of the role internal finance plays for the growth of SMEs. This chapter updates the previous work in the sense that almost a decade afterwards we are performing similar research again on a young, underdeveloped market economy in the last phase of its transition process – Serbia. Both countries build on the economic heritage of the former Yugoslavia with Slovenia being continuously the economic leader among the six former federal units.

Second, we also perform a micro-econometric analysis on the effect of internal finance on firm growth in the context of the GFC in Europe. Most of the crisis related research considers the internal finance – investment relationship, with the exception of Guariglia and Mizen (2012) who examine growth of Asian firms during the early crisis years in search for an explanation of a heterogeneous recovery of several Asian economies and the partial resilience of companies to the tremendous external shock.

Third, a battery of firm-level characteristics that we expect to influence the finance-firm growth relationship will be tested. Usual determinants in the literature are, for example, firm size, age, productivity or overall financial dependency. We assess further, whether foreign participation in the ownership of Serbian companies would vouch access to finance to these companies and influence their growth. Here we follow the intuition of Francis et al. (2013) who argue that corporate governance quality may add to a reduction in informational asymmetries and ease access to external finance. Moreover, Giannetti and Ongena (2012) find a close relationship between foreign owned companies and foreign banks in Eastern Europe. We assume that these findings may particularly hold in the case of Serbia where foreign banks own a majority share in the banking market (Ongena et al. (2013)).

### 3 Related Literature on Firm Growth

Our article is related to several strands of literature, which stem from a common theoretical framework and put the concept of financial market mechanisms under empirical scrutiny. Most of these papers focus on investigating the cash flow – investment relationship in the setup of the neoclassical model of investment (Summers (1981)) which primarily relates investment to investment opportunities proxied by Tobin's Q.<sup>12</sup> The theory stipulates that, in the absence of capital market imperfections, the variation in company's investment should be fully explained by investment opportunities thus leaving the cash flow and investment unrelated. However, in reality, as we already discussed due to numerous issues that impair the mechanisms of capital market allocation process, the investment is related to cash flow implying that there are companies which are not able to borrow at sufficiently low rates to finance their investment but are instead relying on the funds they generate from their own operations (i.e. financially constrained companies). Some of the most influential papers from the field include Fazzari et al. (1988, 2000) and Kaplan and Zingales (1997) which develop a fruitful dispute on the question of whether the financial constraints are the underlying reason for the observed sensitivity of investment to cash flow. Namely, Fazzari et al. (1988) argue that cash flow investment sensitivity increases with financial constraints which is the notion implicitly suggested by the pecking order theory, while Kaplan and Zingales (1997) show the opposite evidence where the most successful (liquid and profitable) companies exhibit the largest sensitivity. They attribute these findings to behavioral choices assumed by managers, which either include a risk-averse type of behavior of investing only when they are making profits or situations where managers decide not to seek funds externally today since they perceive it as running a risk of facing financial constraints in the future.

Much research followed these ideas and attempted to demonstrate arguments, which would reconcile the evidence. The most comprehensive one is given by Guariglia (2008) who focuses on the importance of the selection criteria for determining whether a company is financially constrained or not, since ready-made classification schemes are not available. The author points to the obvious difference between the explicit characteristics of a financially constrained company versus implicit ones, where the first group includes age and size of a company while the latter comprises a set of financial ratios commonly used to separate financially constrained companies from their unconstrained peers (i.e. cash flow and interest coverage ratio).

Literature contains only several other papers further exploring Carpenter and Petersen (2002) idea of the “internal finance theory of growth” for emerging or transition countries. For instance, as already mentioned, Hutchinson and Xavier (2006) analyze the dataset of

---

<sup>12</sup>Tobin's Q is defined as the ratio between a firm's market value and the capital replacement costs.

Belgian and Slovenian firms for the period spanning 1993-2000 and 1994-2002, respectively. Expectedly, they find evidence of internal finance playing a more important role in explaining the growth of Slovenian versus Belgian companies confirming the intuition of the former being more financially constrained. They also find that the growth of small companies (micro ones in particular) is more sensitive to the availability of internal funds than that of large companies in both countries. To our knowledge, this is the only study involving comparative analysis in the context of cash flow – growth relationship. More recently, Guariglia et al. (2011) explore the recent Chinese “growth puzzle” by analyzing the role of internal finance availability across a sample of companies split according to ownership types. The authors find strong evidence of private and foreign firms’ growth depending more on the availability of internally generated cash as opposed to that of state owned and collective firms. When put in relation with the growth rates observed in Chinese economy, these findings show that financial constraints are not necessarily a restricting factor for growth because if firms are sufficiently profitable their investment levels may be intact as they are able to finance it through retained earnings. These companies rely heavily on their internal finance for growth (are financially constrained), but their growth is not affected by the limitations in access to external financing. Finally, the only paper relating the internal finance availability to growth of companies in the context of GFC is the work done by Guariglia and Mizen (2012). The authors look at the investment behavior of companies in eight Asian countries in the period from 2001-2009 to find evidence of internal finance being heavily used for investment and growth, which made them comparatively more resilient to external shocks. The results seem robust to cross-country sample splits and absolute levels of cash flow. The authors suggest that, apart from various capital market inefficiencies, the underlying reasons might be found in the precautionary behavior following the lessons learned from the earlier Asian crisis of 1997-98.

## **4 Data and Summary Statistics**

For our analysis, we employ a unique dataset on initially 17860 Serbian firms that has been collected from a survey of the Business Registry Agency (BRA) of Serbia and covers the period 2005-2012 on an annual basis. General company data (age, size, ownership) come from the Companies Registry while the financial data come from the Financial Statements and Solvency Registry of the BRA. Data on the annual CPI inflation rate is derived from the World Development Indicators database of the World Bank. Although some caution on transition country data is warranted, the data on Serbia profit from a relatively high quality, as all firms are required to report directly to the central bank independent of firm size.

**Table 1: Summary Statistics**

Variables	Mean [1]	Standard Deviation [2]	Minimum [3]	Maximum [4]
Asset growth	0.030	0.233	-1.907	1.876
Employment growth	0.007	0.215	-2.959	2.164
Sales growth	0.008	0.469	-8.296	4.971
Assets	1036.674	1439.741	5.853	17183.94
Sales	1010.955	1231.137	0.689	22478.19
Employees	40.431	49.057	6	1004
Age	14.413	6.931	2.008	94.09
Cash flow/total assets	0.111	0.118	-0.549	1.413
Labor productivity	30.737	32.286	0.059	576.012
Number of firms	1558	1558	1558	1558
Observations	10906	10906	10906	10906

*Remarks:* The table presents summary statistics for the 2006 to 2012 sample period. Assets and sales are expressed in '000 of national currency units and have been deflated by the national CPI inflation rate. Age is expressed in years elapsed since the incorporation date of the company and ratios in percentage terms. Labor productivity is the ratio of total real sales to number of employees.

*Source:* Authors' calculations.

We investigate only firms belonging to the manufacturing sector, excluding agricultural, financial or service firms. As our sample period is rather short, firms are required to have observations for every year in the sample to ensure that cyclical episodes or one-time observations do not blur our results; thus we operate with a balanced panel. We only keep firms with positive values for total sales and total assets to avoid firms under restructuring or bankruptcy (Cleary (1999)). We further apply the typical one per cent-tails outlier cuts to control for potential accounting errors or abnormal firm-level shocks (Bond et al. (2003); Cummins et al. (2006)). Ultimately, 1558 Serbian firms yield a balanced panel of 10906 observations. The sample firms are distributed across several industry sectors and are primarily active in the wood, textile, food, metal, and rubber industries.

Table 1 represents summary statistics in form of mean values and standard deviations of our firm samples. Due to the calculation of growth rates for assets, employment, and sales, we lose one year of the initial sample size and hence include only data from 2006 onwards. By looking at our sample statistics, Serbian firms show in terms of mean assets growth a rate of 3 per cent on average. The figure reported for the second growth category, sales growth, is considerably lower while employment growth drags behind with only 7 per cent. Serbian firms employ on average about 40 employees. The mean age, at 14.4 years, is rather low, suggesting that the majority of firms were created during the transition period.

Compared to other studies on emerging countries, the average cash flow ratio at 11.1 per cent for Serbian firms lies below reported figures elsewhere for transition countries.

For instance, across the transition country sample of Konings et al. (2003), our numbers come closest to the average shown by the Czech Republic (17 per cent), whereas Poland, Bulgaria and Romania exhibit ratios of up to two times the size. Standard deviations, however, are much lower for Serbian firms. The median value of 7.9 per cent is very close to the 8 per cent reported by Hutchinson and Xavier (2006) for Slovenian companies. Relative to Western European countries, though, the numbers are small. Bond et al. (2003) report a cash flow to capital ratio of 17.8 per cent for Belgium, 11.9 per cent for France or 13.4 per cent for the UK.

For a more recent time period, Arslan et al. (2014), focusing on the 1998-1999 Asian financial crisis as well as the Great Recession, report for Asian countries on average 7.2 per cent during the crisis and 7 per cent in the pre-crisis period. Firms analyzed by Arslan et al. (2006) during the Turkish financial crisis between 2000-2001 exhibit a rather low cash flow ratio of 3.6 per cent coming down from 11.5 per cent in the pre-crisis period.

Apart from financial underdevelopment, research has shown that economic uncertainty affects the ability of lenders to accurately assess the creditworthiness of firms. This increased difficulty to raise external funds further constrains the capacity of firms to invest to the amount of internal funds available, putting a drag on future output and firm growth (see e.g. Bond and Van Reenen (2007); Baum et al. (2010)).<sup>13</sup> To provide some initial descriptive evidence for our claim of a strong reliance on internal funds among Serbian firms, we assess the level of uncertainty in the economy. Comparatively high levels of disaggregated and aggregated uncertainty likely point to higher levels of internal financial constraints. We compute three different measures of uncertainty at the firm level, the industry sector level and economy-wide and compare with results previously obtained for other transition countries as in Guariglia et al. (2012). Starting with firm-level uncertainty, we use the interquartile range of the cross-sectional spread of firm-level real sales (Bloom (2009)). We obtain values of 0.35 for Serbia, which compare to 0.37 for Bulgaria, 0.25 for the Czech Republic, 0.31 for Poland and 0.4 for Romania. Next we compute our uncertainty metric at the industry level. For each country, we report the minimum and maximum values of the industrial inter-quartile range. Serbia exhibits 0.19 and 0.49; 0.18 and 2.5 for Bulgaria; 0.17 and 1.5 for the Czech Republic; 0.16 and 1.8 for Poland, and 0.17 and 2.8 for Romania. The aggregated or economy-wide uncertainty is calculated as the standard deviation of GDP growth. Serbia stands out with a value of 3.45, while Bulgaria shows 1.53, the Czech Republic 1.62, Poland 1.41, and Romania 2.75. Although, compared to its peers, the firm-level metric unearths no particular tendency, industry-specific and economy-wide indicators signal heightened uncertainty levels for Serbia, suggesting that internal financial constraints most likely occur.

---

<sup>13</sup>Ghosal and Loungani (2000) report a negative effect of uncertainty on investment particularly in sectors and economies dominated by small firms.

In the next section we estimate dynamic firm-level assets growth equations that include cash flow to assess in more detail the degree of internal financial constraints Serbian firms are affected by when it comes to firm growth.

## 5 Estimation Strategy

The baseline regression model follows Guariglia et al. (2011) and relies on the dynamic specification of the Carpenter and Petersen (2002) firm growth model as follows:

$$Asset\ growth_{i,t} = \beta_0 Asset\ growth_{i,t-1} + \beta_1 \left( \frac{Cash\ flow}{Total\ assets} \right)_{i,t} + error\ term_{i,t} \quad (1)$$

where the cash flow variable is defined as net operating revenues plus total depreciation and expressed as a ratio scaled to contemporaneous total assets to control for size effects.<sup>14</sup> The *error term* in the equation above can be expressed as  $\varepsilon_{i,t} = \mu_i + \tau_t + \epsilon_{i,t}$  and comprises time-invariant firm fixed-effects  $\mu_i$  that may influence growth and time-invariant measurement errors. It further entails time-specific effects  $\tau_t$  from potential business cycle factors that may affect all firms as well as an idiosyncratic component  $\epsilon_{i,t}$ . Moreover, all variables that were expressed in national currency units have been deflated by the national CPI inflation rate.<sup>15</sup>

In a first attempt, we estimate the above regression with a within-groups estimator whereby the firm-specific effects get purged due to a subtraction of firm means. We further account for time effects by including a time dummy at the year level. Standard errors are heteroscedasticity-consistent, robust to autocorrelation within panels and clustered at the firm level.

However, given the relatively large cross-section of firms, the short time dimension and the endogeneity of the lagged dependent variable, we also employ a first-difference Generalized Method of Moments approach (Arellano and Bond (1991)) and the system Generalized Method of Moments methodology introduced by Arellano and Bover (1995) and Blundell and Bond (1998).

This technique accounts for unobserved firm heterogeneity by estimating the equations in

<sup>14</sup>To check for robustness, we also use beginning-of-period total assets as a scaling factor but results remained unaffected.

<sup>15</sup>Even though sectoral deflation or inflation rates may seem appropriate, data availability for Serbia does not allow a more detailed approach. As sectoral inflation rates largely move closely together, we follow Laeven and Valencia (2013) and employ the CPI inflation rate of Serbia as an approximation.

first-differences and controls for endogeneity by instrumenting the variables in differences with internal lags.<sup>16</sup> Apart from the lagged dependent variables, further endogeneity may arise from cash flow in the sense that firms experiencing higher growth in total assets may also be able to create higher changes in cash flow. Therefore all of our above regressors will be instrumented with their own lags.

In order to check for viability of the GMM specification, we follow the strategy of Bond (2002). Due to a likely downward bias of the within-groups estimator in short dynamic panels (Nickell (1981)), one would expect a consistent estimate of the coefficient on the lagged dependent variable to lie considerably above the within-groups estimate. If the estimates obtained from the GMM estimators lie close or below the within-groups coefficients, a threat of a potential downward bias would exist as well, possibly due to weak instruments.<sup>17</sup>

The results of the firm growth model in terms of total assets presented in Table 2 below do not point to a serious finite sample bias. The coefficients of the lagged dependent variable,  $Asset\ growth_{i,t-1}$ , are substantially higher under the first-difference and the system GMM estimators compared to the within-groups estimations.<sup>18</sup> Being overall highly significant, also the cash flow coefficients, as a test lagged once, however, rise considerably in magnitude after being estimated with GMM and obtain the largest coefficient with 1.026 under the system GMM estimator. This may result from taking into account the potential endogeneity of cash flow. As described by Carpenter and Petersen (2002), the coefficient of  $\beta_1 > 1$  implies a slightly higher than one-to-one relationship between the cash flow to assets ratio and firms' assets growth under imperfect capital markets and thus indicates a very strong internal financial constraint. Hutchinson and Xavier (2006) also consider adjustment costs as a potential factor. Investments in physical capital most likely require higher adjustment costs than other forms of investment.<sup>19</sup>

---

<sup>16</sup>Results have not shown significant differences when estimated through forward orthogonal deviation as proposed by Arellano and Bover (1995).

<sup>17</sup>In the case of such a serious finite sample bias, an alternative system GMM estimator is proposed by Blundell and Bond (1998), which instead of instrumenting differenced variables with levels as in Arellano and Bond (1991) instruments levels with differences. This bias generally occurs when instruments for the endogenous variables in the first-differenced GMM estimator are not very informative, which is often the case in autoregressive models with persistent series (as often the case with macroeconomic time series) or where the variance of the fixed-effects is particularly high relative to the variance of the transitory shocks (Guariglia (2008)). Despite of not showing signs of misspecification, equations were also estimated with a two-step system GMM, thereby controlling carefully for instrument proliferation through collapsing the instrument matrix and correcting for a potential small sample bias following Windmeijer (2005). These results have ultimately proven to be more reliable.

<sup>18</sup>Our results are also robust under a pooled ordinary least squares specification, but as expected, the lagged dependent variable is upward biased. In fact, all our results have been tested for a proper specification with respect to within-groups and OLS estimations. Moreover, for the OLS estimations, tests on omitted variable bias are rejected.

<sup>19</sup>For more details consult the seminal paper on adjustment costs of investment by Cooper and Haltiwanger (2006).

Moreover, the lagged asset growth variable in the regressions exhibits negative and significant coefficients for all four specifications. This may be a sign of convergence among firms.

**Table 2: Baseline Regressions with Specification Checks**

Dependent Variable: Asset Growth	FE [1]	FD-GMM [2]	FD-GMM [3]	SYS-GMM [4]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	-0.172*** [0.013]	-0.059*** [0.019]	-0.075*** [0.012]	0.059*** [0.019]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.387*** [0.049]	0.982*** [0.218]		1.026*** [0.230]
<i>Cash Flow</i> <sub><i>i,t-1</i></sub>			0.851*** [0.181]	
J (p-value)		0.232	0.041	0.935
AR(1)		-17.10	-17.04	-17.46
AR(2)		0.58	0.35	0.59
Time FE	YES	YES	YES	YES
Observations	9348	7790	7790	9348

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in column [4] are *Asset growth*<sub>*i,t-2*</sub>, (*Cash flow/Total assets*)<sub>*i,t-2*</sub>. In columns [4] the instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

To evaluate whether the instruments are legitimate and the model is correctly specified, we assess whether the variables in the instrument set are uncorrelated with the error term in the relevant equation. In order to do so, we rely on two criteria. The first is Hansen's J or the J-test, which is a test for overidentifying restrictions. Under the null of valid instruments, this test is asymptotically distributed as a chi-squared with number of instruments minus number of parameters degrees of freedom.<sup>20</sup> We further test with the *m*-test for first, second, and if necessary, third-order serial correlation in the differenced residuals (represented as AR(1) and AR(2) in regression tables). In the presence of second order serial correlation (or first order serial correlation in levels), the instrument set needs to be restricted to lags three or deeper. These lags are valid once serial correlation in the differenced residuals of order three is rejected.

<sup>20</sup>As our GMM estimates are robust to heteroskedasticity, and the assumption of independent and homoscedastic residuals  $\epsilon_{i,t}$  across firms and over time seldom holds in practice, we rely on the J-test instead of the standard Sargan test (see Roodman (2009a) and Roodman (2009b)). The former may, however, over-reject the null hypothesis in case of an either large cross-sectional dimension or a moderate time dimension (see Blundell et al. (2000); Bowsher (2002); Greenaway et al. (2014)). Moreover, there may be cases where the J-test statistic cannot be computed given the near singularity of variance-covariance of the moment conditions. This arises when the cross-sectional dimension is small relative to the number of instruments. Therefore, we always control for serial correlation in the differenced residuals as well.

For all GMM specifications serial correlation of the second order can be rejected. However, the J-test with a value of 0.041 suggests a potential overidentification issue when the lagged cash flow term enters the equation. Together with a careful control against a finite sample bias *à la* Windmeijer (2005) and instrument proliferation through a collapsed instrument matrix, a robust specification under system GMM in column [4] can be confirmed. We therefore rely solely on system GMM for future estimations.

Instrument selection follows the subsequent strategy: We first employ the endogenous variables lagged two times as instruments.<sup>21</sup> If the tests for second-order serial correlation of the differenced residuals and/or the J-test fail, what may for instance happen if measurement errors occur, we opt in case of the former only for instruments lagged three times.

## 5.1 On Investment Opportunites

As usually reported in the literature (e.g. Carpenter and Petersen (2002); Hutchinson and Xavier (2006); Guariglia et al. (2011)), there is a strong relation between asset growth and the cash flow ratio with the latter indicating potential firm growth according to what internal funds permit. By looking at our descriptive statistics in Table 1, this link seems to be broken in Serbia. Despite of cash flow figures of around 11 per cent, firms exhibit positive yet low assets growth and (even negative) sales growth rates. This divergence requires a diligent control for investment opportunities in the econometric analysis in order to disentangle financial constraints and demand-side factors, which are also likely exacerbated by the crisis.

As our dataset consists of only non-listed firms, we are unable to compute Tobin's Q, which is defined as the market value of a firm over the replacement value of its total assets. This variable usually accounts for investment opportunities at the firm level and controls for a potential bias induced by the cash flow coefficient that could represent omitted investment opportunities (Cummins et al. (2006); Carpenter and Guariglia (2008)). Unfortunately, data availability does not allow for an inclusion of industry-level value added growth, as often done in the literature to proxy for Tobin's Q (see e.g. D'Espallier and Guariglia (2015); Guariglia et al. (2011)). Instead, we rely on the growth of real sales as a proxy for future demand, following the example of Hutchinson and Xavier (2006) and Konings et al. (2003).<sup>22</sup> As a second approach, we include subsector dummies interacted with disaggregated time dummies at the 2-digit NACE industry level (33 subsectors). This approach is

---

<sup>21</sup>If the undifferenced error terms are i.i.d., then the differenced residuals should display first-order, but not second-order serial correlation.

<sup>22</sup>We employ the log change of real sales normalized by contemporaneous total assets following Hutchinson and Xavier (2006). Our results are robust to alternative definitions, such as real sales growth normalized by lagged total assets as in Konings et al. (2003) or future real sales growth normalized or not by contemporaneous total assets. Results available upon request confirm the main findings.

a rather indirect way to account for investment opportunities and thus represents also a more general indicator for time varying demand shocks at the industry level<sup>23</sup> (Duchin et al. (2010); Gormley and Matsa (2014)). If the correlation of cash flow with investment opportunities were an issue, coefficients of the cash flow variable should be considerably lower than without controlling for it.<sup>24</sup>

After having properly accounted for investment opportunities, we further add firm-level variables in natural logarithm to our target covariates that according to Evans (1987) may impact firm growth such as firm age (measured in years from incorporation) and size (measured in number of employees).

## 6 Results

Table 3 below presents results for the full sample with the added control variables. Apart from the choice of investment opportunities control with either sales growth in columns [1] – [2] or with interacted time-industry dummies in [3] - [4], the two specifications following Blundell and Bond (1998) differ in the choice of instruments.

In the first specification we choose to use instruments only for the dynamic part of the equation and sales growth, whereas the second specification instruments for all variables included in the equation. We always employ instruments lagged twice unless stated otherwise.

When controlling for investment opportunities with either sales growth or disaggregated sector-industry fixed effects, coefficients of the cash flow variable report values close to the results of the baseline model for the system GMM estimation in column [4] of Table 2. Point estimates are in all cases even slightly higher, what makes us conclude that the correlation between cash flow and investment opportunities is not likely to carry a large bias. Moreover, although showing the correct sign, the sales growth variable does not appear to be significant. Nonetheless, properly accounting for it also adds further precision to estimations and points at an overall strong reliance on internal financial resources for firm growth.

In terms of specification diagnostics of the different models, m-test results do not reject the validity of the estimator by indicating the absence of serial correlation (AR(1) is significantly negative, while AR(2) is not significant). However, we encounter some identification

---

<sup>23</sup>As Carpenter et al. (1994) explain, the inclusion of disaggregated industry-time dummies does not come without additional costs. The dummies control for all time varying facts at the industry level and higher aggregates but also remove common cyclical components of the financial variables.

<sup>24</sup>As for a selection bias, Allayannis and Mozumdar (2004) argue that the inclusion of negative cash flow observations in the sample (i.e. firms in financial distress) could considerably influence cash flow sensitivities. We therefore re-estimate the results after eliminating all negative cash flow observations (which constitute around 18.4 per cent of the sample). Results show very similar sensitivities for different classification of firms and are thus not reported.

**Table 3: Controlling for Investment Opportunities**

Dependent Variable: Asset Growth	SYS-GMM		SYS-GMM	
	Fully Instrumented [1]	Partially Instrumented [2]	Fully Instrumented [3]	Partially Instrumented [4]
$Asset\ Growth_{i,t-1}$	-0.098*** [0.034]	-0.070** [0.033]	-0.039* [0.021]	0.054** [0.021]
$Cash\ Flow_{i,t}$	1.609*** [0.205]	1.188*** [0.382]	1.088*** [0.380]	1.214*** [0.228]
$Sales\ Growth_{i,t}$	0.211 [0.143]	0.055 [0.154]		
$Size_{i,t}$	0.037 [0.037]	0.020*** [0.004]	0.063* [0.036]	0.018*** [0.003]
$Age_{i,t}$	-0.028** [0.012]	-0.022*** [0.007]	-0.026** [0.011]	-0.016* [0.008]
J (p-value)	0.599	0.394	1.000	0.017
AR(1)	-8.37	-15.90	-4.20	-15.20
AR(2)	-1.06	0.11	-1.22	0.03
Time FE	Yes	Yes	No	No
Sector-Time FE	No	No	Yes	Yes
Observations	9348	9348	9348	9348

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments are  $Asset\ growth_{i,t-2}$ ,  $(Cash\ flow/Total\ assets)_{i,t-2}$  and  $(Real\ sales\ growth/Total\ assets)_{i,t-2}$ . The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as  $N(0,1)$  under the null of no serial correlation. \*\*\*, \*\*, \* respectively indicate significance at the 1% level, the 5% level, and the 10% level.

*Source:* Authors' calculations.

problems in the J-test when controlling with sector-time dummies under both fully and partially instrumented system GMM models in columns [3] - [4]. This is not the case anymore when inserting sales growth.<sup>25</sup> Moreover, the additional firm-level determinants of growth, size and age, are precisely estimated when only lagged firm growth, cash flow, and sales growth are instrumented.

Thus, we can state that even under investment opportunities and demand shock control Serbian firms suffer from strong internal financial constraints. Firm growth seems to be further positively driven by firm size, which contradicts the theory of smaller firms usually growing faster. The negative coefficient of the age variable, though, is in line with theory, which finds evidence that younger firms are more likely to grow faster than older ones. From hereon we thus include the sales growth variable as a control for investment opportunities in our regressions and instrument only partially for endogenous variables if not stated otherwise.<sup>26</sup>

<sup>25</sup>Whereas column [3] reports a perfect p-value of 1.000 as the classic sign of instrument proliferation, column [4] shows a rather small value of 0.017. Column [2] yields a p-value of 0.394, which comes relatively close to the J-test results assessment of Roodman (2009a). Given that related research (e.g. Konings et al. (2003); Guariglia (2008); Guariglia et al. (2011)) reports higher and more volatile results, we take comfort in our specification tests presented in this work.

<sup>26</sup>Results can also be confirmed by using the initial unbalanced panel dataset with some firms lacking observations for the whole sample period. Firms dropping out due to accounting errors or bankruptcy do thus not cloud our findings. Results are available upon request.

## 6.1 Firm Growth and Crisis

The regression analysis presented above is based on the entire sample period and all firms. However, the time period of our analysis is characterized by a major economic shock, the Global Financial Crisis. Thus, after the establishment of the baseline model and the imposition of investment opportunity controls, we look into effects on the relation between firm growth and cash flow sensitivity potentially inflicted by the global financial crisis. For this purpose, we interact the cash flow variable in Equation (1) with a crisis dummy, which equals 1 for the years 2008-09 and 0 otherwise.<sup>27</sup> We further include the regular cash flow variable to allow for crisis effects on the cash flow sensibility. The model is estimated with time fixed effects, which subsume the crisis dummy. Moreover, we keep the previous controls in place and employ again the real sales growth variable as a control for investment opportunities and demand effects. Admittedly, however, given our annual data the account for a crisis effect can only remain rudimental, as we are unable to track changes in corporate financial policies in more detail.

---

<sup>27</sup>The non-significance and size of the crisis dummy are robust to changes in the crisis period. Several crisis windows from 2007 to 2009, from 2008 to 2010, a single crisis year 2009, as well as a post-Lehman dummy for an entire regime shift have been tried.

**Table 4: Crisis Effects on the Growth-Cash Flow Sensitivity Relationship**

Dependent Variable:	
Asset Growth	[1]
$Asset\ Growth_{i,t-1}$	-0.098*** [0.034]
$Cash\ Flow_{i,t}$	1.609*** [0.205]
$Cash\ Flow_{i,t} * Crisis$	0.151 [0.378]
$Sales\ Growth_{i,t}$	0.211 [0.143]
$Size_{i,t}$	0.037 [0.037]
$Age_{i,t}$	-0.028** [0.012]
J (p-value)	0.599
AR(1)	-8.37
AR(2)	-1.06
Time FE	Yes
Observations	9348

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments are  $Asset\ growth_{i,t-2}$ ,  $(Cash\ flow/Total\ assets)_{i,t-2}$  and  $(Real\ sales\ growth/Total\ assets)_{i,t-2}$ . The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as  $N(0,1)$  under the null of no serial correlation. \*\*\*, \*\*, \* respectively indicate significance at the 1% level, the 5% level, and the 10% level.

*Source:* Authors' calculations.

the financial supply shock. The crisis thus would not have a significant different effect on the financial configuration of firms.

Moreover, as aforementioned, Serbia has a much less developed financial market, is highly bank dependent and banks have primarily been subsidiaries of foreign banks. Kahle and Stulz (2013) find that bank-dependent firms do not decrease capital expenditures more

Results presented in Table 4 do not, to our surprise, confirm the hypothesis that the cash flow sensitivity of firm growth changes between tranquil and distressed times. Whereas the non-interacted cash flow term exhibits with a positive and precisely measured coefficient of 1.162 a high reliance on internal funds, the interacted term shows up as insignificant and very low. This hints at a continuous and severe constraint of firms when financing for expansionary activities is needed, independent of negative funding shocks such as the financial crisis.

Explanations for this continuous lack of funding can only be indicative. When, for instance, comparing average cash holdings during the years prior to the crisis (2005-2007) with the overall average, pre-crisis holdings with about 14.4 per cent exceed the sample average of 11.1 per cent in Table 1. A change in net cash becomes even more evident when looking at the last year before the crisis and the first year after. The cash flow level stood at 16.8 per cent in 2006 and was reduced to a level of 9.1 per cent in 2010. This may support the theory that financially constrained firms hoarded cash before the crisis and were at least partly living on accumulated funds, cushioning

than other firms in the first years of the crisis and a bank lending shock may thus not be the first determinant for a decrease in firm growth. However, with firms being on average rather small, size may in general restrict them from obtaining financing due to lack of collateral, the presence of asymmetric information or agency costs. Whether this is the case and if other firm-level characteristics play a decisive role in being financially constrained will be the focus of the analysis below. Even though we do not find significant differences for crisis and non-crisis periods, we nonetheless control through separate estimations with crisis interaction terms.<sup>28</sup>

## 6.2 Cash Flow Dependence and External Financial Constraints

We further test if firms that face different external financial constraints or firm characteristics exhibit varying cash flow sensitivities with regard to firm growth. Therefore, we control for a variety of factors that typically influence the access to external finance, such as firm size and firm age (e.g. Schiantarelli (1996)). Moreover, we look into several firm performance parameters such as financial dependency, measured as high and low cash firms (Arslan et al. (2006)), firm productivity (labor productivity) (following Guariglia et al. (2011)), and whether firms belong on average to the faster or slower growing cohort. These performance indicators may have a signaling effect to potential investors or banks and thus help to alleviate funding constraints. Additionally, we embark on a more detailed analysis of the impact by ownership structure below (e.g. Giannetti and Ongena (2012)).

Apart from the size categorizations, firm-level indicators are constructed as either lying on average above or below the sample median following Arslan et al. (2006) and Vermoesen et al. (2013). Firm size is measured according to the size designation of the European Union, which splits the sample in four categories: micro-, small, medium-size, and large firms. Firms are defined according to the different size classifications in terms of employee numbers: micro enterprises, which employ less than 10 persons, small enterprises employing at least 10 but less than 50 persons, and medium-sized enterprises employing between 50 and less than 250 persons. Everything above 250 persons is considered to be a large firm.<sup>29</sup> Following the literature, size is determined upon the firm entering the sample.

In order to allow for a comparison with Hutchinson and Xavier (2006), we estimate equation (1) for each size and external constraint category separately. Depending on whether subsets of firm age or size specifications will be assessed, the corresponding controls will be dropped to avoid collinearity.

---

<sup>28</sup>Only significant results will be reported.

<sup>29</sup>This definition has been taken from the Annual Report on EU SMEs 2013/2014 - A Partial and Fragile Recovery, available at <http://ec.europa.eu/DocsRoom/documents/16121/attachments/1/translations/en/renditions/native>.

**Table 5: Controlling for Size**

Dependent Variable:	Micro Firms	Small Firms	Medium-Size Firms	Large Firms
Asset Growth	[1]	[2]	[3]	[4]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	-0.101** [0.043]	-0.051** [0.023]	-0.010 [0.050]	-0.391** [0.191]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.379 [0.432]	1.112*** [0.255]	1.629** [0.682]	0.647 [0.926]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	0.001** [0.000]	0.000* [0.000]	0.000 [0.000]	0.000 [0.000]
<i>Age</i> <sub><i>i,t</i></sub>	-0.002** [0.001]	-0.001* [0.001]	0.001 [0.001]	-0.001 [0.001]
J (p-value)	0.323	0.109	0.551	0.292
AR(1)	-8.41	-12.86	-6.64	-1.71
AR(2)	-0.41	1.12	-0.25	-0.79
Time FE	Yes	Yes	Yes	Yes
Observations	1812	5544	1884	102

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in all columns are *Asset growth*<sub>*i,t-2*</sub>, *(Cash flow/Total assets)*<sub>*i,t-2*</sub> and *(Real sales growth/Total assets)*<sub>*i,t-2*</sub>. The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

**Table 6: External Financial Constraints**

Dependent Variable:	Young	Old	Low Cash	High Cash	Low Prod.	High Prod.	Low Growth	High Growth
Asset Growth	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	-0.051** [0.025]	-0.059* [0.031]	-0.038 [0.026]	-0.075*** [0.028]	-0.042* [0.025]	-0.072** [0.030]	-0.082*** [0.027]	-0.053** [0.025]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.582** [0.285]	1.675*** [0.407]	0.178 [0.309]	1.172*** [0.310]	1.118*** [0.329]	0.906** [0.352]	0.949*** [0.341]	0.699** [0.341]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	0.000*** [0.000]	0.000 [0.000]	0.000*** [0.000]	0.000** [0.000]	0.001 [0.000]	0.000*** [0.000]	0.000 [0.000]	0.000*** [0.000]
<i>Size</i> <sub><i>i,t</i></sub>	-0.010 [0.011]	0.007 [0.021]	-0.019 [0.011]	-0.003 [0.012]	-0.015 [0.035]	-0.013 [0.014]	-0.009 [0.028]	-0.007 [0.008]
<i>Age</i> <sub><i>i,t</i></sub>			-0.008 [0.008]	-0.028** [0.012]	-0.013 [0.010]	-0.022* [0.012]	-0.005 [0.009]	-0.015* [0.009]
J (p-value)	0.088	0.745	0.382	0.503	0.805	0.652	0.848	0.065
AR(1)	-12.26	-10.64	-13.32	-12.33	-12.13	-11.96	-12.70	-12.51
AR(2)	2.51	-1.83	1.27	-0.05	-0.90	1.44	0.96	-0.28
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4722	4626	4304	5044	6232	3116	4674	4674

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in all columns are *Asset growth*<sub>*i,t-2*</sub>, *(Cash flow/Total assets)*<sub>*i,t-2*</sub> and *(Real sales growth/Total assets)*<sub>*i,t-2*</sub>. The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

Columns [1] to [4] in Table 5, where we first control for a differentiated cash flow sensitivity with respect to firm size, show a strong reliance on internal funds for the small and medium-size firms. While the cash flow terms for micro and large size are positive

but insignificant, the cash flow variables attract with 1.112 and 1.629 two highly positive and precisely estimated coefficients for small and mid-size firms. It becomes evident that particularly small and medium-size enterprises (SMEs) suffer from financial constraints and thus need to rely on retained earnings for growth. Despite of being somewhat at odds with the conventional literature that finds strong internal financial dependence particularly for small firms, including also micro firms (see e.g. Hutchinson and Xavier (2006)), a constrained mid-size category has also been found in Audretsch and Elston (2002), albeit for German listed firms during the period from 1961 to 1989. In Germany, large firms have the ability to access internal and external sources of funds, very small ones seem to profit from the banking sector structure of many cooperative local banks. In Serbia, micro and large firms are apparently also able to avoid being cash strapped and tap other sources than primarily retained earnings, leaving SMEs as the odd one out.

However, it is not only size but also age that matters (Bernanke and Gertler (1995); Honjo and Harada (2006); Arellano et al. (2012)). Under the hypothesis that younger firms are more likely to be financially constrained than older firms, due to lacking a reputation with banks or just being too “opaque” in their business model, we divide our sample into young and old firms.<sup>30</sup> Following the literature, this constraint should hold particularly in financially underdeveloped Serbia. Columns [1] and [2] in Table 6 look at the different firms with below or above the median age respectively. Under this specification we can observe that both age groups are dependent on internal funds. Older firms with a highly significant coefficient of 1.675 are, however, the most financially constrained. This result is not consistent with the conventional literature, which considers primarily young firms reliant on retained earnings (e.g. Schiantarelli (1996); Hadlock and Pierce (2010)). Given that the cash flow ratio is slightly higher for older firms than for firms below the median age, a tentative explanation may be a higher risk aversion among managers of older firms and therefore a lower probability to seek external funding (see Kaplan and Zingales (1997)).

Moreover, financial constraints seem to be an issue for almost every firm independent of individual characteristic, although to varying degree. Judging by the size and the significance of the coefficients in Table 6, however, some differences between firms can be distilled. Firms with rather high cash cushions on average are considerably more financially constrained than their peers with on average low levels of retained earnings as columns [3] and [4] show.<sup>31</sup> These firms thus naturally rely on internally generated funds and are

---

<sup>30</sup>We classify firms as young and old when their age is below or above the median values.

<sup>31</sup>Apart from being only applicable to listed firms, conventional indices of financial dependence of firms have recently been found to be ineffective (Farre-Mensa and Ljungqvist (2016)). Thus, as an alternative, we move beyond a simple separation of firms according to their median cash flow and employ the recent approach suggested by Hovakimian and Hovakimian (2009) to endogenously evaluate the sensitivity of asset growth to cash flow for an unlisted firm ( $CFS_i$ ):

therefore very sensitive to marginal changes in constraints. Also high productivity and firms in the high growth cohort seem to show weaker signs of relying extraordinarily on retained earnings, as less significant and lower cash-flow coefficients demonstrate.

As a robustness check, we follow Honjo and Harada (2006) and divide our firm sample according to sample quartiles of the respective firm-level characteristics. The results are robust to our previous findings as again smaller, older, high cash firms, low growth firms, and those with a rather low productivity show strong internal financial constraints, whereas firms at the other end of the quartile range do not seem to suffer from this issue to a similar degree.

To sum up, we are able to test for and largely identify firm-level characteristics that have been singled out in the literature as being significant for access to external finance and thus ultimately determine internal financial constraints. It turns out that in the case of Serbia these constraints seem to be rather ubiquitous and not always selective with respect to previous findings in the literature. Nonetheless, allegedly economic stronger and better performing firms suffer less from internal financial constraints and may thus be able to tap financial sources elsewhere. That particularly medium-size SMEs and old firms face the harshest constraints, however, appears somewhat as a surprising result. Interestingly though, interacting firm characteristics with the crisis dummy to control for a changed cash flow sensitivity in distressed times always fails to yield significantly different results. This is inconsistent with the flight to quality hypothesis of banks, yet coincides with earlier findings for Italian manufacturing firms by Presbitero et al. (2014). The authors report that the credit crunch has not been harsher for smaller and economically weak firms.

The result that primarily SMEs firms are financially constrained, leads over to the question of firm ownership, i.e. are firms financially constrained because of their size or because their ownership structure conveys certain characteristics.

### 6.3 What Does Firm Ownership Tell?

Existing research finds strong evidence of a persistent foreign bank – foreign company relationship in Eastern Europe (Giannetti and Ongena (2012)). Since the Serbian bank-

$$CFS_i = \frac{\sum_{t=1}^{t=1} \left( Asset\ growth_{i,t} * \frac{\left( \frac{Cash\ flow}{Total\ assets} \right)_{i,t}}{\sum_{n=1}^{t=1} \left( \frac{Cash\ flow}{Total\ assets} \right)_{i,t}} \right)}{n} - \frac{1}{n} \sum_{n=1}^{t=1} Asset\ growth_{i,t},$$

where  $n$  is the number of annual observations for firm  $i$ , and  $t$  indicates time. Cash flow sensitivities are thus given by the difference between the cash flow weighted time series average of total assets growth of a firm and its time series arithmetic average of assets growth. We use a 50 per cent cut-off point to distinguish between firms sensitive and non-sensitive to cash flow. Firms above the cut-off point exhibit positive and highly significant cash-flow coefficients. This finding suggests that our previously employed identification of cash-strapped firms correctly singles out firms that are more or less financially constrained. Results are not reported for brevity.

ing sector is dominated by subsidiaries of international banks we expect foreign owned companies to be less financially constrained than firms that are in majority domestically owned (Hutchinson and Xavier (2006); Colombo and Stanca (2006); Blalock et al. (2008)). Moreover, we expect that foreign ownership can be considered as a good indicator for the quality of corporate governance and may thus also contribute to an elimination of financial constraints (Francis et al. (2013)). The same holds for firms with a majority stake owned by the government, which may, for instance, facilitate access to external finance or contribute through targeted policy instruments to lower financing barriers.<sup>32</sup>

In order to exploit the persistence of this relationship further, we take a look at the performance of foreign-owned firms in Serbia and their reliance on cash flow for firm growth compared to the largest ownership category, private firms, and state-owned counterparts. The attribute “foreign owned” is defined according to the enterprise survey as any firm with a majority stake owned either by a foreign company or person. The same holds for a firm being classified as “state-owned”, i.e. the government owns more than 50 per cent of the company.

Hence, we estimate the following regression:

$$\begin{aligned}
 Asset\ growth_{i,t} = & \beta_0 Asset\ growth_{i,t-1} + \beta_1 \left( \frac{Cash\ flow}{Total\ assets} \right)_{i,t} \\
 & + \beta_2 \left( \frac{Cash\ flow}{Total\ assets} \right)_{i,t} * Category_{i,t} \\
 & + \beta_3 \left( \frac{Real\ sales\ growth}{Total\ assets} \right)_{i,t} \\
 & + \beta_4 Controls_{i,t} + error\ term_{i,t}
 \end{aligned} \tag{2}$$

*Category* refers to the different dummy terms of firm-level ownership characteristics with which the cash flow variable will be interacted. The *Controls* term stands for the previously introduced age and size variables.

As a first approach, we explore the key variables reported in Table 7 split according to ownership categories. The average foreign firm exhibits a firm size of 66.15 employees.<sup>33</sup> Conversely, state-owned firms employ on average 94.28 employees and are thus larger than the average foreign firm and almost three-times as big as domestic private companies. Hence the average foreign and state-owned firm belongs to the group of median-sized enterprises. Mean firm growth for state-owned firms in all growth categories remains

<sup>32</sup>As, for instance, Khwaja and Mian (2005) show for Pakistan, such preferential treatment through government connections can lead to sizeable inefficiencies among both banks and firms, resulting in higher borrowing and default rates.

<sup>33</sup>Given the low number of foreign owned firm-level observations, we refrain from disentangling according to firm size and pool all observations.

**Table 7: Firm Characteristics by Ownership**

Variables	Foreign Means [1]	State-Owned Means [2]	Private Means [3]
Asset growth	0.015	-0.026	0.036
Employment growth	0.016	-0.072	0.016
Sales growth	0.033	-0.015	0.011
Assets	1799.028	2214.779	912.022
Sales	1985.124	1460.316	963.688
Employees	66.151	94.284	34.724
Age	10.037	16.853	14.164
Cash flow/total assets	0.087	0.033	0.120
Labor productivity	42.205	18.251	32.050
Number of firms	53	148	1407
Observations	371	1036	9849

*Remarks:* The table presents summary statistics for the 2006 to 2012 sample period. Assets and sales are expressed in '000 of national currency units and have been deflated by the national CPI inflation rate. Age is expressed in years elapsed since the incorporation date of the company and ratios in percentage terms. Labor productivity is the ratio of total real sales to number of employees.

*Source:* Authors' calculations.

with negative values well below the level of private companies, the respective control group. Foreign firms grow particularly fast in real sales. Of particular interest for our analysis is the level of average retained earnings and performance in terms of labor productivity. Foreign owned firms constantly rely on a roughly 5 per cent higher cash flow ratio (on average 8.7 per cent) relative to their domestic state-owned peers (on average 3.3 per cent). Both figures are, however, lower than the private firm average of 12 per cent. This high level of cash flow for domestic private firms may signal a general strong reliance on internal funds for firm growth. Another striking observation is the comparison between productivity and firm size. Whereas foreign firms exhibit with 42.205 the strongest productivity performance, state-owned firms with by far the largest firm size only show a meager 18.251. Such a discrepancy may testify to still existing inefficiencies in the economy hailing from the transition process.

As a next step, we employ the model specification of Equation (2) for cash flow sensitivity and interact the cash flow variable with the foreign-owned and the state-owned dummy. Real sales growth controls again for investment opportunities.

Results in Table 8 column [1] show that compared to all firms, foreign-owned Serbian firms do not need to rely on internal funds for firm growth. The regular cash flow coefficient is highly significant and positive, thus indicating again strong internal financial constraints for the representative firm in our sample. This result confirms the initially postulated

**Table 8: Firm Ownership and Cash-Flow Sensitivity**

Dependent Variable: Asset Growth	[1]	[2]	[3]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	-0.092* [0.044]	-0.097** [0.038]	-0.069** [0.036]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	1.606*** [0.576]	1.468*** [0.458]	0.748 [0.488]
<i>Cash Flow</i> <sub><i>i,t</i></sub> * <i>Foreign</i>	-1.972*** [0.709]	-2.259*** [0.649]	-1.720** [0.667]
<i>Foreign</i> <sub><i>i</i></sub>	0.161** [0.068]	0.188*** [0.064]	0.146** [0.062]
<i>Cash Flow</i> <sub><i>i,t</i></sub> * <i>State – Owned</i>	-0.901 [0.825]	-0.839 [0.721]	-0.528 [0.717]
<i>State – Owned</i> <sub><i>i</i></sub>	0.085 [0.070]	0.086 [0.053]	0.068 [0.047]
<i>Cash Flow</i> <sub><i>i,t</i></sub> * <i>High Productivity</i>		0.522 [0.416]	0.398 [0.432]
<i>High Productivity Firms</i> <sub><i>i</i></sub>		-0.044 [0.047]	-0.023 [0.051]
<i>Cash Flow</i> <sub><i>i,t</i></sub> * <i>SME</i>			0.482 [0.404]
<i>SME</i> <sub><i>i</i></sub>			-0.047 [0.045]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	0.153 [0.204]	0.169 [0.167]	0.013 [0.143]
<i>Size</i> <sub><i>i,t</i></sub>	0.014* [0.008]	0.013* [0.007]	
<i>Age</i> <sub><i>i,t</i></sub>	-0.027*** [0.009]	-0.029*** [0.009]	-0.030*** [0.009]
J (p-value)	0.189	0.201	0.196
AR(1)	-6.67	-6.96	-16.73
AR(2)	-0.51	-0.54	0.35
Time FE	Yes	Yes	Yes
Observations	9348	9348	9348

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in all columns are  $Asset\ growth_{i,t-2}$ ,  $(Cash\ flow/Total\ assets)_{i,t-2}$  and  $(Real\ sales\ growth/Total\ assets)_{i,t-2}$ . The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

intuition regarding the comparatively high cash levels. In comparison, the interaction of cash flow with the foreign firm dummy attracts high significance and even a high negative value of -1.653, indicating no particular reliance on internal funds. In columns [2] and [3] we further control in a gradual manner for particularities in terms of productivity and firm size with respect to the different ownership types observed in the descriptive part above. Adding first the cash flow interacted with high labor productivity and subsequently with the SME size dummy, knowing that particularly small and medium-size firms are

constrained, turns the coefficient of the regular cash flow variable insignificant. Controlling for size thus partly mops up the effect previously kept by the regular cash flow variable and indicates a size bias with respect to company financial access as previously found.

Conversely, the coefficients for foreign firms interaction term remain continuously negative and highly significant. Also Hutchinson and Xavier (2006) find lower cash flow sensitivities for foreign firms in Slovenia with respect to all firms, their coefficients, however, are still higher than those we report. Combined with the rather low cash levels, this may hint at several particularities with respect to foreign-owned firms: foreign firms are, for example, able to exploit their relationships with foreign banks, confirming previous findings from the literature on foreign bank – foreign company links (Giannetti and Ongena (2012)). They may also profit from their earlier observed strong labor productivity or through foreign majority stakes, both signaling better performance and corporate governance. Both indicators result in higher creditworthiness among foreign and local banks what ultimately helps them to obtain financing for expansionary activities.<sup>34</sup> Moreover, larger firms may be able to tap international capital markets. Becker and Sivadasan (2010) also show that foreign subsidiaries of other firms receive funding from their parent companies through internal capital markets what may further ease financial constraints. Moreover, there is no significant difference in the relationship between firm growth and cash flow sensitivity for state-owned companies compared to all firms. Being non-significantly different from other firms comes a bit as a surprise because it seems that according to our results the alleged proximity to the government does not pay off. We therefore do not observe a “political pecking order”<sup>35</sup> or soft budget constraints like in some other developing and transition countries.

Our results thus suggest a difference in the reliance on internal funds among different ownership categories, where foreign-owned firms seem to be the least constrained. Conversely, state-owned companies do not significantly differ from the financially-constrained representative firm. These findings, for instance, may corroborate earlier results by Harrison and McMillan (2003) for the Ivory Coast, where preferred financing of foreign firms crowds other firms out of the market, leaving them financially constrained for investment and growth.

---

<sup>34</sup>As Kujundzic and Otasevic (2012) report, total loans to enterprises and households in Serbia have mostly a long term structure (> 5 years), of which the majority is foreign currency denominated.

<sup>35</sup>See, for instance, Poncet et al. (2010)’s findings on China. Note that in order to make definitive statements on such a pecking order one would need to explicitly look into financing decisions of firms with different majority owners.

## 7 A Comparison With a Developed Economy

Before reaching our concluding remarks, we want to put some of our obtained results into perspective and compare the Serbian firm-level financial constraints with Belgium, an economy featuring a more developed financial market.<sup>36</sup>

Hutchinson and Xavier (2006) compared Slovenia with Belgium for the periods 1993-2000 and 1994-2002 respectively; we thus consider this section to be an update to their study, given that Serbia has reached a level of development comparable to Slovenia in the examined period. In line with expectations of financial market development as elaborated in Section 2.1, access to finance should be considerably easier than in a more underdeveloped financial market like Serbia due to lower market “imperfections” Myers and Majluf (1984); Stiglitz and Weiss (1981).<sup>37</sup> We thus hypothesize that the availability of internal funds does only play a minor or no role at all for Belgian firms along their growth trajectory.

In order to compare the degree of firm-level financial constraints, we perform the same estimations with Belgian data as for the Serbian firm dataset. In order to establish a sound model specification, we follow again the strategy of Bond (2002). The previous model specification checks apply and are correct throughout all estimations. Results on the estimations can be found in Appendix A.

The baseline regressions in Table A.1 do not show, with the exception of the fixed-effects estimator in column [1], any significant impact of cash flow on firm growth in general. The results on cash flow dependency are thus coherent with the theory and our expectations for a well-developed economy. They are also comparable with recent findings for a comparable sample period in a firm-level investment framework by Vermoesen et al. (2013), who find either very low and significant or non-significant coefficients for the cash flow variable.

Analog to our previous analysis for Serbia, we also control in the Belgian case for investment opportunities and demand shocks through either real sales growth or interacted fixed effects. Results are in Table A.2.<sup>38</sup> We find again no significant internal financial constraints for Belgian firms; regarding the controls on age or size, only the size variable does exhibit a highly positive impact on firm growth.

---

<sup>36</sup>Apart from a mature financial sector, Belgium offers a couple of other advantages. Data quality, for instance, is considered to be superior as Belgian firms also have to report directly to the central bank. Moreover, the size of the country in terms of population (Serbia: 7.6 million; Belgium: 11.2 million) and firms in the dataset (Serbia: 1558; Belgium: 1982) are roughly comparable. Data has been retrieved from the *Amadeus* database provided by Bureau van Dijk.

<sup>37</sup>The level of uncertainty in the economy is also considerably lower, as figures for firm-level (0.26), industry-level (0.15 and 0.47), and economy-wide uncertainty (1.82) demonstrate.

<sup>38</sup>Although none of the variables is significant, column [2] with the partially instrumented controls remains our favorite due to the lowest p-value in the J-test.

As a consequence, we split again our sample with respect to the previously employed size categories. Interestingly, medium-size firms in Belgium have been financially constrained during our sample period as Table A.3 shows. Although with a coefficient of 1.209 somewhat lower than for Serbian medium-size firms in Table 5, the coefficient is still considerably above one and thus indicates a strong reliance on internal funds for expansionary activities. In contrast, Hutchinson and Xavier (2006) find significant cash flow coefficients for SMEs with 0.68 of almost half the size during an earlier period. Although a crisis effect in our sample may be a reason for this difference, it is, as in the Serbian case, not discernible when explicitly testing for it.<sup>39</sup> Firms of different size do apparently not rely predominately on retained earnings and are thus considerably less financially constrained. The same result applies to previously identified firm characteristics, which do not seem to influence the funding of expansionary activities (see Table A.4).

Concluding, Belgian firms behave with respect to their cash flow sensitivity as expected and therefore present a suitable counter-example for an advanced economy with a well-developed financial sector. Although we generally do not find significant internal financial constraints for firms, medium-sized companies are the only firms that require internal funding.

## 8 Conclusion

In this paper we analyze firm-level data of Serbia on internal financial constraints for firm growth. With our results from dynamic panel data regressions we are able to update findings of Hutchinson and Xavier (2006) who assess almost a decade earlier credit constraints of Slovenia and Belgium. Serbian firms in general face high financial constraints and exhibit a strong reliance on internal funds for firm growth. The firms with the tightest constraints consist of small and medium-size enterprises as well as comparatively old firms. The latter finding may be the result of higher risk aversion of managers. Moreover, firms that perform better in terms of their overall growth trajectory, labor productivity and those which are less dependent on retained earnings face significantly fewer internal financial constraints. In comparison, only medium-size Belgian firms exhibit strong reliance on retained earnings, thus confirming our theory of a better functioning and more developed financial sector.

By looking at majority ownership stakes of Serbian firms, foreign-owned firms do not seem to rely much on cash flow, suggesting that strong foreign bank – foreign firm ties as found

---

<sup>39</sup>Results are not included here and may be available from the authors.

by Giannetti and Ongena (2012) or internal capital markets as observed by Becker and Sivadasan (2010) seem to mitigate constraints. State-owned enterprises, on the other hand, do not seem to profit financially from government involvement in their business activities.

Results suggest that in light of a general heavy reliance on internal funds for Serbian SMEs, and to a much smaller degree for Belgian medium-size enterprises, a relief of funding constraints for these firms through policy initiatives is highly recommended. Better and a more diversified access to finance through banks for all firm segments should be given priority. The fact that state-owned companies in Serbia are still the largest firms yet the least efficient ones calls for a continuation of restructuring, an increase in efficiency and a continuous abolishment of soft budget constraints. Moreover, the development of alternative funding options such as capital markets instead of a mere concentration on the banking sector may be a solution to more sustainable and equal access to finance and thus firm growth.

## References

- Akerlof, G. A. (1970). The market for “lemons”: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics* 84(3), 488–500.
- Allayannis, G. and A. Mozumdar (2004). The impact of negative cash flow and influential observations on investment-cash flow sensitivity estimates. *Journal of Banking and Finance* 28, 901–930.
- Arellano, C., Y. Bai, and P. J. Kehoe (2012). Financial frictions and fluctuations in volatility. Working Paper 466, Federal Reserve Bank of Minneapolis Research Department.
- Arellano, M. and S. R. Bond (1991). Some tests of specification of panel data: Monte carlo evidence and an application to employment equations. *Review of Economic Studies* 58, 277–297.
- Arellano, M. and O. Bover (1995). Another look at the instrumental-variable estimation of error-components models. *Journal of Econometrics* 68, 29–52.
- Arslan, Ö., C. Florackis, and A. Ozkan (2006). The role of cash holdings in reducing investment-cash flow sensitivity: Evidence from a financial crisis period in an emerging market. *Emerging Market Review* 7, 320–338.
- Arslan, Ö., C. Florackis, and A. Ozkan (2014). Financial flexibility, corporate investment and performance: Evidence from financial crises. *Review of Quantitative Finance and Accounting* 42, 211–250.
- Audretsch, D. B. and J. A. Elston (2002). Does firm size matter? evidence on the impact of liquidity constraints on firm investment behavior in germany. *International Journal of Industrial Organization* 20, 1–17.
- Baum, C. F., M. Caglayan, and O. Talavera (2010). On the sensitivity of firms’ investment to cash flow and uncertainty. *Oxford Economic Papers* 62, 286–306.
- Beck, T. and M. S. Martinez-Peria (2008). Foreign bank acquisitions and outreach: Evidence from mexico. Working Paper 4467, World Bank Policy Research.
- Becker, B. and J. Sivadasan (2010). The effect of financial development on the investment-cash flow relationship: Cross-country evidence from europe. *The B.E. Journal of Economic Analysis and Policy* 10(1 Advances), Article 43.
- Bernanke, B. and M. Gertler (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives* 9(4), 27–48.
- Bernanke, B., M. Gertler, and S. Gilchrist (1996). The financial accelerator and the flight to quality. *The Review of Economics and Statistics* 78(1), 1–15.

- Blalock, G., P. J. Gertler, and D. I. Levine (2008). Financial constraints on investment in an emerging market crisis. *Journal of Monetary Economics* 55(3), 568–591.
- Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica* 74, 391–415.
- Blundell, R. and S. R. Bond (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87(1), 115–143.
- Blundell, R., S. R. Bond, and F. Windmeijer (2000). Estimation in dynamic panel data models: Improving on the performance of the standard gmm estimators. In B. Baltagi, T. B. Fomby, and R. C. Hill (Eds.), *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, Volume 15 of *Advances in Econometrics*, pp. 53–91. JAI Press, Elsevier Science.
- Bond, S. and J. Van Reenen (2007). *Handbook of Econometrics*, Volume 6, Chapter Microeconomic Models of Investment and Employment. Elsevier.
- Bond, S. R. (2002). Dynamic panel data models: A guide to micro data methods and practice. *Portuguese Economic Journal* 1(2), 141–162.
- Bond, S. R., J. A. Elston, J. Mairesse, and B. Mulkey (2003). Financial factors and investment in belgium, france, germany, and the united kingdom: A comparison using company panel data. *The Review of Economics and Statistics* 85(1), 153–165.
- Bowsher, C. G. (2002). On testing overidentifying restrictions in dynamics panel data models. *Economic Letters* 77(2), 211–220.
- Campello, M., J. R. Graham, and C. R. Harvey (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics* 97, 470–487.
- Carpenter, R. E., S. M. Fazzari, and B. C. Petersen (1994). Inventory investment, internal-finance fluctuations, and the business cycle. *Brookings Papers on Economic Activity* 2.
- Carpenter, R. E. and A. Guariglia (2008). Cash flow, investment, and investment opportunities: New tests using uk panel data. *Journal of Banking and Finance* 32, 1894–1906.
- Carpenter, R. E. and B. C. Petersen (2002). Is the growth of small firms constrained by internal finance? *The Review of Economics and Statistics* 84(2), 298–309.
- Cetorelli, N. and L. Goldberg (2012a). Follow the money: Quantifying domestic effects of foreign bank shocks in the great recession. *American Economic Review* 102(3), 213–218.
- Cetorelli, N. and L. Goldberg (2012b). Liquidity management of us global banks: Internal capital markets in the great recession. *Journal of International Economics* 88(2), 299–311.

- Cihak, M., A. Demirgüç-Kunt, E. Feyen, and R. Levine (2012). Benchmarking financial development around the world. Policy Research Working Paper 6175, World Bank.
- Claessens, S. (2006). *Cross-Border Banking: Regulatory Challenges*, Chapter Competitive Implications of Cross-Border Banking, pp. 151–182. World Scientific Publishing.
- Claessens, S., A. Demirgüç-Kunt, and H. Huizinga (2001). How does foreign entry affect the domestic banking market? *Journal of Banking and Finance* 25(5), 891–911.
- Claessens, S. and N. van Horen (2013). Impact of foreign banks. *Journal of Financial Perspectives* 1(1), 1–18.
- Clarke, G., R. Cull, M. S. Martínez-Peria, and S. Sánchez (2003). Foreign bank entry: Experience, implications for developing countries, and agenda for further research. *World Bank Research Observer* 18(1), 25–59.
- Clarke, R. G., R. Cull, and G. Kisunko (2012). External finance and firm survival in the aftermath of the crisis: Evidence from eastern europe and central asia. *Journal of Comparative Economics* 40(3), 372–392.
- Cleary, S. (1999). The relationship between firm investment and financial status. *Journal of Finance* 54(2), 673–92.
- Colombo, E. and L. Stanca (2006). Investment decisions and the soft budget constraint: Evidence from a large panel of hungarian firms. *Economics of Transition* 14(1), 171–198.
- Cooper, R. W. and J. C. Haltiwanger (2006). On the nature of capital adjustment costs. *Review of Economic Studies* 73(3), 611–633.
- Correa, P. and M. Iooty (2010). The impact of the global economic crisis on the corporate sector in europe and central asia: Evidence from a firm-level survey. Enterprise Note 9, IFC.
- Cull, R. and M. S. Martínez-Pería (2013). Bank ownership and lending patterns during the 2008-2009 financial crisis: Evidence from latin america and eastern europe. *Journal of Banking and Finance* 37, 4861–4878.
- Cummins, J., K. Hasset, and S. Oliner (2006). Investment behavior, observable expectations, and internal funds. *The American Economic Review* 96(3), 796–810.
- de Haas, R. and I. van Lelyveld (2014). Multinational banks and the global financial crises: Weathering the perfect storm. *Journal of Money, Credit and Banking* 46(1), 333–364.
- D'Espallier, B. and A. Guariglia (2015). Does the investment opportunities bias affect the investment-cash flow sensitivities of unlisted smes? *European Journal of Finance* 21(1), 1–25.

- Dimitrijevic, J. and B. Najman (2008). Inside the credit boom: Competition, segmentation and information - evidence from the serbian credit market. *Comparative Economic Studies* 50, 217–252.
- Duchin, R., O. Ozbas, and B. A. Sensoy (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of Financial Economics* 97, 418–435.
- Evans, D. (1987). The relationship between firm growth, size and age: Estimates for 100 manufacturing industries. *Journal of Industrial Economics* 35, 567–581.
- Farre-Mensa, J. and A. Ljungqvist (2016). Do measures of financial constraints measure financial constraints? *Review of Financial Studies* 29(2), 271–308.
- Fazzari, S., R. G. Hubbard, and B. C. Petersen (1988). Financial constraints and corporate investment. *Brookings Paper on Economic Activity* 19, 141–195.
- Fazzari, S., R. G. Hubbard, and B. C. Petersen (2000). Investment-cash flow sensitivities are useful: A comment on kaplan and zingales. *Quarterly Journal of Economics* 115, 695–713.
- Francis, B., I. Hasan, L. Song, and M. Wasiman (2013). Corporate governance and investment-cash flow sensitivity: Evidence from emerging markets. *Emerging Market Review* 15, 57–71.
- Ghosal, V. and P. Loungani (2000). The differential impact of uncertainty on investment in small and large businesses. *The Review of Economics and Statistics* 82, 338–334.
- Giannetti, M. and S. Ongena (2012). "lending by example": Direct and indirect effects of foreign bank presence in emerging markets. *Journal of International Economics* 86(1), 167–180.
- Gormley, T. A. and D. A. Matsa (2014). Common errors: How to (and not to) control for unobserved heterogeneity. *Review of Financial Studies* 27(2), 617–661.
- Greenaway, D., A. Guariglia, and Z. Yu (2014). The more the better? foreign ownership and corporate performance in china. *European Journal of Finance* 20(7-9), 681–702.
- Guariglia, A. (2008). Internal financial constraints, external financial constraints, and investment choice: Evidence from a panel of uk firms. *Journal of Banking and Finance* 32, 1795–1809.
- Guariglia, A., X. Liu, and L. Song (2011). Internal finance and growth: Microeconomic evidence from chinese firms. *Journal of Development Economics* 96, 79–94.

- Guariglia, A. and P. Mizen (2012). Investment and asset growth of asian firms: Evidence for financial resilience in the recent financial crisis. Working Paper 32, Hong Kong Institute for Monetary Research.
- Guariglia, A., J. Tsoukalas, and S. Tsoukas (2012). Investment, irreversibility, and financing constraints: Evidence from a panel of transition economies. *Economics Letters* 117, 582–584.
- Hadlock, C. J. and J. R. Pierce (2010). New evidence on measuring financial constraints: Moving beyond the kz index. *Review of Financial Studies* 23(5), 1909–1940.
- Harrison, A. and M. McMillan (2003). Does direct foreign investment affect domestic credit constraints? *Journal of International Economics* 61(1), 73–100.
- Henrekson, M. and D. Johansson (2010). Gazelles as job creators: A survey and interpretation of the evidence. *Small Business Economics* 35, 227–244.
- Hetland, O. R. and A. Mjos (2012). Credit shocks harm the unprepared - financing constraints and the financial crisis. Discussion Paper 11, Norwegian School of Economics.
- Honjo, Y. and N. Harada (2006). Sme policy, financial structure and firm growth: Evidence from japan. *Small Business Economics* 27, 289–300.
- Hovakimian, A. and G. Hovakimian (2009). Cash flow sensitivity of investment. *European Financial Management* 15(1), 47–65.
- Hubbard, R. G. (1998). Capital-market imperfections and investment. *Journal of Economic Literature* 36(1), 193–225.
- Hutchinson, J. and A. Xavier (2006). Comparing the impact of credit constraints on the growth of sme in a transition country with an established market economy. *Small Business Economics* 27, 169–179.
- Kahle, K. M. and R. M. Stulz (2013). Access to capital, investment and the financial crisis. *Journal of Financial Economics* 110, 280–299.
- Kaplan, S. N. and L. Zingales (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics* 112, 196–215.
- Kaplan, S. N. and L. Zingales (2000). Investment-cash flow sensitivities are not valid measures of financing constraints. *Quarterly Journal of Economics* 115(2), 707–712.
- Khwaja, A. I. and A. Mian (2005). Do lenders favor politically connected firms? rent provision in an emerging financial market. *The Quarterly Journal of Economics* 120(4), 1371–1411.

- Konings, J., M. Rizov, and H. Vandenbussche (2003). Investment and credit constraints in transition economies: Micro evidence from poland, the czech republic, bulgaria, and romania. *Economic Letters* 78, 253–258.
- Konings, J. and H. Vandenbussche (2004). Financial ratio adjustment in the presence of soft budget constraints: Evidence from bulgaria. *European Accounting Review* 13(1), 131–159.
- Kujundzic, S. and D. Otasevic (2012). The bankd lending channel in an euroised economy: The case of serbia. Working paper, National Bank of Serbia.
- Laeven, L. and F. Valencia (2013). The real effects of financial sector interventions during crises. *Journal of Money, Credit and Banking* 45(1), 147–177.
- Lízal, L. and J. Svejnar (2002). Investment, credit rationing, and the soft budget constraints: Evidence from czech panel data. *The Review of Economics and Statistics* 84(2), 353–370.
- Martínez-Pería, M. S. and A. Mody (2004). How foreign participation and market concentration impact bank spreads: Evidence from latin america. *Journal of Money, Credit and Banking* 36(3), 511–537.
- Muller, P., D. Gagliardi, C. Caliandro, N. U. Bohn, and D. Klitou (2014, July). Annual report on european smes 2013/2014 - a partial and fragile recovery. Final report, European Commission.
- Myers, S. C. and N. S. Majluf (1984). Corporate financing and investment decisions - when firms have information that investors do not have. *Journal of Financial Economics* 13, 187–221.
- Nguyen, T., S. Locke, and K. Reddy (2015). Ownership concentration and corporate performance from a dynamic perspective: Does national governance quality matter? *International Review of Financial Analysis* 41, 148–161.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica* 49, 1417–1426.
- Ongena, S., J. L. Peydro, and N. van Horen (2013). Shocks abroad, pain at home? bank-firm level evidence on financial contagion during the 2007-2009 crisis. Working Paper 385, De Nederlandsche Bank.
- Poncet, S., W. Steingress, and H. Vandenbussche (2010). Financial constraints in china: Firm-level evidence. *China Economic Review* 21, 411–422.
- Presbitero, A. F., G. F. Udell, and A. Zazzaro (2014). The home bias and the credit crunch: A regional perspective. *Journal of Money, Credit and Banking* 46(s1), 53–85.

- Roodman, D. (2009a). How to do xtabond2: An introduction to difference and system gmm in stata. *The Stata Journal* 9(1), 86–136.
- Roodman, D. (2009b). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics* 7(1), 135–158.
- Schiantarelli, F. (1996). Financial constraints and investment: Methodological issues and international evidence. *Oxford Review of Economic Policy* 12(2), 70–89.
- Stiglitz, J. E. and A. Weiss (1981). Credit rationing in markets with imperfect information. *The American Economic Review* 71(3), 393–410.
- Summers, L. H. (1981). Taxation and corporate investment: A q-theory approach. *Brookings Papers on Economic Activity* 1, 67–140.
- Vermoesen, V., M. Deloof, and E. Laveren (2013). Long-term debt maturity and financing constraints of smes during the global financial crisis. *Small Business Economics* 41, 433–448.
- Wagenvoort, R. (2003). Are finance constraints hindering the growth of smes in europe? *EIB Papers* 8(2), 22–50.
- Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step gmm estimators. *Journal of Econometrics* 126, 25–51.

## A Firm-Level Estimations for Belgium

### A.1 Baseline Regressions

Dependent Variable: Asset Growth	FE [1]	FD-GMM [2]	FD-GMM [3]	SYS-GMM [4]
<i>Assets Growth</i> <sub><i>i,t-1</i></sub>	-0.165*** [0.017]	-0.015 [0.023]	0.005 [0.025]	-0.012 [0.022]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.175*** [0.057]	0.410 [0.388]		0.059 [0.176]
<i>Cash Flow</i> <sub><i>i,t-1</i></sub>			-0.664* [0.391]	
J (p-value)		0.841	0.681	0.895
AR(1)		-12.09	-11.63	-12.74
AR(2)		-1.18	-1.07	-1.54
Time FE	YES	YES	YES	YES
Observations	11892	9910	9910	11892

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in column [4] are *Asset growth*<sub>*i,t-2*</sub>, *(Cash flow/Total assets)*<sub>*i,t-2*</sub>. In columns [4] the instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

## A.2 Investment Opportunities

Dependent Variable: Asset Growth	SYS-GMM		SYS-GMM	
	Fully Instrumented [1]	Partially Instrumented [2]	Fully Instrumented [3]	Partially Instrumented [4]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	-0.005 [0.021]	-0.012 [0.039]	-0.006 [0.022]	-0.013 [0.021]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.110 [0.243]	0.060 [0.178]	0.120 [0.254]	0.098 [0.203]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	-0.000 [0.000]	-0.000 [0.000]		
<i>Size</i> <sub><i>i,t</i></sub>	0.172*** [0.046]	0.005** [0.002]	0.167*** [0.044]	0.005** [0.002]
<i>Age</i> <sub><i>i,t</i></sub>	-0.021 [0.014]	0.001 [0.003]	-0.019 [0.013]	0.001 [0.003]
J (p-value)	0.869	0.915	0.946	0.972
AR(1)	-12.59	-12.72	-12.58	-12.63
AR(2)	-1.38	-1.54	-1.39	-1.51
Time FE	Yes	Yes	No	No
Sector-Time FE	No	No	Yes	Yes
Observations	11892	11892	11892	11892

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in columns [1] - [2] are *Asset growth*<sub>*i,t-2*</sub>, *(Cash flow/Total assets)*<sub>*i,t-2*</sub> and *(Real sales growth/Total assets)*<sub>*i,t-2*</sub>. The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

### A.3 Controlling for Size

Dependent Variable: Asset Growth	Micro Firms [1]	Small Firms [2]	Medium-Size Firms [3]	Large Firms [4]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	0.000 [0.066]	-0.027 [0.035]	-0.014 [0.031]	0.068 [0.066]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	-0.466 [0.875]	-0.116 [0.093]	1.209*** [0.303]	-0.344 [0.425]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	0.001 [0.003]	-0.000 [0.000]	0.000** [0.000]	-0.000 [0.000]
<i>Age</i> <sub><i>i,t</i></sub>	0.006 [0.013]	-0.007 [0.005]	0.008 [0.007]	0.015 [0.009]
J (p-value)	0.207	0.641	0.857	0.133
AR(1)	-4.45	-6.29	-5.03	-5.53
AR(2)	-0.77	0.65	-0.35	-1.30
Time FE	Yes	Yes	Yes	Yes
Observations	990	767	4788	1520

*Remarks:* All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in all columns are  $Asset\ growth_{i,t-2}$ ,  $(Cash\ flow/Total\ assets)_{i,t-2}$  and  $(Real\ sales\ growth/Total\ assets)_{i,t-2}$ . The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as  $N(0,1)$  under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

*Source:* Authors' calculations.

## A.4 External Financial Constraints

Dependent Variable:	Young	Old	Low Cash	High Cash	Low Prod.	High Prod.	Low Growth	High Growth
Asset Growth:	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
<i>Asset Growth</i> <sub><i>i,t-1</i></sub>	0.012 [0.023]	-0.043 [0.030]	0.016 [0.027]	-0.075*** [0.032]	-0.001 [0.025]	-0.010 [0.033]	-0.063* [0.035]	0.014 [0.023]
<i>Cash Flow</i> <sub><i>i,t</i></sub>	0.011 [0.482]	0.014 [0.203]	-0.012 [0.113]	0.120 [0.467]	0.129 [0.329]	0.359 [0.486]	0.106 [0.234]	0.304 [0.383]
<i>Sales Growth</i> <sub><i>i,t</i></sub>	0.000 [0.000]	-0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]	0.001 [0.001]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
<i>Size</i> <sub><i>i,t</i></sub>	-0.003 [0.006]	0.008** [0.003]	0.001 [0.004]	0.006 [0.005]	-0.016 [0.028]	0.006 [0.003]	0.004 [0.002]	0.004 [0.004]
<i>Age</i> <sub><i>i,t</i></sub>			0.001 [0.005]	0.003 [0.012]	0.009 [0.005]	0.002 [0.005]	0.005 [0.004]	-0.003 [0.004]
J (p-value)	0.418	0.919	0.521	0.243	0.640	0.465	0.921	0.599
AR(1)	-9.66	-8.67	-8.23	-9.58	-9.27	-8.94	-9.15	-9.54
AR(2)	-1.51	-0.76	-1.25	-0.15	-1.03	-0.45	-0.21	-1.70
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5958	5934	5886	6006	5946	5946	5964	5964

Remarks: All GMM estimations were performed with the *xtabond2* routine by Roodman (2009a). The figures reported in parentheses are asymptotic standard errors. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Instruments in all columns are *Asset growth*<sub>*i,t-2*</sub>, *(Cash flow/Total assets)*<sub>*i,t-2*</sub> and *(Real sales growth/Total assets)*<sub>*i,t-2*</sub>. The instrument matrix has been collapsed and the small sample bias has been corrected according to Windmeijer (2005). The Hansen J statistic is a test statistic of the overidentifying restrictions, distributed as a chi-squared under the null of instrument validity. AR(1) and AR(2) are tests for AR(n)-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level.

Source: Authors' calculations.