Economic Systems 38 (2014) 502–517

Contents lists available at ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

Financial constraints and corporate investments during the current financial and economic crisis: The credit crunch and investment decisions of Slovenian firms

Matjaž Črnigoj [a,*], Miroslav Verbič [a,b]

[a] Institute for Economic Research, Kardeljeva ploščad 17, 1000 Ljubljana, Slovenia
[b] Faculty of Economics, University of Ljubljana, Kardeljeva ploščad 17, 1000 Ljubljana, Slovenia

ARTICLE INFO

Article history:
Received 3 January 2014
Received in revised form 10 March 2014
Accepted 19 March 2014
Available online 16 September 2014

Keywords:
Corporate investments
Financial constraints
Financial and economic crisis
Error-correction model
Euler-equation specification

ABSTRACT

We investigate the effect of financial constraints on the investment decisions of Slovenian firms during the current financial and economic crisis. By estimating the error-correction model and the Euler-equation specification, we found that corporate investments were significantly affected by financial constraints during the crisis. The effect of financial constraints intensified in 2009 and alleviated slightly in 2010, although still being significantly more intense than before the crisis hit the economy. By estimating a switching regression model with unknown sample separation that enabled us to address the problem of judgemental sample separation, we were also able to estimate the error-correction model separately for financially constrained and financially unconstrained firms. The results indicate that financial constraints have a significant effect on both financially constrained and financially unconstrained firms, although corporate investments were more severely affected in financially constrained firms.

© 2014 Elsevier B.V. All rights reserved.

* Corresponding author at: Institute for Economic Research (IER), Kardeljeva ploscad 17, 1000 Ljubljana, Slovenia. Tel.: +386 15303830; fax: +386 15303874.
E-mail addresses: crnigojm@ier.si (M. Črnigoj), miroslav.verbic@ef.uni-lj.si (M. Verbič).

http://dx.doi.org/10.1016/j.ecosys.2014.03.004
0939-3625/© 2014 Elsevier B.V. All rights reserved.

Downloaded from http://www.elearnica.ir

1. Introduction

There is an ongoing debate as to whether banks provided sufficient financing resources to the Slovenian corporate sector during the current financial and economic crisis, which hit the economy in 2009, and whether they impede economic recovery by pulling out from corporate financing. Banks argue that the Slovenian corporate sector is overleveraged and needs deleveraging, although firms with profitable investment opportunities can still obtain credit. First, the data show that Slovenian firms are significantly more levered than their EU counterparts. The Bank of Slovenia (2012) reports that the debt/equity ratio of the Slovenian corporate sector amounted to almost 1.5 in the period 2008–2010, while the average in the Euro area hardly exceeded one[i]. Second, bank lending collapsed in 2009. According to the Bank of Slovenia (2012), the increase in credit obtained by banks dropped from 3.5 billion EUR in 2008 to only 216 million EUR in 2009 and just 139 million EUR in 2010. At the same time, there was a significant drop in corporate investments. The Institute of Macroeconomic Analysis and Development (IMAD, 2011, 2012) reports that corporate investments dropped by 21.6% in 2009 and by a further 6.7% in 2010. We contribute to the debate investigating the effect of financial constraints on corporate investments.

Assuming a perfect capital market in which a firm can raise as much finance as it desires and internal and external funds are perfect substitutes, a firm's investment decisions are not related to its financial decisions (Modigliani and Miller, 1958). However, as argued by Fazzari et al. (1988), the separability between investment and financial decisions no longer holds if the capital market is not perfect and a firm cannot raise as much finance as it desires. In this case, investment decisions depend on financial factors such as availability of internal finance and access to new finance. Most of the empirical evidence shows that financing constraints significantly affect corporate investments. Bond et al. (2003) tested the effect of financial factors on corporate investments in Belgium, France, Germany and the UK and found significant effects in all countries. They documented economically more significant results for the UK, suggesting that financial constraints on investments may be relatively more severe in the more market-oriented UK financial system than in the continental European countries, which tend to be bank-based. Similar findings were obtained by Hall et al. (1999), who tested whether a firm's cash flow affects investments and R&D in French, Japanese and U.S. high-tech firms. They report a significant effect in all countries and a higher sensitivity of investments and R&D in the U.S., which, like the UK, is characterized by a market-based financial system.

Financial systems tend to be characterized by even more severe market imperfections in emerging markets, which is why one would expect financial constraints to play a more important role there. Empirical evidence documents significant financial constraints in European transition countries, Turkey, Russia, India, China, Taiwan and Brazil (see Arslan et al., 2006; Budina et al., 2000; Chow and Fung, 1998; Hobdari et al., 2009; Kalatzis et al., 2008; Konings et al., 2003; Lizal and Svejnar, 2002; Mickiewicz et al., 2004; Mykhayliv and Zauner, 2013; Perotti and Gelfer, 2001; Perotti and Vesnaver, 2004; Poncet et al., 2010; Rizov, 2004; Saeed and Vincent, 2012; Tseng, 2012). However, lower cash flow sensitivity for some of the firms in these countries does not always imply lower financial constraints or an absence of financial constraints, but often the persistence of soft budget constraints. Hutchinson and Xavier (2006) compared the magnitude of the effect in an established market economy (Belgium) and a transition country (Slovenia) and showed that the firms in the transition country are more sensitive to financing constraints than their counterparts from the established market economy.

One would also expect that the effects of financial constraints intensified during the current financial and economic crisis. Duchin et al. (2010) studied the effects of the subprime mortgage credit crisis in U.S. public firms and showed that corporate investment declined significantly during the crisis. They found that the decline was greatest for firms that had low cash reserves or high net short-term debt or that were operating in industries dependant on external finance. Campello et al. (2010) surveyed Chief Financial Officers worldwide and found that financially constrained firms planned deeper cuts in tech spending, employment, and capital spending. Financially constrained firms also

[i] The leverage of Slovenian firms has increased enormously in the period after 2006. Črnigoj and Mramor (2009) still reported a relatively low leverage of the Slovenian corporate sector in 2006.

burned through more cash, drew more heavily on lines of credit for fear banks would restrict access in the future and sold more assets to fund their operations. The authors also found that the inability to borrow externally caused many firms to bypass attractive investment opportunities.

Although the research is broadly in agreement that financial constraints significantly affect corporate investments, there is still an ongoing debate on several methodological issues in empirical testing. The main question is how firms are classified into financially constrained and financially unconstrained groups. Fazzari et al. (1988) suggested classifying the firms *ex ante*, using dividend payout behaviour and leverage of firms as the criteria. However, Kaplan and Zingales (1997), applying an alternative approach to classify firms, report that the sensitivity of corporate investment to cash flow, which proxies for the availability of internal resources and can show the effect of financial constraints, is not monotonic with respect to financial constraints. Namely, financially constrained firms exhibit the lowest investment sensitivity to cash flow. Aware of the fact that the results may be sensitive to the choice of criteria and the threshold values of firms' characteristics used for sample separation, Hu and Schiantarelli (1998), Hovakimian and Titman (2006) and Hobdari et al. (2009) use an endogenous switching regression model with unknown sample separation that enables them to avoid the problem of judgemental sample separation.

In order to test the effect of financial constraints on corporate investments during the current financial and economic crisis in Slovenia, we constructed a panel data set that covers Slovenian firms in the period 2006–2010. The panel combines accounting data provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services and data from the Survey on Corporate Gross Investments (INV-1) conducted by the Statistical Office of the Republic of Slovenia. We first estimated the error-correction model and then – as a robustness check – the Euler-equation specification. Next, by estimating the switching regression model with unknown sample separation, we estimated the error-correction model separately for financially constrained and financially unconstrained firms. We found that investments in Slovenian firms have been significantly affected by financial constraints during the crisis. The effect of financial constraints intensified in 2009 and alleviated slightly in 2010, although remaining significantly more intense than before the crisis hit the economy. The results indicate that financial constraints have a significant effect on both financially constrained and financially unconstrained firms, though corporate investments were more severely affected in financially constrained firms. As a result, the latter have more severe difficulties in closing the gap between the desired and the actual stock of capital. By estimating the error-correction model on subsamples of small, medium-sized and large firms, we also found that financial constraints affected corporate investments more severely in small firms compared to medium-sized and large firms.

The paper is structured as follows. In Section 2, we present the theoretical framework and the empirical models. In Section 3, we analyse the data and present the descriptive statistics. In Section 4, we present and discuss the results, and in Section 5 we conclude the article.

2. Theoretical framework and empirical models

Empirical tests of corporate investment behaviour and the effects of financial constraints on corporate investments build on dynamic factor demand models; structural and reduced form models. Structural models, including the Q model, the Abel and Blanchard model and the Euler-equation specification, have not been very successful in characterizing the adjustment process. Since the capital of a firm cannot be adjusted costlessly and immediately, and we therefore cannot resort to static models, econometricians proposed relying on a dynamic specification that is not explicitly derived as optimal adjustment behaviour for some particular structure of adjustment costs. As argued by Bond and van Reenen (2007), a favourable interpretation of reduced form models, such as the accelerator model and the error-correction model, is that they represent an empirical approximation to some complex underlying process that generated the data[iii]. Our empirical tests thus rely on an error-correction model, while we estimate an Euler-equation specification as a robustness check. We extended both models to include the effects of financial constraints.

[iii] However, they compound the parameters of the adjustment process with the parameters of the expectations-formation process and can thus be subject to the Lucas (1976) critique.

In order to test for the differences in sensitivity of corporate investment to the availability of internal financing resources and therefore the effect of financial constraints, we classified the firms into financially constrained and financially unconstrained groups. Fazzari et al. (1988) suggested classifying firms *ex ante* using dividend payout behaviour and leverage of firms as the criteria. However, subsequent research has shown that the results may be sensitive to the choice of criteria and the threshold values of firms' characteristics used for sample separation. Besides, the extent of financial constraints may not be directly observable and thus we cannot perfectly identify firms that are financially constrained. To avoid the problem of judgemental sample separation, we use an endogenous switching regression model with unknown sample separation, introduced in the literature by Maddala (1986) and Maddala and Nelson (1994). This allows us to estimate our investment models on subsamples of financially constrained and financially unconstrained firms without *a priori* classifying the firms as constrained or unconstrained[iiiiii].

2.1. Error-correction model

The error-correction model was introduced in the investment literature by Bean (1981) and first used in the context of firm-level data by Bond et al. (2003). The idea of the model is to nest a long-run specification for a firm's demand for capital within the regression model, which allows a flexible specification for short-run investment dynamics to be estimated from the data.

Aware that firms have some desired capital stock, we can expect a firm to invest in order to decrease the gap between its actual and desired capital stock. The desired capital stock of the firm (k_{it}) can be written as a log-linear function of its output (y_{it}) and its cost of capital (j_{it}):

$$k_{it} = \alpha_i + y_{it} - \sigma j_{it} \tag{1}$$

where α and σ are the model parameters. Under the assumption of no adjustment costs, the firm would adjust to the desired capital stock immediately. However, the firm does not adjust immediately in the presence of adjustment costs. Allowing the adjustment process to be determined by the data, we nest Eq. (1) within the autoregressive-distributed lag (ADL) specification. We implicitly assume that the firm's desired capital stock in the presence of adjustment costs is proportional to its desired capital stock in the absence of adjustment costs, and that the short-term dynamics are stable enough to be well approximated by distributed lags in the regression model. Assuming an ADL specification with first and second order dynamics, the model can be written as:

$$k_{it} = \alpha_1 k_{i,t-1} + \alpha_2 k_{i,t-2} + \beta_0 y_{it} + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} \tag{2}$$

where α_1, α_2, β_0, β_1 and β_2 are the model parameters. Imposing the long-run elasticity restriction that requires $(\beta_0+\beta_1+\beta_2)/(1-\alpha_1-\alpha_2)=1$ and reparameterizing the ADL model to an error-correction form, we obtain:

$$\begin{aligned}\Delta k_{it} = {} & (\alpha_1 - 1)\Delta k_{i,t-1} + \beta_0 \Delta y_{it} + (\beta_0 + \beta_1)\Delta y_{i,t-1} - \\ & - (1 - \alpha_1 - \alpha_2)(k_{i,t-2} - y_{i,t-2}) + d_t + \mu_i + \vartheta_{it}\end{aligned} \tag{3}$$

where d_t is a time dummy variable, μ_i is an unobserved firm-specific effect, and ϑ_i is an error term. To obtain the specification for the investment rate, we approximate $\Delta k_{it} \approx I_{it}/K_{i,t-1} - \delta_i$, where I_{it} denotes gross investment, $K_{i,t-1}$ denotes the capital stock at the beginning of the period, and δ_i denotes the firm-specific depreciation rate. To investigate the effects of financial constraints on corporate investments, we include the current and lagged value of the firm's cash flow (normalized by $K_{i,t-1}$ and $K_{i,t-2}$, respectively). The estimated empirical model thus has the form:

$$\begin{aligned}\frac{I_t}{K_{i,t-1}} = {} & \rho \frac{I_{i,t-1}}{K_{i,t-2}} + \gamma_0 \Delta y_{it} + \gamma_1 \Delta y_{i,t-1} + \theta(k_{i,t-2} - y_{i,t-2}) + \\ & + \pi_0 \frac{CF_{it}}{K_{i,t-1}} + \pi_1 \frac{CF_{i,t-1}}{K_{i,t-2}} + d_t + \mu_i + \vartheta_{it}\end{aligned} \tag{4}$$

[iiiiii] Nonetheless, we estimated only the error-correction model on subsamples of financially constrained and financially unconstrained firms.

where ρ, γ_0, γ_1, θ, π_0 and π_1 are the model parameters. The model requires $\theta<0$ in order to be consistent with the error-correcting behaviour, implying that capital stock below the desired level is associated with positive future investments and vice versa.

2.2. Endogenous switching regression model

To avoid the problem of *ex ante* classification of firms as financially constrained or financially unconstrained, we use the endogenous switching regression model with unknown sample separation, previously used to study the effects of financial constraints in Hu and Schiantarelli (1998), Hovakimian and Titman (2006) and Hobdari et al. (2009). In line with their findings, we assume that there exist two different investment regimes, which are unobservable. Depending on the extent of financial constraints, a firm can operate in a financially constrained (*FC*) or a financially unconstrained regime (*FU*). Determining the regime by the endogenous switching regression model, we get the following system of equations:

$$\left(\frac{I_{it}}{K_{i,t-1}}\right)^{FC} = X_{it}\xi_1 + \vartheta_{1it} \quad \text{if} \quad Z_{it}\gamma + \epsilon_{it} \geq 0 \tag{5}$$

$$\left(\frac{I_{it}}{K_{i,t-1}}\right)^{FU} = X_{it}\xi_2 + \vartheta_{2it} \quad \text{if} \quad Z_{it}\gamma + \epsilon_{it} < 0 \tag{6}$$

where X_{it} are the determinants of corporate investments, Z_{it} are factors determining the firm's propensity of being in one or the other regime, ξ_1, ξ_2 and γ are vectors of parameters to be estimated, while ϑ_{1it}, ϑ_{2it} and ε_{it} are respective error terms that are supposed to be correlated across equations, but not over time. The first part of Eqs. (5) and (6) constitutes the structural equations that show investment behaviour in financially constrained and financially unconstrained regimes, respectively. The second (conditional) part of Eqs. (5) and (6) represents the switching function that is estimated simultaneously with the investment equations. The sample separation is therefore unknown, but comes from the process given by the above expressions. Once the equations are simultaneously estimated, the respective probabilities of the firm being in either regime are calculated.

The structural equations are based on the error-equation model outlined in Eq. (4), which in addition includes the inverse Mill's ratio (M_{it}) to control for the sample selection bias:

$$\begin{aligned}\frac{I_{it}}{K_{i,t-1}} = \rho\frac{I_{i,t-1}}{K_{i,t-2}} + \gamma_0\Delta y_{it} + \gamma_1\Delta y_{i,t-1} + \theta(k_{i,t-2} - y_{i,t-2}) + \\ + \pi_0\frac{CF_{it}}{K_{i,t-1}} + \pi_1\frac{CF_{i,t-1}}{K_{i,t-2}} + \kappa M_{it} + d_t + \mu_i + \vartheta_{it}\end{aligned} \tag{7}$$

where κ is a model parameter. By estimating a Heckman-type panel probit model, we calculate the probability that the firm is in a financially constrained regime on the basis of determinants Z_{it}. These include the ratio of earnings before interest, taxes and depreciation to debt (EBITDA/Debt ratio), the interest coverage ratio, the size of the firm measured with the logarithm of sales (y), and the level of financial slack.

Leverage negatively affects corporate investment, as it reduces the cash flow available for investments, increases the hurdle rate used to evaluate investment opportunities and the bankruptcy risk, and, as argued by Myers (1977), changes incentives to invest. By including the EBITDA/Debt ratio in the switching function, we take into account the effect of leverage as well as the ability of the firm to repay the debt. Firms with high leverage relative to their ability to repay their debt and thus a lower EBITDA/Debt ratio tend to operate in a financially constrained regime, while firms that have low leverage relative to their repayment ability and thus a higher EBITDA/Debt ratio tend to operate in a financially unconstrained regime. The interest coverage ratio complements this determinant by looking at the ability of a firm to pay interest.

The size of a firm is the most widely used proxy for a firm's financial constraints. Smaller firms tend to be more financially constrained because the transaction cost of issuing capital decreases with the size of the issue. In addition, small firms are also characterized by higher bankruptcy costs and are

more severely affected by asymmetric information. Smaller firms thus tend to operate in a financially constrained regime, while larger firms tend to operate in a financially unconstrained regime.

The effect of financial slack on the extent of financial constraints of firms is ambiguous in the literature. Some authors argue that firms with high liquidity reserves are not financially constrained, as investments are not limited by a lack of finance (Kaplan and Zingales, 1997), while others argue that the level of financial slack indicates that these firms are financially constrained (Fazzari et al., 2000).

2.3. Euler-equation specification

Our Euler-equation specification is based on Bond and Meghir (1994). In contrast to the error-correction model, the Euler-equation specification is based on an explicit theoretical generalization of the first-order condition to the case of strictly convex costs of adjustment. This particular specification describes the relationship between investment rates in successive periods, derived from dynamic optimization in the presence of symmetric quadratic adjustment costs.

In the derivation, we consider a firm with a net present value (V_{it}) in the absence of taxes at the beginning of the period equal to:

$$V_{it}(K_{i,t-1}) = \max_{L_{it}, I_{it}} \left\{ \prod (K_{it}, L_{it}, I_{it}) + \beta^{t}_{i,t+1} E_{it}\left[V_{i,t+1}(K_{it})\right] \right\} \tag{8}$$

where $\prod(\cdot)$ is the net revenue function and L_{it} represents costlessly adjustable factors. The firm invests I_{it} at the beginning of the period and is immediately productive, but faces strictly convex adjustment costs. The capital stock evolves according to the equation $K_{it} = (1-\delta)K_{i,t-1} + I_{it}$. The expectations operator $E_{it}(\cdot)$ is conditional on information available at the beginning of the period and expectations are taken over future interest rates, input and output prices, and technologies.

The Euler equation, characterizing the optimal path of investments, can be written as:

$$\lambda_{it} = (1-\delta)\left(\frac{\partial \prod}{\partial K}\right)_{it} + (1-\delta)\beta^{t}_{i,t+1} E_t\left[\lambda_{i,t+1}\right] \tag{9}$$

where $\lambda_{it} = \partial V_{it}/\partial K_{i,t-1}$ is the shadow value of capital. From the first-order condition for investments, we obtain:

$$(1-\delta)\left(\frac{\partial \prod}{\partial I}\right)_{it} + \lambda_{it} = 0 \tag{10}$$

Combining Eqs. (9) and (10), we can write the Euler equation in terms of observables as:

$$-(1-\delta)\beta^{t}_{i,t+1} Eit\left[\left(\frac{\partial \prod}{\partial I}\right)_{i,t+1}\right] = -\left(\frac{\partial \prod}{\partial I}\right)_{it} - \left(\frac{\partial \prod}{\partial K}\right)_{it} \tag{11}$$

Assuming that the capital market is not perfect and internal and external funds are not perfect substitutes, the Euler equation characterizing the optimal path for investments can be written as:

$$\begin{aligned} -(1-\delta)\beta^{t}_{i,t+1} E_t\left[\left(\gamma_{i,t+1} + \lambda^{D}_{i,t+1}\right)\left(\frac{\partial \prod}{\partial I}\right)_{i,t+1}\right] = &-\left(\gamma_{it} + \lambda^{D}_{it}\right)\left(\frac{\partial \prod}{\partial I}\right)_{it} \\ &-\left(\gamma_{it} + \lambda^{D}_{it}\right)\left(\frac{\partial \prod}{\partial K}\right)_{it} - \tau_t\left(\frac{B^2_{it}}{p^I_{it} K^2_{it}}\right) \end{aligned} \tag{12}$$

where B_{it} denotes the firm's debt and τ_{it} characterizes the optimal debt policy. We obtain the empirical model by assuming the following net revenue function:

$$\prod_{it} V_{it}(K_{i,t-1}) = p_{it} F(K_{it}, L_{it}) - p_{it} G(I_{it}, L_{it}) - w_{it} L_{it} - p^{I}_{it} I_{it} \tag{13}$$

where p_{it} is the price of the firm's output, $G(I_{it}, L_{it}) = 1/2bK_{it}\left[(I/K)_{it} - c\right]^2$ is a symmetric adjustment-cost function that is linearly homogenous in investments and capital, w_{it} is the vector of prices for the variable inputs, and p^{I}_{it} is the price of investment goods. In addition, we replace unobserved

expectations with realized values. The resulting empirical model can be written as:

$$\left(\frac{I}{K}\right)_{i,t+1} = \beta_1\left(\frac{I}{K}\right)_{it} - \beta_2\left(\frac{I}{K}\right)^2_{it} - \beta_3\left(\frac{CF}{K}\right)_{it} + \beta_4\left(\frac{Y}{K}\right)_{it} - \beta_5\left(\frac{B}{K}\right)^2_{it} + d_t + \mu_i + \vartheta_{it} \quad (14)$$

where β_i, i = 1,. . .,5 are the model parameters. Parameter β_1 is expected to be positive and greater than one, parameter β_2 is expected to be negative and greater than one, while parameter β_3 is expected to take a negative value under the Modigliani–Miller irrelevance theorem and a positive value if investment and financial decisions are related. The value of the coefficient depends on the magnitude of adjustment costs. The output term (Y/K) that controls for imperfect competition is expected to drop out under perfect competition and to take a positive value if there is imperfect competition. The debt term $(B/K)^2$ that controls for non-separability between investment and financial decisions is expected to drop out in general and to take positive values if investment and financial decisions are related.

3. Data

We constructed a panel data set that covers Slovenian firms in the period 2006–2010. The panel combines accounting data provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES) and data from the Survey on Corporate Gross Investments (INV-1), conducted yearly by the Statistical Office of the Republic of Slovenia. The AJPES database includes income statements and balance sheets of all Slovenian firms, while the INV-1 database includes data on corporate investments and financing resources used to fund the investments and covers all Slovenian firms that have more than 10 employees. The AJPES database comprises all Slovenian firms, as they are legally obliged to report financial statements to AJPES, whereas the coverage of the survey data in INV-1 depends on the response rate, which amounted to some 90–93% in the period 2006–2010. Analysing the descriptive statistics and various distributions of the population of firms and the sample including only the firms that participated in INV-1, we do not observe any significant differences. The firms that did not respond to the survey are approximately evenly distributed across different size groups and sectors, meaning that our panel is representative.

Combining the data from AJPES and INV-1, we ended up with a panel that consists of 14,313 firm-year observations. Table 1 shows the descriptive statistics of the panel. The firms in the panel generated on average 17 million EUR of sales, 1 million EUR of earnings before interests and taxes (EBIT), and 330 thousand EUR of net income per year. They had almost 19 million EUR of assets and employed 120 employees. The median values of the corresponding variables are on average more than 50% smaller and thus the size distribution is highly skewed. The firms exhibited a relatively high average profitability of 4.5%. On average, the firms included in the panel operated with a leverage ratio, i.e. the ratio of short-term and long-term debt to assets, of 26.8%. The leverage ratio had been increasing massively until 2009 and started to decrease in 2010.

In Table 2, we further investigate the corporate financial structure, or more precisely the structure of investment financing resources. Despite the fact that the leverage of firms had been increasing until 2009 and decreased only in 2010, the use of external resources to finance investments had been increasing with a slower pace until 2008 and plunged in 2009. The use of debt already plunged in 2008. The drop in the use of external resources was rather small in the mean firm, because it was being financed to a large extent by internal resources. However, it was significantly larger for the 75th percentile firm that used a larger share of external resources. An even larger drop is observed in the use of debt (for the 90th percentile firm)[iiiiiiiv]. The dynamics away from the use of external resources and the use of debt toward a larger dependence on internal resources to finance investments is also confirmed by the increasing coefficient of skewness.

The variables we use in our investment models are firm's investments, output, cash flow, debt, and stock of capital. Investments were obtained from the INV-1 database, while we obtained other variables from the AJPES database. We considered firm's investments in property, plants and

[iiiiiiiv] We use the 75th percentile firm and the 90th percentile firm to study the dynamics of the use of external resources and the use of debt, respectively, because the median firm did not use external resources and the 75th percentile firm did not use debt to finance its investments.

Table 1
Descriptive statistics: The table presents descriptive statistics of the panel (mean, median and standard deviation). The leverage ratio is calculated as the ratio of short- and long-term debt to total assets.

	2006	2007	2008	2009	2010	Total
Sales	17,026,691	17,473,033	17,419,640	15,966,086	17,440,093	17,072,578
	4,347,442	4,391,793	4,577,483	4,132,270	4,359,216	4,354,405
	70,278,281	72,797,941	78,388,681	70,306,107	77,371,628	74,022,107
EBIT	822,331	1,001,545	987,850	919,583	969,895	943,250
	135,762	208,965	208,834	172,887	167,140	178,505
	5,119,405	4,890,898	5,489,037	5,395,163	5,411,271	5,269,589
Net income	170,570	713,383	382,822	220,968	123,873	328,695
	21,720	91,284	63,360	40,246	40,402	46,195
	1,112,891	4,303,848	5,285,060	5,092,829	7,494,678	5,127,433
ROA	0.061	0.065	0.051	0.022	0.027	0.045
	0.044	0.049	0.043	0.027	0.027	0.037
	0.124	0.152	0.135	0.204	0.147	0.156
Assets	17,524,091	18,892,630	18,605,812	19,145,583	20,584,769	18,961,603
	3,736,530	3,665,563	3,783,474	3,837,494	3,786,439	3,770,764
	74,171,532	85,810,024	83,157,249	85,335,332	97,375,037	85,572,420
Leverage	0.226	0.240	0.270	0.323	0.276	0.268
	0.187	0.197	0.235	0.257	0.244	0.222
	0.204	0.249	0.265	2.259	0.239	1.033
Employees	131	124	117	115	113	120
	48	45	44	44	44	45
	411	390	377	376	355	382
N	2,617	2,929	3,110	2,857	2,800	14,313

Sources: AJPES; authors' own calculations.

equipment as well as intangible assets. We also tried to measure investments by taking into account only investments in tangible assets, but the results remained approximately unchanged. Output was approximated by the firm's sales. We calculated the measure of cash flow by adding back depreciation to the reported net income. Debt and leverage take into account long-term and short-term debt. The stock of capital is approximated by the firm's book value of property, plants and equipment, and intangible assets or only the firm's book value of tangible assets, depending on what is the proxy for investments. We control for industry-specific effects and time effects by including industry and time dummies.

The switching function that was used to determine the investment regime includes the EBITDA/Debt ratio, the interest coverage ratio, the size of the firm, and the level of financial slack. The EBITDA/Debt ratio ($EBITDA/Debt_{t-1}$) takes into account the gross cash flow obtained by adding back depreciation to the operating income and the long- and short-term debt. We calculated the interest coverage (IC_{t-1}) ratio by dividing the gross cash flow by the interest expense. The firm's size is measured by the logarithm of the firm's sales (y_{t-1}). Financial slack (FS_t/K_{t-1}) considers liquid assets – short-term financial assets and cash – and is divided by capital.

In Table 3, we present the means and standard deviations of the variables used in our investment models. The investment rate (I_t/K_{t-1}) amounted to slightly below 0.4 in 2008 and dropped to 0.27 and 0.25 in the years 2009 and 2010, respectively. The relatively high overall investment rates were driven primarily by the high investment rates in small firms. The investment rates in small firms were twice as high as in medium-sized and almost three times higher than in larger firms.

A somewhat similar trend can be observed when analysing the growth rate of sales (Δy_t) and the cash flow rates (CF_t/K_{t-1}). The growth rate of sales (Δy_t) decreased from 0.12 in 2008 to as low as −0.10 in 2009, when the crisis hit the economy most severely, but picked up again in 2010 and reached 0.07. Again, the average growth rate was primarily affected by small firms driving it higher in the

Table 2
The structure of investment financing resources: The table presents the mean, the 75th percentile and the 90th percentile of internal resources, external resources and debt used to finance investments and the coefficient of skewness.

	2006	2007	2008	2009	2010	Total
Mean						
Internal resources	0.744	0.734	0.724	0.770	0.780	0.751
External resources	0.256	0.266	0.276	0.230	0.220	0.249
Debt	0.103	0.109	0.102	0.090	0.087	0.098
75th percentile						
External resources	0.529	0.565	0.592	0.464	0.404	0.517
Debt	0.000	0.000	0.000	0.000	0.000	0.000
90th percentile						
External resources	0.846	0.869	0.868	0.851	0.796	0.850
Debt	0.504	0.554	0.510	0.450	0.428	0.498
Skewness						
External resources	0.954	0.891	0.826	1.139	1.251	1.000
Debt	2.355	2.257	2.354	2.624	2.684	2.442
N	2,617	2,929	3,110	2,857	2,800	14,313

Sources: INV-1; authors' own calculations.

period before the crisis and mitigating the decrease during the crisis. The cash flow rates (CF_t/K_{t-1}) decreased from 0.64 in 2008 to slightly above 0.55 in 2009 and 2010. Higher cash flow rates were again observed for small firms, though these also exhibited the highest decrease when the crisis hit the economy. Other variables that were not included in the error-correction model, but enter the Euler-equation specification, are the sales/capital ratio (Y_{t-1}/K_{t-1}) and the debt term $(B_{t-1}/K_{t-1})^2$. The sales/capital ratio (Y_{t-1}/K_{t-1}) increased in 2009 and dropped in 2010, while the debt term $(B_{t-1}/K_{t-1})^2$ was increasing throughout the whole period.

4. Results

In Table 4, we report the regression results for the error-correction model outlined in Eq. (4). The model was estimated using the generalized method of moments (GMM), where the instruments include lagged values of explanatory variables ($t-1$ and $t-2$). The GMM estimator controls for biases due to unobserved firm-specific effects as well as endogenous explanatory variables. It eliminates the firm-specific effects by differencing the equations and then uses lagged values of endogenous explanatory variables as instruments. If the error term (ϑ_{it}) in levels is serially uncorrelated, then the error term in first differences is MA(1), and instruments dated $t-2$ and earlier should be valid in the differenced equations and thus consistent estimates can be obtained. We test the validity of instruments used by reporting the Sargan test statistic of overidentifying restrictions.

As seen in Table 4, we observe significant effects of financial constraints for Slovenian firms during the current financial and economic crisis. In specification (1) we measured investments as investments in property, plants and equipment, as well as intangible assets, while in specification (2) we considered only investments in tangible assets. The coefficient on the current cash flow rate (CF_t/K_{t-1}) amounts to 0.30 in specification (1) and 0.31 in specification (2). We also observe a significant coefficient on the lagged cash flow rate (CF_{t-1}/K_{t-2}), though the values are considerably lower; 0.08 in specification (1) and 0.06 in specification (2). As argued by Hobdari et al. (2009), this shows cash smoothing behaviour or the "buffer stock" liquidity hypothesis. Due to the inability to secure all required resources, when a profitable investment project is undertaken, firms accumulate internal funds over a longer period of time. To assess the dynamics of the financial constraints effect over time, in specification (3) we include two interactive terms that were obtained by multiplying the cash flow rates and the time dummies ($CF_t/K_{t-1} \times d\_2009$, $CF_t/K_{t-1} \times d\_2010$, $CF_{t-1}/K_{t-2} \times d\_2009$, $CF_{t-1}/K_{t-2} \times d\_2010$). The coefficients on these interactive terms suggest that the effect of financial

Table 3
Means and standard deviations of the variables in the investment models: The table presents the means and standard deviations of the variables used in the models and the number of firms/observations in the studied period. The total refers to the panel 2006–2010.

	2008	2009	2010	Total
Error-correction model				
I_t/K_{t-1}	0.3951412	0.269142	0.249379	0.3533794
	1.332721	1.838109	1.052897	2.541988
Δy_t	0.1208656	−0.1027615	0.0719359	0.0811785
	0.2978983	0.3008394	0.286313	0.309679
$(k_{t-2}-y_{t-2})$	−1.382727	−1.438333	−1.40739	−1.385936
	1.248016	1.265751	1.299219	1.266064
CF_t/K_{t-1}	0.6447395	0.5443483	0.5370363	0.5842518
	1.294519	1.049107	0.9725373	1.181475
Euler-equation specification				
I_t/K_t	0.2355435	0.2307265	0.180092	0.2286176
	0.3852334	0.2942322	0.4227972	0.6451498
CF_{t-1}/K_{t-1}	0.5948175	0.5887315	0.563655	0.5294118
	1.641985	1.418679	1.149526	1.375257
Y_{t-1}/K_{t-1}	10.57841	11.31815	10.03499	10.62095
	24.07833	28.02955	23.67794	25.40275
$(B_{t-1}/K_{t-1})^2$	5.359055	6.49385	6.882014	4.892073
	31.01244	33.00858	38.354	30.143
N	3,110	2,857	2,800	14,313

Sources: AJPES, INV-1; authors' own calculations.

constraints intensified in 2009 and alleviated slightly in 2010, however still being significantly more intense than before the crisis hit the economy.

The coefficients on the error-correction term $(k_{t-2}-y_{t-2})$ are correctly signed, indicating that, on average, firms close 18% of the gap between the desired and actual capital stock per year. Despite the significant financial constraints faced by Slovenian firms during the current financial crisis, their speed of adjustment to target capital stock does not lag behind the speed found in other EU member states (Bond et al., 2003). It seems that Slovenian firms still conduct the necessary investments. This is possible due to declining economic activity and a lower desired capital stock, as well as relatively high profitability, which enables them to generate enough internal financing resources. However, when economic activity picks up, we can expect that the desired capital stock and the resulting gap will increase, whereas Slovenian firms will not generate enough internal funds to finance all the necessary investments.

We further investigate the effect of financial constraints by splitting the sample of Slovenian firms into subsamples of financially constrained and financially unconstrained firms. To avoid the problem of judgemental sample separation, we use an endogenous switching regression model with unknown sample separation, where the switching regression is estimated as a panel probit model using the random-effects estimator.

Table 5 reports the results of the switching regression model. In Panel A, we report the results of investment regressions for financially constrained and financially unconstrained firms. Comparing the investment-cash flow sensitivities in both groups of firms, we observe significant differences in the effect of financial constraints. The coefficient of the current cash flow rate (CF_t/K_{t-1}) for financially constrained firms amounts to 0.72, while it is only 0.15 for financially unconstrained firms, pointing at significantly more severe financial constraints for the former. This means that an increase in the

Table 4
Error-correction model. The table presents the regression results for the error-correction model (regression coefficients, standard errors and statistical significance of the coefficients, where * denotes significance at 0.1 probability level, ** significance at 0.05 probability level and *** significance at 0.01 probability level). The Sargan test for overidentifying restrictions and the corresponding *p*-value are also reported.

	(1)	(2)	(3)
I_{t-1}/K_{t-2}	−0.00318711	−0.00549448	−0.0016664
	0.0045922	0.005154	0.0045714
Δy_t	0.10420934*	0.15580151**	.1027876*
	0.0548899	0.0651243	0.0546469
Δy_{t-1}	0.14276358**	0.18767479***	0.1309098**
	0.0572743	0.0670934	0.0570539
$k_{t-2}-y_{t-2}$	−0.18648864***	−0.18072756***	−0.1624309***
	0.0387639	0.0439356	0.0388132
CF_t/K_{t-1}	0.29961369***	0.31020574***	0.2325998***
	0.0240339	0.0230073	0.0279708
CF_{t-1}/K_{t-2}	0.0841356***	0.05809993***	0.0797677***
	0.020254	0.0191372	0.0245557
$CF_t/K_{t-1} \times d\_2009$			0.2948846***
			0.0446097
$CF_t/K_{t-1} \times d\_2010$			0.1953601***
			0.0545929
$CF_{t-1}/K_{t-2} \times d\_2009$			−0.0053333**
			0.0323067
$CF_{t-1}/K_{t-2} \times d\_2010$			0.1335135***
			0.0593415
Observations	6,503	6,502	6,503
Firms	2,696	2,695	2,696
Sargan test	4.2581	8.2657	2.9516
p-Value	0.5129	0.1422	0.7074

Sources: AJPES, INV-1; authors' own calculations.

available cash flow translates into an increase of investments that is five times larger for financially constrained firms compared to that for financially unconstrained firms. The result is in line with the findings obtained by Hobdari et al. (2009), who tested the investment behaviour of Estonian firms, and Hovakimian and Titman (2006), who investigated U.S. firms. In contrast to the findings obtained when testing the investment model on the whole sample, the coefficient on the lagged cash flow rate (CF_{t-1}/K_{t-2}) is insignificant in both groups of firms. Besides, we also tested for the statistical difference of individual coefficients in investment regressions across the two different regimes. Based on the Wald test, we can reject the null hypothesis that the coefficients of the cash flow rate are equal.

The coefficients on the error-correction term ($k_{t-2}-y_{t-2}$) for financially unconstrained firms amount to 0.26 (approximately 0.18 for the whole sample). Firms that are not financially constrained thus close the larger gap between the actual and desired capital stock. On the other hand, we observe that financially constrained firms experience serious difficulties in closing the gap.

Panel B reports the results of the estimation of the switching function. The results show that all variables included in the selection equation significantly determine the likelihood of a firm being in a particular investment regime. According to the expectations, a lower EBITDA/Debt ratio ($EBITDA/Debt_{t-1}$), lower interest coverage ratio (IC_{t-1}) and lower level of financial slack (FS_{t-1}) are all associated with a higher propensity that a firm is financially constrained.

To further investigate the effect of financial constraints, we also tested the model on subsamples of small firms and medium-sized and large firms. Small firms tend to be most severely hit by the credit crunch and also constantly complain about the inability to obtain credit. As seen from Table 6, the coefficient on the current cash flow rate (CF_t/K_{t-1}) for small firms amounts to 0.26, while it amounts to only 0.16 for medium-sized and large firms. Based on the Wald test, we can also reject the null hypothesis that the coefficients of the cash flow rate are equal. Again, we observe different dynamics of the effect of financial constraints on small firms. The coefficients on the interactive terms ($CF_t/K_{t-1} \times d\_2009$, $CF_t/K_{t-1} \times d\_2010$, $CF_{t-1}/K_{t-2} \times d\_2009$, $CF_{t-1}/K_{t-2} \times d\_2010$) suggest that the effect

Table 5
Switching regression model. Panel A presents the regression results for the error-correction model (regression coefficients, standard errors and statistical significance of the coefficients, where * denotes significance at 0.1 probability level, ** significance at 0.05 probability level and *** significance at 0.01 probability level) estimated for financially constrained and financially unconstrained firms. Panel B reports the regression results for the switching function.

Panel A: Investment regressions		
	Financially constrained	Financially unconstrained
I_{t-1}/K_{t-2}	0.07436559***	−0.00482998
	0.0144968	0.0058591
Δy_t	0.06086217	0.00942996
	0.0477437	0.1012347
Δy_{t-1}	0.03674897	0.0591377
	0.0521955	0.1061747
$k_{t-2}-y_{t-2}$	0.03131621	−0.26451543***
	0.0414899	0.0672325
CF_t/K_{t-1}	0.71819117***	0.14921759***
	0.043402	0.0441192
CF_{t-1}/K_{t-2}	−0.00364401	0.07029907
	0.0277342	0.0444945
$CF_t/K_{t-1} \times d\_2009$	−0.24209696***	0.40941501***
	0.0742485	0.0860825
$CF_t/K_{t-1} \times d\_2010$	−0.49126557***	0.46226412***
	0.0865356	0.0935304
$CF_{t-1}/K_{t-2} \times d\_2009$	0.12226414***	0.03804737
	0.0384109	0.0573548
$CF_{t-1}/K_{t-2} \times d\_2010$	0.35284622***	0.00199857
	0.1036416	0.1128936
Observations	3,013	2,610
Firms	1,341	1,348
Sargan test	15.788	5.7092
p-Value	0.0750	0.3356
Panel B: Switching regression		
Const.	−0.3416461	
	0.5321572	
$(EBITDA/Debt)_{t-1}$	−0.0026757***	
	0.0005673	
IC_{t-1}	−0.0000971**	
	0.0000476	
y_{t-1}	0.0532892	
	0.0343081	
FS_{t-1}	−0.0683038***	
	0.0182796	
Observations	5,623	
Firms	2,689	
log*L*	−4,504.6	

Notes: Investment regressions also include a constant, time and industry dummies, as well as the inverse Mill's ratio to account for selection bias. The dependent variable in the switching regression is an indicator taking the value of 1 for firms classified as financially constrained and 0 for those classified as not financially constrained.
Sources: AJPES, INV-1; authors' own calculations.

intensified during the crisis for small firms, while it remained unchanged for medium-sized and large firms. However, as is argued in the literature, it is possible that a lower effect of financial constraints for medium-sized and large firms does not always imply lower financial constraints or an absence of financial constraints, but the persistence of soft budget constraints in these firms.

Coefficients on the error-correction term ($k_{t-2}-y_{t-2}$) suggest that small firms on average close a larger part of the gap between the desired and actual capital stock per year compared to medium-sized and large firms, despite being more financially constrained. Namely, small firms close on average 25% of the gap per year, while medium-sized and large firms only close 16%.

Table 6
Error-correction model—subsamples of small firms and medium-sized and large firms The table presents the regression results for the error-correction model (regression coefficients, standard errors and statistical significance of the coefficients, where * denotes significance at 0.1 probability level, ** significance at 0.05 probability level and *** significance at 0.01 probability level). The Sargan test for overidentifying restrictions and the corresponding *p*-value are also reported.

	Small firms	Medium-sized and large firms
I_{t-1}/K_{t-2}	−0.0058398	0.1549993***
	0.0059115	0.0175136
Δy_t	0.0945823	0.0349373
	0.0894098	0.0423704
Δy_{t-1}	0.1621952*	−0.0940559**
	0.0917359	0.0471697
$k_{t-2} - y_{t-2}$	−0.2508735***	−0.1653103***
	0.0596294	0.0370591
CF_t/K_{t-1}	0.2607036***	0.164902***
	0.0403741	0.0300705
CF_{t-1}/K_{t-2}	0.0762261**	0.0986272***
	0.0343861	0.0305372
$CF_t/K_{t-1} \times d\_2009$	0.3977797***	−0.0338182
	0.065264	0.0463511
$CF_t/K_{t-1} \times d\_2010$	0.2296239***	0.1272851**
	0.0794537	0.0580667
$CF_{t-1}/K_{t-2} \times d\_2009$	0.0318003	−0.0429876
	0.0464839	0.0363624
$CF_{t-1}/K_{t-2} \times d\_2010$	0.2403817***	−0.1412492**
	0.0840347	0.0686245
Observations	3,588	2,915
Firms	1,633	1,169
Sargan test	5.0151	13.921
p-Value	0.4140	0.0161

Sources: AJPES, INV-1; authors' own calculations.

In Table 7, we present the results of the Euler-equation specification. In line with the results obtained with the error-correction model, we observe a significant effect of financial constraints on Slovenian corporate investments during the current economic crisis; the coefficient on the cash flow rate (CF_{t-1}/K_{t-1}) is positive and significant in both specifications. In specification (1) we consider

Table 7
Euler-equation specification. The table presents the regression results for the Euler-equation specification (regression coefficients, statistical significance of the coefficients, where * denotes significance at 0.1 probability level, ** significance at 0.05 probability level and *** significance at 0.01 probability level). The Sargan test for overidentifying restrictions and the corresponding *p*-value are also reported.

	(1)	(2)
I_{t-1}/K_{t-1}	0.3941543***	0.2565231***
	0.0335364	0.0239027
$(I_{t-1}/K_{t-1})^2$	−0.0210164***	−0.0007718***
	0.0019126	0.0000717
CF_{t-1}/K_{t-1}	0.0294353***	0.0285341***
	0.0105632	0.0089633
Y_{t-1}/K_{t-1}	0.0026255***	0.0024412***
	0.0005885	0.0005423
$(B_{t-1}/K_{t-1})^2$	−0.0001783	−0.00056**
	0.0002731	0.0002287
Observations	6,609	6,608
Firms	2,736	2,736
Sargan test	41.50414	21.03268
p-Value	0.0000	0.0008

Sources: AJPES, INV-1; authors' own calculations.

investments in property, plants and equipment, as well as intangible assets, while in specification (2) we only regard investments in tangible assets. A negative coefficient on the debt term $(B_{t-1}/K_{t-1})^2$ also rejects the hypothesis of separability between investments and financial decisions, and suggests that financial decisions are not irrelevant for investments decisions.

5. Conclusions

In order to assess the effect of financial constraints on the investment decisions of Slovenian firms during the current economic crisis, we constructed a panel data set that covers Slovenian firms in the period 2006–2010 and estimated the error-correction model and the Euler-equation specification. We found that investments in Slovenian firms have been significantly affected by financial constraints during the first two years of the current financial and economic crisis that hit the economy in 2009. The effect of financial constraints intensified in 2009 and alleviated slightly in 2010, though still being significantly more intense than before the crisis.

By estimating an endogenous switching regression model with unknown sample separation, we then estimated the error-correction model for financially constrained and financially unconstrained firms. The results indicate that financial constraints have a significant effect in both financially constrained and financially unconstrained firms, though corporate investments were more severely affected in financially constrained firms. In line with the findings of Hobdari et al. (2009), who tested investment behaviour for Estonian firms, and Hovakimian and Titman (2006), who investigated U.S. firms, we found that an increase in the available cash flow translates into an increase of investments that is five times larger for financially constrained firms compared to that for financially unconstrained firms. We found that financially constrained firms also had more severe difficulties in closing the gap between the desired and the actual stock of capital.

We also found that financial constraints affected investments more severely in small firms compared to medium-sized and large firms. The effect intensified for small firms during the crisis, while it remained unchanged for medium-sized and large firms. However, as argued in the literature, it is possible that the lower effect of financial constraints for medium-sized and large firms does not necessarily imply lower financial constraints or an absence of financial constraints, but may point to the persistence of soft budget constraints in these firms.

By providing strong empirical evidence that financial constraints significantly affected Slovenian corporate investments during the current financial and economic crisis, we contribute to the discussion on the role of banks in the economic recovery. Since it is clear that the effect of financial constraints is not merely a phenomenon that impedes the growth of some financially constrained firms but a more general problem that threatens the long-term survival of many Slovenian firms, our policy recommendation points to restructuring the banking sectors as soon as possible in order to provide the corporate sector with sufficient financing resources that will stimulate investments and thus economic recovery. Analysing financially constrained firms, one can observe that these firms already exhibit serious difficulties in conducting the necessary investments, though on average we still observe adequate investment rates with respect to the gap between the desired and the actual capital stock. This is possible due to declining economic activity, lower desired capital stock and a relatively high profitability, which enables the firms to generate enough internal financing resources. However, when the economic activity picks up, we can expect the desired capital stock and the resulting gap to increase, whereas Slovenian firms will not be able to generate enough internal funds to finance all the necessary investments.

Furthermore, assuming that the findings can be generalized to other EU peripheral countries that have similarly ill-functioning banking sectors and are still struggling with reviving economic growth, we also contribute to the scarce literature on the role of finance for stimulating corporate investments and the role of the banking sector in the economic recovery of these countries.

Acknowledgements

This research was funded by the Slovenian Research Agency and the Ministry of Finance of the Republic of Slovenia under the contract No. 1000-10-281001. The authors thank the participants of the

EMU-SSEM EuroConference 2013 (Famagusta, North Cyprus, 2013) for helpful comments on earlier drafts of this paper.

References

Arslan, Ö., Florackis, C., Ozkan, A., 2006. The role of cash holdings in reducing investment–cash flow sensitivity: evidence from a financial crisis period in an emerging market. Emerg. Mark. Rev. 7, 320–338.
Bank of Slovenia, 2012. Financial Stability Review. Bank of Slovenia, Ljubljana.
Bean, C.R., 1981. An econometric model of manufacturing investment in the UK. Econ. J. 91, 106–121.
Bond, S., Elston, J., Mairesse, J., Mulkay, B., 2003. Financial Factors and Investment in Belgium, France, Germany and the UK: a comparison using company panel data. Rev. Econ. Stat. 85 (1), 153–165.
Bond, S.R., Meghir, C., 1994. Dynamic investment models and the firm's financial policy. Rev. Econ. Stud. 61, 197–222.
Bond, S., van Reenen, J., 2007. Microeconometric models of investment and employment Handbook of Econometrics, 6A. , pp. 4417–4498.
Budina, N., Garretsen, H., de Jong, E., 2000. Liquidity constraints and investment in transition economies. Econ. Trans. 8 (2), 453–475.
Campello, M., Graham, J.R., Harvey, C.R., 2010. The real effects of financial constraints: evidence from a financial crisis. J. Financ. Econ. 97, 470–487.
Chow, C.K.W., Fung, M.K.Y., 1998. Ownership structure, lending bias, and liquidity constraints: evidence from Shanghai's manufacturing sector. J. Compar. Econ. 26 (2), 301–316.
Črnigoj, M., Mramor, D., 2009. Determinants of capital structure in emerging European economies: evidence from Slovenian firms. Emerg. Mark. Finance Trade 45 (1), 72–89.
Duchin, R., Ozbas, O., Sensoy, B.A., 2010. Costly external finance, corporate investment, and the subprime mortgage credit crisis. J. Financ. Econ. 97, 418–435.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 1988. Financing constraints and corporate investment. Brookings Pap. Econ. Act. 1988 (1), 141–206.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 2000. Investment–cash flow sensitivities are useful: a comment on Kaplan and Zingales. Q. J. Econ. 115, 695–705.
Hobdari, B., Jones, D.C., Mygind, N., 2009. Capital investment and determinants of financial constraints in Estonia. Econ. Syst. 33, 344–359.
Hall, B.H., Mairesse, J., Branstetter, L., Crepon, B., 1999. Does cash flow cause investment and R&D: an exploration using panel data for French, Japanese and United States firms in the scientific sector. In: Audretsch, D., Thurik, A.R. (Eds.), Innovation, Industry Evolution and Employment. University Press, Cambridge.
Hovakimian, G., Titman, S., 2006. Corporate investment with financial constraints: sensitivity of investment to funds from voluntary assets sales. J. Money, Credit, Bank. 38 (2), 357–374.
Hu, X., Schiantarelli, F., 1998. Investment and capital market imperfections: a switching regression approach using US firm panel data. Rev. Econ. Stat. 80, 466–479.
Hutchinson, J., Xavier, A., 2006. Comparing the impact of credit constraints on the growth of SMEs in a transition country with an established market economy. Small Bus. Econ. 27, 169–179.
IMAD, 2011. Spring Forecast of Economic Trends 2011. IMAD, Ljubljana.
IMAD, 2012. Spring Forecast of Economic Trends 2012. IMAD, Ljubljana.
Kalatzis, A.E.G., Azzoni, C.R., Achcar, J.A., 2008. Financial constraints and investment decisions: evidence from a highly unstable emerging economy. Appl. Econ. 40, 1425–1434.
Kaplan, S.N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Q. J. Econ. 112, 169–215.
Konings, J., Rizov, M., Vandenbussche, H., 2003. Investment and financial constraints in transition economies: micro evidence from Poland, the Czech Republic, Bulgaria and Romania. Econ. Lett. 78, 253–258.
Lizal, L., Svejnar, J., 2002. Investment, credit rationing, and the soft budget constraint: evidence from Czech panel data. Rev. Econ. Stat. 84 (2), 353–370.
Lucas, R.E., 1976. Econometric policy evaluation: a critique. In: Brunner, K., Meltzer, A. (Eds.), The Phillips Curve and Labour Markets. Carnegie-Rochester Conference Series, 1. pp. 19–46.
Maddala, G.S., 1986. Disequilibrium, self-selection, and switching model. In: Griliches, Z., Intriligator, M.D. (Eds.), Handbook of Econometrics, vol. 3. Elsevier Science, Amsterdam.
Maddala, G.S., Nelson, F.D., 1994. Switching regression models with exogenous and endogenous switching. In: Maddala, G.S. (Ed.), Econometric Methods and Applications. Edward Elgar, Aldershot.
Mickiewicz, T., Bishop, K., Varblane, U., 2004. Financial constraints in investment, panel data result from Estonia, 1995–1999. Acta Oecon. 54 (4), 425–449.
Modigliani, F., Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. Am. Econ. Rev. 48 (3), 261–297.
Myers, S.C., 1977. Determinants of corporate borrowings. J. Finance 5, 147–175.
Mykhayliv, D., Zauner, K.G., 2013. Investment behaviour and ownership structures in Ukraine: soft budget constraints, government ownership and private benefits of control. J. Comp. Econ. 41, 265–278.
Perotti, E.C., Gelfer, S., 2001. Red barons or robber barons? Governance and investment in Russian financial–industrial groups. Eur. Econ. Rev. 45, 1601–1617.
Perotti, E.C., Vesnaver, L., 2004. Enterprise finance and investment in listed Hungarian firms. J. Comp. Econ. 32, 73–87.
Poncet, S., Steingress, W., Vandenbussche, H., 2010. Financial constraints in China: firm-level evidence. China Econ. Rev. 21, 411–422.

Rizov, M., 2004. Firm investment in transition evidence from Romanian manufacturing. Econ. Trans. 12 (4), 721–746.
Saeed, A., Vincent, O., 2012. Bank concentration and firm investment: empirical evidence from India. Emerg. Mark. Finance Trade 48 (3), 85–105.
Tseng, T., 2012. Will both direct financial development and indirect financial development mitigate investment sensitivity to cash flow? The experience of Taiwan. Emerg. Mark. Finance Trade 48, 139–152.