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Bankruptcy, Investment, and Financial Constraints: Evidence from a Post-Transition Economy

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Abstract:
In this paper we use balance-sheet data and information on bankruptcy to study the relationship between investment, financial constraints, and bankruptcy in a post-transition country. Our data constitute a dynamic panel and cover the period 2006–2011, which also allows us to study the impact of the 2008 crisis on Czech companies. Using investment–cash flow sensitivity to analyze financial constraints we find there is robust evidence that cash flow and the level of debt have a positive and significant impact on the investment rate. By taking a closer look at individual subsamples we reveal that the existence of financial constraints, proxied by investment–cash flow sensitivity, is evident mainly after 2008 and in small and medium-sized enterprises. At the same time, we do not uncover any evidence that firms going bankrupt during our observed period faced more severe financial constraints. Moreover, companies going bankrupt had significantly higher levels of

external debt and bank loans, which indicates that they may have been, in fact, less constrained than others.

Keywords: bankruptcy, cash flow, credit rationing, financial constraints, investment, post-transition economy

JEL: D22, D92, E22, G32

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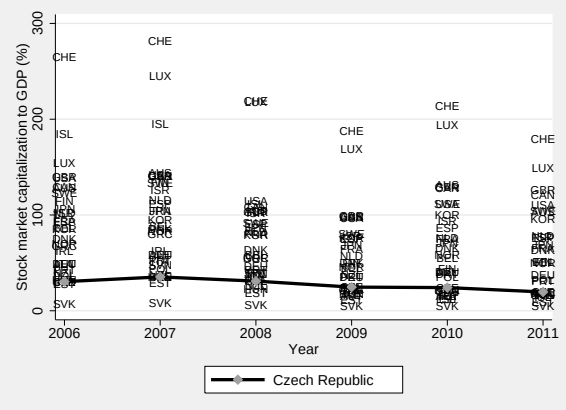
1. Statement of the Problem

In a country with a small stock market such as the Czech Republic, firms have limited access to capital and need to use bank credit extensively as their principal form of external financing. As there are not many other options for firms to get credit, a significant decline in bank loans, such as the one experienced after September 2008, characterized by severely contracted liquidity in global credit markets, constrains the whole economy and may lead to an increased incidence of bankruptcy.

Generally, investment is the most volatile part of GDP and is strongly linked to external credit provision, as investors usually do not have enough internal funds for their investment projects. Financial constraints influence investment to a varying degree over the business cycle. As a consequence, financially constrained firms may be forced to forgo good investment opportunities and the whole economy can suffer. Knowing more about the link between finance, investment, and bankruptcy can help policy-makers understand how to mitigate the consequences of such a credit crunch.[1] Recognizing this, in this paper we focus on the link between investment, bankruptcy, and financial constraints. Linking the latest balance-sheet data with original information on bankruptcy, we offer a new perspective on this important relationship in the economy.

Figure 1: Stock Market Capitalization in High-Income OECD Countries

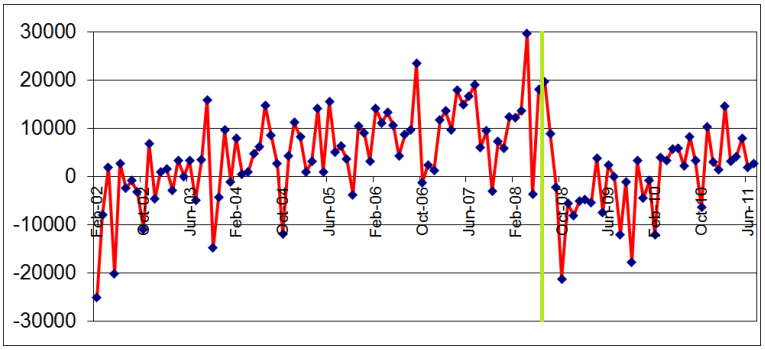


Note: The Czech Republic is among the OECD countries with the lowest stock market capitalization. Moreover, stock market capitalization decreased after 2008. This supports the notion that bank lending is of crucial importance for investment and growth in the Czech Republic.
Source: The World Bank (`http://go.worldbank.org/X23UD9QUX0`), authors' calculations.

Analysis of financial constraints using data from the Czech Republic constitutes an interesting and important contribution to the existing literature for several reasons. First, the Czech Republic is a small and open economy. As such, it is vulnerable to external economic shocks such as the global credit crunch after September 2008. Second, it is a good example of a country with a small stock market.[2] Because of the low stock market capitalization, bank lending is crucial for investment and growth in the country. Third, the Czech banking crisis of 1997 and the subsequent privatization of Czech banks to Western global banking groups[3] helped the Czech banking sector learn how to better assess risk and was one of the reasons why the Czech banking sector weathered the 2008 crisis relatively well. Therefore, it is assumed that banks know how to assess the risk of investment

[1] As Bernanke et al. (1999) note, Fisher (1933) argued that the severity of the Great Depression was due to a heavy debt burden and financial constraints.
[2] In Figure 1 we plot stock market capitalization against GDP in OECD countries. The figure also shows that the already low Czech stock market capitalization decreased further after 2008.
[3] Large state-owned banks were privatized to foreign investors (e.g. KBC, Erste, and Société Générale.)

Figure 2: Evolution of Credit to Non-Financial Companies in the Czech Republic



Note: Monthly flows in CZK million. Before the 2008 crisis credit grew significantly. September 2008 marks a significant decline in lending to non-financial companies.
Source: Czech National Bank, authors' calculations.

projects in the country. Fourth, Czech companies had to face a decline in lending after the fall of Lehman Brothers in 2008 (see Figure 2).[4] Finally, the Czech Republic is a typical post-transition country.[5] As such, an analysis of this country can help us understand other countries that are catching up in terms of development.

The decline in credit coincided with a number of company bankruptcies in the Czech Republic (see Figure 5). One of the reasons for companies going bankrupt might have been the often mentioned difficult access to finance during the time of economic distress. However, detailed analysis of this link has so far been limited due to the unavailability of firm-level data in the post-2008 period. Today, now the data are finally available, we are able to link balance-sheet data with an original dataset of company bankruptcies to study firms' investment behavior in relation to financial constraints and bankruptcy in the Czech Republic.

Due to the nature of available data, our identification of financially constrained companies is only indirect. But if combined, for example, with survey data or data on firms' credit, it would be possible to identify a more direct link between credit and investment. Such research would then have potential policy implications. Good identification of financially constrained companies and sectors can help, for instance, in times of economic crisis to support the argument for well-targeted policy intervention (loan provision, guarantees) on the credit market.[6]

The remainder of the paper is organized as follows. The next section reviews the related literature. In section 3 we look at financial constraints through the lens of a number of surveys. Then we explain our research methodology. In section 5 we describe our data and data management. Section 6 presents and discusses the results, and section 7 concludes.

[4] The 2008 crisis hit firms in the Czech Republic hard. For example, in 2009 they were complaining that they were being hit by a credit crunch, with banks reluctant to lend money (`http://goo.gl/r2ulZA`). It was observed that the decline in credit after the events of 2008 was due to higher economic uncertainty, more prudent lending because of pressure from parent banks from abroad, and lower demand for credit in general due to low aggregate demand.
[5] At the end of 2007, the Czech Republic opted out of funding from the European Bank for Reconstruction and Development (EBRD).
[6] As Oliner and Rudebusch (1996) note, the research on the credit channel stresses that central bank actions affect output, in part, by causing shifts in the supply of loans.

2. Literature Review

The concept of financial constraints and credit rationing[7] were first well analyzed theoretically by Stiglitz and Weiss (1981).[8] The outcome of their research is that under financial imperfections, the Modigliani-Miller theorem[9] does not hold, firms can be constrained, and overall economic growth may slow. Over time, credit rationing theory has become highly important, especially in macroeconomic models with financial frictions.[10] The logic of credit rationing is that there is no linear relationship between the interest rate on loans and a bank's profitability. Beyond a certain (optimal) interest rate, any higher rate is considered too risky from the perspective of the bank and therefore the credit market does not clear.

Bernanke and Gertler (1995) were among the first to claim that the credit view approach aims to identify the propagation mechanism of the conventional interest rate effect. As Chatelain et al. (2003) note, however, standard macro-models usually do not include balance-sheet information on firms' behavior and are, therefore, not good enough to test for broad-credit-channel effects and imperfections.

Good evidence on how financial constraints affect economic growth is provided by Love (2003), for example. Several other studies (e.g. Oliner and Rudebusch, 1996; Gertler and Hubbard, 1989; Agca and Mozumdar, 2008; Kashyap et al., 1994) confirm the robustness of the variation in the severity of financial constraints over time. However, it remains difficult to identify credit rationing from the aggregate data. For example, a decline in lending may be driven either by unwillingness of lenders to lend or by low demand for new loans (Bernanke, 1993). In order to be able to correctly estimate the severity of financial constraints, one has to distinguish credit supply from credit demand shifts. A decrease (no matter how strong) in aggregate lending per se does not say anything about a credit crunch, as this decline may have been caused by a strong decrease in the demand for credit (for example due to expected limited business opportunities).

In recognition of that, there has been a recent shift in economics from aggregate data toward the use of micro-level, balance-sheet data to test for the effects of financial constraints. For example, Bernanke and Blinder (1992) show how the credit rationing concept is related to the balance-sheet effect. At the same time, financial constraints are empirically unobservable and there is no balance-sheet item that will indicate financial constraints. Therefore, to test for financial constraints, several authors use the presence of investment–cash flow sensitivity as an indication of firms being credit constrained (e.g. Fazzari et al., 1988; Hobdari et al., 2009).

Other authors use survey data to get firm-level information on credit denial (e.g. Gaiotti, 2011; Holton et al., 2012). But as Campello et al. (2010) point out, survey-based analysis is strongly limited by the ability of surveyed personnel to correctly assess credit constraints. Also, their analysis reveals that the differences between constrained and unconstrained firms became more significant

[7] In this paper the terms credit constraints and financial constraints are used interchangeably.

[8] As lenders cannot distinguish between good and bad borrowers, when the interest rate increases, relatively good borrowers drop out of the market. Lenders' profits can then decrease since this "drop out" can lead to an increase in the default probability on loans made.

[9] The Modigliani-Miller theorem in its basic form states that, under a certain market price process, in the absence of taxes, bankruptcy costs, agency costs, and asymmetric information, and in an efficient market, the value of a firm is unaffected by how that firm is financed.

[10] Bernanke et al. (1999) show how credit-market frictions can significantly amplify both real and nominal shocks in the economy. Other economists who stand outside the standard macroeconomic models and focus on the importance of credit in the economy include Keynes, Minsky, and Stiglitz.

during the 2008 crisis. Mach and Wolken (2012), in their study based on survey data on credit experiences, report that there is a link between credit access and the likelihood of bankruptcy, even though the authors themselves admit that their data on bankruptcy are not fully reliable. Similar results are obtained by Keasey and Watson (1991) and Musso and Schiavo (2008).

Literature on the investment behavior and credit constraints of firms in countries with larger stock markets is rich (e.g. Chava and Roberts, 2008; Whited, 2001; Hovakimian and Titman, 2006). For example, in a recent paper focused on Italy, Gaiotti (2011) finds that the elasticity of a firm's investment to the availability of bank credit has been significant in periods of economic distress but not in other periods. He concludes that a credit crunch strongly affects investment and the whole economy. Recently, Clarke et al. (2012) focused on how country and firm characteristics affected firms' financial constraints and their likelihood of survival during the early phase of the recent global financial crisis in Eastern Europe and Central Asia. Carpenter and Guariglia (2008), using UK data, show that finance constrains a firm's investment decisions after controlling for investment opportunities and distinguishing between internal and external constraints.

On the other hand, there is scarce empirical literature on financial constraints in post-transition countries. Geršl and Jakubík (2011) focus on the question of how Czech firms obtain financing from domestic banks. Their results show that the vast majority of non-financial corporations obtain finances from just one lender. Plašil et al. (2013) apply an error-corection model on macroeconomic data to disentangle demand and supply effects on the amount of loans and describe the evolution of their mutual relationship.

To conclude, studies analyzing financial constraints, investment, and bankruptcy focus usually on publicly traded companies and make heavy use of various market value measures. This approach is unfortunately an unusable one for countries such as the Czech Republic, where the very small share of publicly traded companies makes this kind of information unavailable. As a consequence, we have to rely solely on microeconomic balance-sheet data. There are only a few papers on these topics that use Czech panel data (e.g. Fidrmuc et al., 2010; Pruteanu, 2004; Lízal and Svejnar, 2002). A couple of papers, such as Lízal and Svejnar (2000) and Konings et al. (2003), use investment–cash flow sensitivities to identify financial constraints. But to our knowledge, there is no study using Czech data to link bankruptcy information with financial constraints or to investigate the impact of the 2008 crisis on financial constraints.

3. A First Qualitative Look at Financial Constraints

To assess financial constraints, surveys are often used as a useful quick and cost-efficient tool.[11] Before we start with the microeconometric analysis, we therefore focus on three surveys to illustrate how much of an obstacle finance is to firms in the Czech Republic.[12]

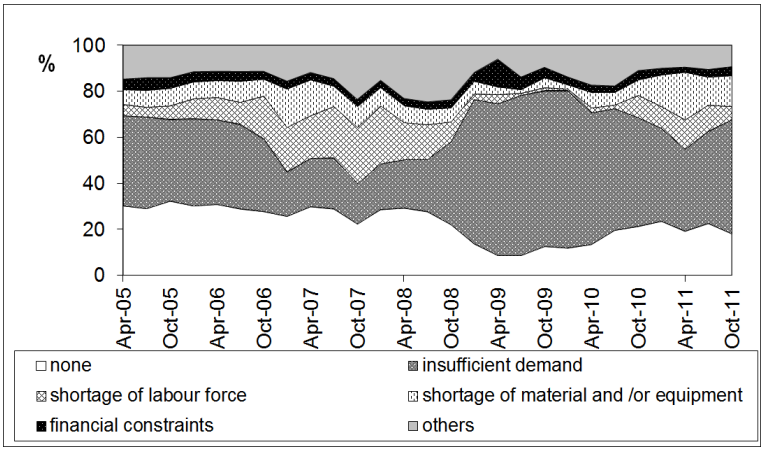
3.1 Czech Statistical Office Survey

First, we analyze data from the Czech Statistical Office, which regularly publishes a report on the barriers to growth in the Czech Republic. This survey takes place every month and focuses on qualitative self-assessment of the barriers faced by companies in the economy.

[11] See for example, the European Central Bank (`http://goo.gl/xuHj3P`), or the European Commission (`http://goo.gl/jZxRdQ` or `http://goo.gl/1XDmGM`).

[12] In a similar fashion, Kaplan and Zingales (1997) examine firms' annual reports and read the management's liquidity needs, which should describe the need for funds. From that, the Kaplan-Zingales critique emanates.

Figure 3: Barriers to Growth in Industry



Note: The evolution of barriers to growth in industry in the Czech Republic. The relative importance of financial constraints has not increased since 2008. There was an only temporary increase in the financial constraints indicator after the fall of Lehman Brothers in September 2008. We can, however, see that insufficient demand started to play a crucial role as a barrier to growth in industry.
Source: Czech Statistical Office, authors' calculations.

We plot the results of this survey in Figure 3 and we see that finance (the darkest area in the figure) does not appear to constrain companies in their growth.[13] Surprisingly, the 2008 crisis does not seem to have made a significant change either, as there was only a relatively small and temporary increase after summer 2008. However, we see a significant increase in the "insufficient demand" barrier (the dark grey area in the Figure 3).

This qualitative assessment would support the view that the sharp reduction in lending (see Figure 2) was demand rather than supply driven. Or, in other words, even though there was a dramatic decline in credit, these survey data suggest that the decline was more likely due to insufficient demand on the goods market and not on the credit market. Simply put, as firms went through a period of higher uncertainty on the goods market, they demanded less credit. In that case, we cannot speak of a credit crunch. To be more specific, if we observe a large decline in credit, while firms did not increasingly perceive finance as an obstacle to their growth, then the credit decline was most likely demand driven.

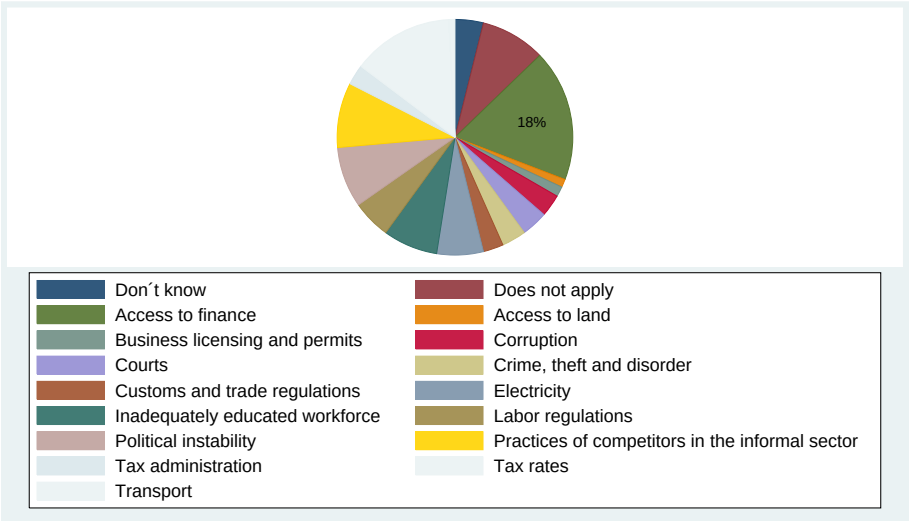
On the other hand, we have to interpret these survey data with caution because the answers capture only the relative importance of the barriers and not their size. The near-stability of the financial constraints barrier only means that the number of firms perceiving it as one of the two most important barriers to growth did not change. The result does not imply anything about the size of the barrier itself.

3.2 Czech National Bank Survey

The second survey comes from the Czech National Bank and was carried out in June 2009 among 399 Czech companies with the goal to shed more light on the issue of the size of the constraints. Czech companies were asked to what extent did the 2008 crisis present itself in each of the following areas: falling demand for products or services; difficulties in financing activities through the usual channels; difficulties due to late payments from customers; difficulties in obtaining intermediate

[13] For the time series for firms in services, see the Appendix.

Figure 4: Biggest Obstacles in Running a Business. BEEPS Data for the Czech Republic.



Note: For 18% of Czech companies, finance was the biggest constraint on their business growth in the fiscal year 2007. The specific question in the survey is "Which of the following elements of the business environment, if any, currently represents the biggest obstacle faced by this establishment."
Source: EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS), 2009.

goods from the usual suppliers. The share of companies that answered the question about the extent of difficulties in financing with "exceptionally strong" and "strong" was 27.2%. Due to the non-existence of a comparable survey in the pre-crisis period, we cannot be sure that these difficulties were truly caused by the crisis. But the results indicate that financial constraints did play some role during the crisis.

There are two other sources of survey-based information regarding financial constraints published by the Czech National Bank. Unfortunately, both surveys started long after the onset of the 2008 crisis. First, there is the quarterly survey in the non-financial corporations' sector published since March 2011. The results show that finances restrict firms' growth far less than insufficient demand, prices of inputs, or competition. The average impact of insufficient finances lies around 2.5 (where 1 = not at all, and 5 = the most).

The second potentially useful information source is the Czech bank lending survey, which has been published only since July 2012 and shows the relative development of the credit supply and credit demand sides. The problem is that the answers always refer to changes since the last quarter. That is, they only reveal information about easing and tightening of the conditions, not about the absolute levels.

3.3 Business Environment and Enterprise Performance Survey (BEEPS)

The third survey we analyze is the Business Environment and Enterprise Performance Survey (BEEPS) published regularly by the World Bank and the European Bank for Reconstruction and Development (EBRD).[14] In this survey, among other topics, managers of businesses report on the biggest constraints they face in running their company, including the role finance plays. The data therefore allow for an analysis of subjective financial constraints. The BEEPS data have already

[14] There have already been four rounds of the BEEPS survey (1999, 2002, 2005, and 2009). Data from the next round are expected to be available in late 2013.

been used in a similar context, for example by Brown et al. (2009), to analyze credit rationing; however, they have rarely been used in combination with balance-sheet data because no data allowing identification of the surveyed companies are published.[15] The survey results show that for 18% of Czech companies, finance was the biggest constraint on their economic growth in 2009 (see Figure 4).[16]

To conclude the survey results, finance seems to be an obstacle for a significant proportion of firms in the Czech Republic. At the same time, the Czech Statistical Office survey shows that financial constraints did not increase much after 2008 despite a large decrease in lending. It will be interesting to observe how financial constraints have developed in the next wave of BEEPS data. To sum up, the available survey data do not provide enough evidence in favor of, or against, the existence of financial constraints.

4. Research Methodology

Research on financial development usually cannot rely on experiments to verify its hypothesis. The 2008 financial crisis, however, can be perceived as an experiment with regard to financial constraints in the Czech Republic. The crisis is assumed to be exogenous with respect to Czech firms,[17] there is a clearly identifiable change in the economy, and we have pre- and post-crisis data. As noted, financial constraints are unobservable. Therefore, to identify the relationship between investment, bankruptcy, and financial constraints we first present relevant survey results and then carry out an econometric analysis of firm-level data.

4.1 Investment–Cash Flow Sensitivity

The core belief in the financial growth literature is that investment should be determined by future investment opportunities rather than by the firm's internal funds (net worth). There is a lively discussion, however, about how much cash flow matters. The standard empirical approaches recognize not only the importance of liquidity constraints, but also the fact that they are not evenly distributed across firms. Some firms simply face higher costs of raising capital. Financially constrained firms should, therefore, prefer internal financing to external financing. To test this hypothesis, authors usually look for the presence and scope of investment–cash flow sensitivity as an indicator of being credit constrained. Poncet et al. (2010) argue that the larger the sensitivity of investment to cash flow, the more constrained the firm is because it has to rely more on its internal funds to finance investment.

Moreno Badia and Slootmaekers (2009) argue that if a firm is financially constrained, the impact of cash flow on the intertemporal allocation decision will be positive. The more financially constrained a firm is, the larger will be the impact of its available cash stock on the cost of capital. In other words, an increase in cash stock will lower the implied cost of capital, making investment today more attractive than investment tomorrow. Although cash stock may be a proxy for future

[15] BEEPS has the advantage of allowing for the control of heterogeneity at the firm level. The notable exception as regards the linking of BEEPS and balance-sheet (Amadeus) data is Kochanova (2012).

[16] It is important to note that BEEPS 2009 was effectively surveyed in 2008 and asked about the fiscal year 2007. Therefore, the crisis was not yet a part of the survey. The first set of post-2008 data is expected to be published in 2014. In the Appendix we show that financial constraints remained relatively stable between 2002 and 2009 in the Czech Republic, while they increased dramatically in Russia, for example.

[17] This means not that the Czech National Bank is powerless, but rather that the source of the crisis was outside the economy. This is in sharp contrast to the Czech currency crisis in 1997, which was to a large extent driven from within the Czech economy.

profit opportunities, it has been argued that this would only be the case in the presence of financial constraints (see, for example, Love, 2003) since holding liquid assets is costly. Therefore, a firm anticipating profitable investment opportunities will accumulate liquid assets only if it expects to be financially constrained.

At the same time, Kaplan and Zingales (1997) are skeptical about the usability of investment–cash flow sensitivities in this context, while Fazzari et al. (2000) counter-argue that these sensitivities matter.[18] Also, Agca and Mozumdar (2008) and Chen and Chen (2011) empirically showed a significant decline in investment–cash flow sensitivity over time. This investment–cash flow bias is a central point in the corporate finance literature. We can therefore follow the work of Kaplan and Zingales (1997), who note that:

> *While it is easy to show that constrained firms should be sensitive to internal cash flow while unconstrained firms should not, it is not necessarily true that the magnitude of the sensitivity increases in the degree of financing constraints.*

Based on the above-mentioned arguments and literature review, we hypothesize the following:

H1a: Investment rates of Czech firms will display positive and significant sensitivity to the availability of internal funds.

H1b: Investment rates of Czech **small and medium-sized enterprises** will display positive and significant sensitivity to the availability of internal funds.

H1c: Investment rates of Czech **large firms** will **not** display positive and significant sensitivity to the availability of internal funds.

H2a: Investment rates of Czech firms will **not** display positive and significant sensitivity to the availability of internal funds **before** 2008.

H2b: Investment rates of Czech firms will display positive and significant sensitivity to the availability of internal funds **after** 2008.

4.2 Our Framework: The Q Model

To empirically test for financial constraints, one can use the Q model derived from the Euler equation[19] and an investment–cash flow relation. Under the assumptions of perfect competition, capital as the only input, and constant returns to scale, and conditional on average Q,[20] no other variable

[18] For a discussion about this so-called monotonicity hypothesis see the original paper by Fazzari et al. (1988), the Kaplan and Zingales critique emanating from Kaplan and Zingales (1997), the reply by Fazzari et al. (2000), and the answer by Kaplan and Zingales (2000). Kaplan and Zingales (1997) theoretically show that even in a one-period model, investment–cash flow sensitivities do not necessarily increase in the degree of financial constraints. They also claim that in a multi-period case, for example, precautionary savings make it even more difficult to justify this relationship. They finally argue that this relationship may be more complicated, with overly risk-averse firms preferring to invest their own cash flow.

[19] The derivation of the Euler equation is given in the Appendix.

[20] The ratio of the market value of existing capital to its replacement cost. Usually, we can only observe average Q (even this can be difficult, especially for non-listed companies). Marginal Q, on the other hand, is the ratio of the market value of an additional unit of capital to its replacement cost. In most empirical work, average Q serves as the proxy for marginal Q.

should matter for investment. Under quadratic adjustment costs, the investment equation can be written as (i stands for firm index and t stands for time index):

$$\frac{I_{it}}{K_{it}} = \beta_0 + \beta_1 Q_{it} + \beta_2 \frac{CF_{it}}{K_{it}} + e_{it} \tag{4.1}$$

where $\frac{I_{it}}{K_{it}}$ denotes the investment rate, β_0 is the non-stochastic additive parameter, β_1 is the multiplier in the adjustment-cost function, and CF_{it} is the cash flow in the same year. Tobin's Q_{it} is a proxy for the availability of investment opportunities and is often calculated using information on firms' market values, and e_{it} is the stochastic additive component (assumed to be an *i.i.d.* process).

However, as noted above, we focus on a post-transition country where large information asymmetry is still assumed. Also, Tobin's q would be available only for a very limited sample of publicly listed companies. Therefore, our baseline equation follows, for example, Hobdari et al. (2009) and Cinquegrana et al. (2012) and makes use of the available balance-sheet data to instrument for Tobin's q:

$$\frac{I_{it}}{K_{it}} = \beta_0 + \beta_1 \frac{I_{it-1}}{K_{it-1}} + \beta_2 (\frac{I_{it-1}}{K_{it-1}})^2 + \beta_3 \frac{Y_{it-1}}{K_{it}} + \beta_4 \frac{CF_{it-1}}{K_{it}} + \beta_5 \frac{D_{it-1}}{K_{it}} + \mu_{kt} + e_{it} \tag{4.2}$$

where I_{it} is investment, K_{it} is beginning-of-period fixed assets,[21] Y is turnover, CF is cash flow, D is total debt, and μ_{kt} is a sector-time specific effect.[22] Coefficient β_4 is of interest to us because for financially-constrained firms, internal cash flow is expected to be relevant in the investment rate equation. This implies that a firm is considered to be financially constrained if the cash flow coefficient is estimated to be positive. The idea behind this equation is that the larger the sensitivity of investment to cash flow is, the more constrained the firm is, because it has to rely on its internal funds to finance investment projects. To reduce potential omitted variable bias and to get more information on the relation between investment, bankruptcy, and cash flow, we also include information on future firm bankruptcy as an explanatory variable. While there may be a problem with reverse causality (e.g. lower investment leading to bankruptcy), including information on future firm bankruptcy can have the power to capture unobserved variables that can be related to bankruptcy and determine investment rates. At the same time, we believe that the reverse causality problem can arise for a dummy capturing whether a firm goes bankrupt sometime during our time period, but not for a dummy capturing whether the firm goes bankrupt in the next period. Due to the length of the bankruptcy process, it is unlikely that this year's investment rate would affect next year's bankruptcy.

[21] Therefore, a lagged observation.

[22] In the Albertina database, cash flow is calculated as current year profit (loss) + depreciation of tangible and intangible fixed assets. There are generally two approaches to calculating cash flow: direct and indirect. For direct calculation of cash flow, balance-sheet information is clearly insufficient. Indirect calculation starts with the information available on the balance sheet, but usually adjusts for revenues and costs which should be included in net income but are not, or, on the other hand, should not be included but are. However, such adjustments cannot be made based on data available to an outside observer who has access only to the financial statements of firms. As a consequence, for the purposes of financial constraints analysis, cash flow is usually calculated in the same way as in Albertina.

5. Data and Data Management

5.1 Data

Our analysis uses Czech firm-level microdata. We take the firms' **balance-sheet data** from the Albertina database.[23] This is a Czech database containing financial and ownership structure information on major public and private companies in all sectors of the economy in the Czech Republic.

The database is updated monthly and each version features only currently registered (existing) entities, i.e., if any entity has gone successfully through a process of bankruptcy or liquidation ending in an act of deregistration in the past, it will no longer be available in the most recent version of the database. Even though it is not unusual for the bankruptcy process to take several years, ignoring enterprises which have gone through a swift bankruptcy and have already left the dataset can bias our results. In order to overcome the issue of entry and exit we obtained and combined historical versions of the database to capture the state of enterprises at the beginning of 2008, 2009, 2010, 2011, and 2012. Together with the data available in June 2013, these versions form the data source used in this study. The period covered by our dataset differs and depends on the particular firm. For the needs of our analysis, the most relevant variables are the book value of the firm's total, tangible and fixed assets, employment, total debt, bank loans, turnover, and cash flow.

We also assembled original **data on bankruptcy** in the Czech Republic. This data is available only from 2006. This and the limited or zero availability of post-2011 financial data justifies the choice of our time span (2006–2011). It is not a simple task to create a reliable measure of bankruptcy. The legal status provided in the Albertina database for every entity indicates whether the entity is healthy, is going (or has gone) through the bankruptcy process, or is in liquidation. This attribute is supplemented with the date of the status change. However, in a number of cases no date was provided. Therefore, in order to fill in the missing observations, we extracted the date from the record in the Insolvency Register, which is attached to each entity in the database. In cases where there were multiple dates of insolvency declaration in the Register, we used the most recent one. Such a situation can arise if, for example, a declaration of insolvency was cancelled by a court due to deficiencies in the insolvency proposal and was then followed by a revised proposal. The date extracted from the Register is given priority over the one provided in the database in the event of data conflict.

In a significant number of cases this process revealed serious inconsistencies in the database. Sometimes, for example, bankruptcy was not declared by a court in the end, but still appeared in the legal status of the firm in the database. Going through the details in the Insolvency Register allowed us to cleanse the data and remove all incorrect observations. We should note that studies relying solely on information on bankruptcy taken from the Albertina database will probably be misleading.[24] We therefore correct for potential bias related to bankruptcy information.

To get consistency in the data, the following entities are not used: entities in liquidation, entities having no property when declaring insolvency, entities with uncertain insolvency status, and entities with an unknown date of insolvency declaration. Observations of entities with insolvency

[23] Operated by Bisnode Ceska republika, a.s., `www.albertina.cz`. We would like to thank the Czech National Bank for access to this dataset.

[24] A similar problem would arise if Amadeus, a European-wide, firm-level dataset, was used. Amadeus is compiled by Bureau Van Dijk (BvD) by harmonizing companies' annual reports obtained from various European vendors. Again, the information on bankruptcy is not accurate for the above-mentioned reasons.

status are included in the dataset only before the declaration of insolvency. Linking the bankruptcy information with balance-sheet data we get our final sample.

We distinguish between three types of companies:

- "healthy", i.e., companies that do not go bankrupt during the period studied
- "at some point going bankrupt", i.e., companies that go bankrupt during the period studied (i.e., in $n+t$, where $n \in \{2006;2011\}$ is the fiscal year and $t \in \{1;5\}$)
- "next year going bankrupt", i.e., companies that go formally bankrupt during the following period[25] (i.e., in $n+1$, where $n \in \{2006;2011\}$ is the fiscal year)

As the dependent variable, we have a measure of the investment rate (capital expenditures) scaled by beginning-of-year capital (this follows, for example, Julio and Yook, 2012; Cetorelli and Strahan, 2006). Following the literature, we define the investment rate as the percentage change in net fixed assets (see, for example, Cai and Harrison, 2011; Moreno Badia and Slootmaekers, 2009).

5.2 Data Management

Our data management follows previous work in this field. We drop all observations which do not cover a 12-month-long fiscal year and all observations with missing employment data. Due to the source of the data (the data mostly come from forms filled out by hand by employees of individual companies), we also exclude all zero observations on employment because anecdotal evidence confirms that sometimes zero in fact means "no data." There is no way we can discriminate between these two possibilities so we drop zero observations. When possible, we fill in missing values by extrapolating previous values of employment. We also drop firms in the public administration, defense, and compulsory social security sectors (62 observations).

Another potential problem with our dataset is outliers. While performing a random check of the data, we found a significant number of cases where typos and wrong order of numbers render the observations unusable. The large heterogeneity of firms also complicates the analysis. We identify outliers in our multivariate data using the blocked adaptive computationally efficient outlier nominators (BACON) algorithm proposed by Billor et al. (2000) and described in Weber (2010). Using this effective way of detecting outliers in multivariate data, we identify outliers with respect to the following variables: total assets, fixed assets, and employment (on the 1% level). Out of 729,508 observations, we drop 18,455.

We also winsorize large firms in the top one percentile of employment, total assets, and fixed assets. We exclude firms with less than CZK 1,000 in total assets (2,369 observations) or with negative total, tangible, or intangible assets (2,508 observations), and drop all observations for which the balance-sheet equation does not hold (i.e., assets do not equal liabilities and shareholders' funds; 10,562 observations). In some cases, financial data for one year were provided from several sources for one entity. In order to remove these duplications, the source with more filled-out information was chosen. We deflate all financial variables by the relevant producer price indices taken from the EBRD.[26]

[25] As noted, due to the length of the bankruptcy process, it makes more sense to assign the bankruptcy to the year just preceding the year when the firm formally goes bankrupt.

[26] We cannot use the possibly most relevant deflators based on the EU KLEMS database in order to obtain country-sector-specific output and intermediate input deflators, as EU KLEMS data are available only until 2007. We

Table 1: Summary Statistics of Relevant Variables for the Whole Sample, Healthy Firms, and Firms Going Bankrupt (2006–2011)

Variable	Sample	Mean		Std. Dev.	N
Investment rate	all	0.9009		3.4411	347,457
per unit of	healthy	0.9009		3.4394	344,337
fixed assets	going bankrupt	0.8925		3.6262	3,120
	next year bankrupt	0.1718	***	2.0072	464
Cash flow	all	1.1871		6.6897	482,247
per unit of	healthy	1.2065		6.6739	477,844
fixed assets	going bankrupt	-0.9082	***	7.9494	4,403
	next year bankrupt	-3.3566	***	8.9077	599
Debt	all	15.6975		53.8349	482,247
per unit of	healthy	15.4930		53.3923	477,844
fixed assets	going bankrupt	37.8979	***	86.9137	4,403
	next year bankrupt	46.7683	***	97.1966	599
Bank loans	all	5.8652		169.2749	193,785
per unit of	healthy	5.6147		163.4643	190,940
fixed assets	going bankrupt	22.6760	***	397.7208	2,845
	next year bankrupt	10.8390		42.4261	382
Turnover	all	0.0522		0.1690	464,780
per unit of	healthy	0.0519		0.1684	460,463
fixed assets	going bankrupt	0.0850	***	0.2211	4,317
	next year bankrupt	0.0724	***	0.1944	577

Note: Hypothesis of equality of means with healthy companies tested using a t-test.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Summary Statistics

Altogether, we have 655,582 observations in our sample, which spans from 2006 to 2011. We have 650,090 observations on healthy companies, 5,492 observations on companies that will go bankrupt at some point in the future and 810 companies that will go bankrupt the following year.[27] Figure 5 depicts the evolution of bankruptcy incidence in our dataset. The coincidence between macroeconomic development, credit restriction (see Figure 2), and bankruptcy is clearly visible.

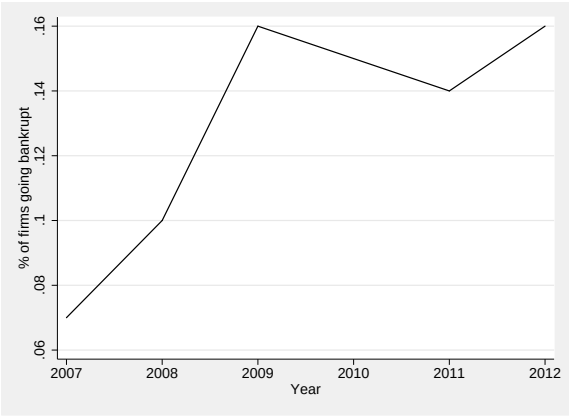
Figure 6 shows that after 2009 the investment rate started to decline. This is also roughly in line with the drop in lending to non-financial companies depicted in Figure 2. Table 1 summarizes the balance-sheet items of interest in the final dataset always for the whole sample, for healthy companies, for companies which go bankrupt, and for companies which go bankrupt the following year. We also test the hypothesis of equality of means with healthy companies. Asterisks mean that the hypothesis of equality is rejected (see the table notes).

Interestingly, we do not find significantly differing investment behavior of healthy firms and firms which will go bankrupt during our observed period. Only in the last year before declaring

believe that using EBRD deflators will be sufficient. However, these deflators vary only on the country level, which is a drawback.

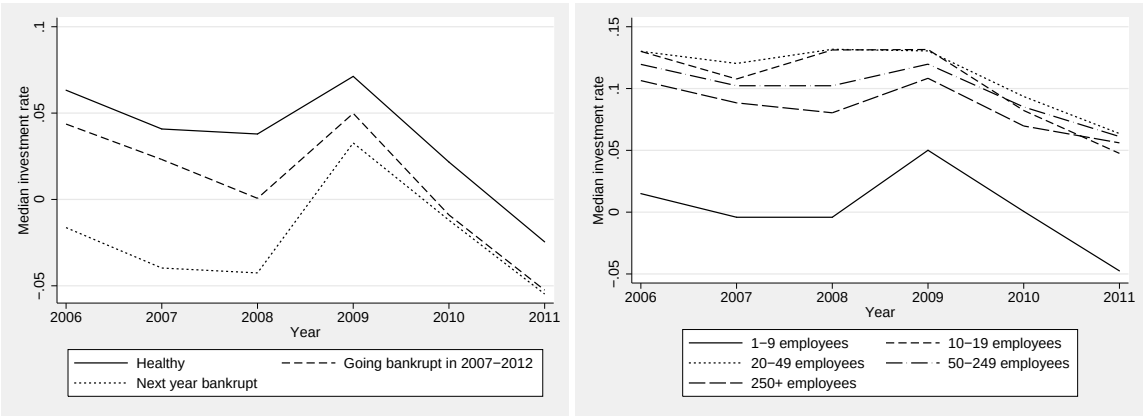
[27] The numbers differ because "at some point going bankrupt" are the yearly observations for the 810 companies which go bankrupt.

Figure 5: Evolution of Bankruptcy in the Czech Republic



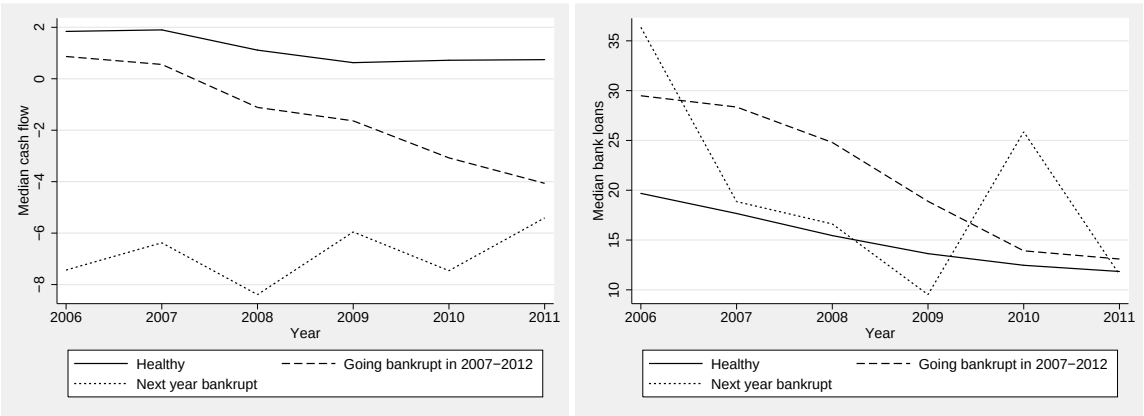
Note: The figure depicts the share of bankrupt companies in total companies in the sample for the particular year.
Source: Albertina, authors' calculations.

Figure 6: Evolution of Investment Rate for Healthy and Bankrupt Companies and for Firms of Different Sizes



Source: Albertina, authors' calculations.

Figure 7: Evolution of Cash Flow and Bank Loans for Healthy and Bankrupt Companies



Source: Albertina, authors' calculations.

Table 2: Investment Rate Regression: All Companies

Dependent variable: Investment rate	(1)	(2)	(3)
Investment rate$_{(t-1)}$	-7.3e-05	-6.9e-05	-4.1e-05
	(6.3e-05)	(6.4e-05)	(7.5e-05)
Squared investment rate$_{(t-1)}$	-5.7e-04***	-5.5e-04***	-5.6e-04***
	(1.2e-04)	(1.2e-04)	(1.3e-04)
Turnover$_{(t-1)}$	-.027*	-.029*	-.024*
	(.016)	(.017)	(.013)
Cash flow$_{(t-1)}$	2.3e-03***	2.4e-03***	3.2e-03***
	(7.1e-04)	(7.5e-04)	(9.0e-04)
External debt$_{(t-1)}$	4.8e-04***	5.1e-04***	4.3e-04***
	(1.6e-04)	(1.7e-04)	(1.6e-04)
(Cash flow)$_{(t-1)}$*(At some point bankrupt)		-.132	
		(.165)	
(Cash flow)$_{(t-1)}$*(Next year bankrupt)			-6.46
			(5.37)
Constant	.496***	.496***	.464***
	(.025)	(.025)	(.059)
Observations	236250	236250	236250

Note: Heteroskedasticity and autocorrelation consistent standard errors in parentheses. All specifications include year and industry fixed effects. All variables are normalized by the respective firm's capital stock (fixed assets).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

bankruptcy do firms invest less. The cash flow of companies going bankrupt is negative (see Figure 7).[28] On average, we can say that firms with negative cash flow are on the path to bankruptcy. However, companies going bankrupt on average have higher bank loans than healthy ones. This indicates that companies which are going to declare bankruptcy during our sample period do not have problems with obtaining bank credit. Again, this changes only a year before declaring bankruptcy, when the difference in bank loans between healthy and next-period-going-bankrupt companies turns statistically insignificant. Companies going bankrupt are more indebted than healthy ones.

6. Regression Results and Discussion

We have a classical situation with a panel of small T (limited time periods) and large N (many companies). Our independent variable (investment rates) is not strictly exogenous, meaning it is correlated with past and possibly current realizations of the error. We also have fixed effects, heteroskedasticity, and autocorrelation within companies. In this case, the most relevant estimators

[28] Negative cash flow means that cash inflow from sales is lower than cash outflow of cash payments. The common reasons for negative cash flow are usually thought to be low sales, high operating expenses, wrong investments, or unattractive financing conditions.

Table 3: Investment Rate Regression: Separate Results for 2006–2008 and 2008–2011

Dependent variable: Investment rate	06–08	06–08	06–08	08–11	08–11	08–11
Investment rate$_{(t-1)}$	-1.2e-04*	-1.2e-04*	-7.9e-05*	-5.0e-05	-2.9e-05	-1.9e-05
	(6.6e-05)	(6.2e-05)	(4.3e-05)	(6.8e-05)	(9.0e-05)	(9.7e-05)
Squared investment rate$_{(t-1)}$	8.9e-05	1.3e-04	-1.7e-04	-6.9e-04***	-5.0e-04*	-6.6e-04***
	(2.7e-04)	(2.9e-04)	(4.9e-04)	(1.3e-04)	(2.6e-04)	(1.4e-04)
Turnover$_{(t-1)}$	-4.5e-03	-4.4e-03	-.019	-.036**	-.029**	-.025*
	(.022)	(.021)	(.027)	(.018)	(.014)	(.014)
Cash flow$_{(t-1)}$	2.9e-03	2.9e-03	4.7e-03	2.4e-03***	3.5e-03***	3.6e-03***
	(2.1e-03)	(2.1e-03)	(3.0e-03)	(8.3e-04)	(1.1e-03)	(1.2e-03)
External debt$_{(t-1)}$	4.7e-04**	5.2e-04*	4.0e-04	6.0e-04***	5.6e-04***	5.4e-04***
	(2.3e-04)	(2.8e-04)	(2.6e-04)	(1.7e-04)	(1.6e-04)	(1.6e-04)
(Cash flow)$_{(t-1)}$*(At some point bankrupt)		-.13			-3.73	
		(.254)			(3.29)	
(Cash flow)$_{(t-1)}$*(Next year bankrupt)			-40.9			-6.68
			(48.8)			(5.99)
Constant	.387***	.385***	.347***	.168***	.105	.083
	(.039)	(.039)	(.059)	(.024)	(.07)	(.103)
Observations	82216	82216	82216	198760	198760	198760

Note: Heteroskedasticity and autocorrelation consistent standard errors in parentheses. All specifications include year and industry fixed effects. All variables are normalized by the respective firm's capital stock (fixed assets).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Investment Rate Regression: Companies of Different Sizes (Number of Employees in Columns)

Dependent variable: Investment rate	1–9	10–19	20–49	50–249	250–
Investment rate$_{(t-1)}$	-4.2e-04*	1.4e-04	-6.8e-05	5.3e-05	-8.4e-04
	(2.4e-04)	(3.2e-04)	(5.9e-05)	(5.8e-05)	(1.4e-03)
Squared investment rate$_{(t-1)}$	-9.0e-04***	-8.9e-04***	-4.4e-04	-1.8e-03***	1.6e-03
	(1.7e-04)	(3.2e-04)	(4.7e-04)	(4.7e-04)	(2.3e-03)
Turnover$_{(t-1)}$	-.067	.346***	.935***	-8.9e-03	.147
	(.046)	(.104)	(.318)	(.188)	(.56)
Cash flow$_{(t-1)}$	4.6e-03***	4.3e-03***	-1.8e-03	5.9e-03	-3.7e-04
	(1.4e-03)	(1.1e-03)	(3.0e-03)	(4.8e-03)	(1.3e-03)
External debt$_{(t-1)}$	8.0e-04***	8.3e-04***	-3.5e-05	7.0e-04***	5.9e-04
	(3.0e-04)	(1.7e-04)	(5.4e-04)	(1.5e-04)	(2.9e-03)
Constant	.875***	.642***	.329***	.214***	.195**
	(.073)	(.063)	(.034)	(.026)	(.077)
Observations	97105	34648	32585	26858	6130

Note: Heteroskedasticity and autocorrelation consistent standard errors in parentheses. All specifications include year and industry fixed effects. All variables are normalized by the respective firm's capital stock (fixed assets).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Investment Rate Regression: Healthy Companies and Companies Going at Some Point Bankrupt

Dependent variable: Investment rate	Healthy	Going bankrupt
Investment rate$_{(t-1)}$	-7.0e-05	1.2e-03
	(6.3e-05)	(1.2e-03)
Squared investment rate$_{(t-1)}$	-5.8e-04***	-1.5e-03
	(1.2e-04)	(1.0e-03)
Turnover$_{(t-1)}$	-.029*	.446
	(.018)	(.598)
Cash flow$_{(t-1)}$	2.3e-03***	3.8e-03
	(7.2e-04)	(9.0e-03)
External debt$_{(t-1)}$	5.2e-04***	-1.2e-03
	(1.8e-04)	(1.7e-03)
Constant	.499***	-.614***
	(.025)	(.122)
Observations	234619	1631

Note: Heteroskedasticity and autocorrelation consistent standard errors in parentheses. All specifications include year and industry fixed effects. All variables are normalized by the respective firm's capital stock (fixed assets).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

appear to be the Arellano–Bond (Arellano and Bond, 1991) and Arellano–Bover/Blundell–Bond (Arellano and Bover, 1995; Blundell and Bond, 1998) dynamic panel estimators.[29]

First, we apply the GMM estimator on the whole sample with the interaction of a dummy capturing whether the firm goes bankrupt with the cash flow (see Table 2). The results indicate that there is a positive statistical correlation between the investment rate and cash flow for Czech firms in the period 2006–2011. Firms are, therefore, more likely to invest in new assets if they generate enough funds of their own. As we argue above, such a finding means that financial constraints exist and are binding. The coefficient shows the impact of a unit cash flow increase on the investment rate, both normalized by the capital stock of the company (proxied by its fixed assets). As we explain in the literature review, there is no clear consensus regarding the relationship between the coefficient size and the severity of the financial constraints faced by a firm. The results also show a non-linear negative impact of the past investment rate on the current investment rate. This supports the notion that investments tend to be made in clusters. Turnover should approximate firm specific investment opportunities but the negative coefficients indicate that it tends to capture other influences. Because we are interested in the link between bankruptcy and financial constraints, we add interaction terms between cash flow and going bankrupt during the whole observed period, or during the following year. This term captures the additional impact of cash flow on investment if the company is a bankrupting one. The results reveal that companies going bankrupt do not face significantly different financial constraints captured by the investment–cash flow sensitivity.

[29] We use the Stata command *xtabond2* to apply these estimators.

However, we are particularly interested in the impact of the 2008 crisis. Therefore, we apply this model on separate periods 2006–2008 and 2008–2011 (Table 3). The results show that even though the investment–cash flow sensitivity did not increase after 2008, it was not statistically significant in the pre-crisis period. This indicates that financial constraints started to play a more important role after 2008.

To better understand the potential impact of firm heterogeneity, we also split the sample according to firm size (Table 4) and health status (healthy firms vs. firms going bankrupt during the period 2007–2012; Table 5). The results reveal differences: whereas investment by small and medium-sized enterprises is sensitive to internal cash flow, investment by larger firms is not. Furthermore, whereas the investment rate of small and medium-sized enterprises is sensitive to external debt, this does not seem to be the case for larger companies (with the exception of firms with 50–249 employees).

Splitting the sample according to the health status of the firms further confirms what we found using the interaction terms between cash flow and the bankruptcy dummy: there does not seem to be a systematic relationship between going bankrupt and being financially constrained. In this case, however, the high standard errors may be partly caused by the relatively low number of observations and large differences between individual companies.

7. Conclusion

In this paper, we used balance-sheet data to empirically study the relationship between investment, cash flow, and bankruptcy in a post-transition country. Specifically, we looked at the evolution of investment with respect to financial constraints. Our paper links balance-sheet microdata with original bankruptcy data, which allows us to study the evolution of firms' behavior and their reaction to the 2008 crisis from a new perspective.

Companies which went bankrupt in the period 2006–2011 had significantly lower cash flow and, maybe surprisingly, a higher level of bank loans than healthy companies. This indicates that companies which are going to declare bankruptcy do not have problems obtaining bank credit. We find that they did not face more severe financial constraints than healthy companies. We could even speculate that the lack of financial constraints in some companies led to excess accumulation of external debt and subsequent financial difficulties. At least, this hypothesis is not falsified by our analysis. The data clearly show that a lack of external financing was not the primary reason for bankruptcy.

Regarding the factors which influence the rate of investment, we conclude that there is robust evidence that cash flow and the level of debt have a positive and significant impact on the investment rate. At the same time, future bankruptcy as a proxy for unobserved variables does not seem to have any significant impact on the investment rate. Only in the last year before declaring bankruptcy did firms invest less.

Investment–cash flow sensitivities, which are used as an indicator of financial constraints, did not increase after 2008. But internal cash flow is significant in the investment equations after the crisis and not before. This leads us to conclude that financial constraints became more widespread and severe in the post-crisis period. We also find that whereas the investment decisions of larger firms were not sensitive to internal cash flow, the latter played a significant role in the case of small and medium-sized enterprises. This is in line with existing literature showing that financial constraints are usually negatively correlated with firm size. Our analysis also reveals that investment by small

and medium-sized enterprises was sensitive to external debt, which was mostly not the case for larger companies.

The analysis could be taken even further in the future. It is, for instance, probable that the division between credit-constrained and credit-unconstrained companies is in fact much more complicated than just according to their size. It may be possible to link some of the above-mentioned survey results on whether companies feel financially constrained with balance-sheet data and other firm characteristics, and use them to estimate threshold values for splitting the sample into constrained and unconstrained regimes. An estimation of investment–cash flow sensitivity on these subsamples could lead to even more precise answers regarding the severity of financial constraints in the Czech Republic.

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Appendix A: Derivation of the Euler Equation

Here we derive the Euler equation of the firm's problem.

Following Poncet et al. (2010), Moreno Badia and Slootmaekers (2009), Gilchrist and Himmelberg (1999), and Harrison et al. (2004)[30] we can define the value of the firm as

$$V_t(K_t, \xi_t) = \max_{I_t} \{D_t + E_t(\sum_{s=1}^{\infty} \beta_{t+s} D_{t+s})\} \tag{A.1}$$

subject to

$$D_t = \Pi(K_t, \xi_t) - C(K_t, I_t) - I_t \tag{A.2}$$

$$K_{t+1} = (1-\delta)K_t + I_t \tag{A.3}$$

where ξ_t is the productivity shock, D_t are dividends paid to shareholders, K_t is investment, I_t is capital, $\Pi_t(\cdot,\cdot)$ is the profit function, $C_t(\cdot,\cdot)$ is the adjustment cost function, and β_t is the discount factor.

The Q model of the investment Euler equation is:

$$1 + \frac{\partial C(I_t, K_t)}{\partial I_t} = \beta_t \{\Psi_t \frac{\partial \Pi_{t+1}}{\partial K_{t+1}} + (1-\delta)(1 + \frac{\partial C(I_{t+1}, K_{t+1})}{\partial I_{t+1}})\} \tag{A.4}$$

where λ_t is the Lagrange multiplier and $\Psi_t = \frac{1+\lambda_{t+1}}{1+\lambda_t}$ is the marginal cost of capital and also represents the financial constraints. As Poncet et al. (2010) note, firms do not face financial constraints if the shadow cost of investment $\lambda_{t+1} = \lambda_t = 0$ for all time periods. If $\Psi_t > 1$, then firms invest today; if, on the other hand, $\Psi_t < 1$, a firm invests tomorrow.

From this theoretical derivation, we get an empirical model by proxying Ψ_t with cash flow (assets available for investment).

$$\Psi_t = a_0 + a_1 \frac{CashFlow}{K} \tag{A.5}$$

[30] Our work also draws inspiration from the literature on credit rationing and capital market imperfections (e.g. Harrison et al., 2004). Recently, Janda (2011) modeled credit guarantees and interest rate subsidies in a framework of credit rationing.

The marginal product of capital can be proxied as:

$$MPK_t = \frac{\partial \pi_t}{\partial K_t} = \theta_i(\frac{Sales}{K})_i \simeq b + \theta_i + \bar{\theta}(\frac{Sales}{K})_i, \tag{A.6}$$

and

$$\theta_i = \frac{\alpha_k}{\mu} \tag{A.7}$$

where b is a constant, α_k is the share of capital in the Cobb-Douglas function, μ is a markup, θ_i can be captured using fixed effects, and $\bar{\theta}$ can be assumed to be the industry average.

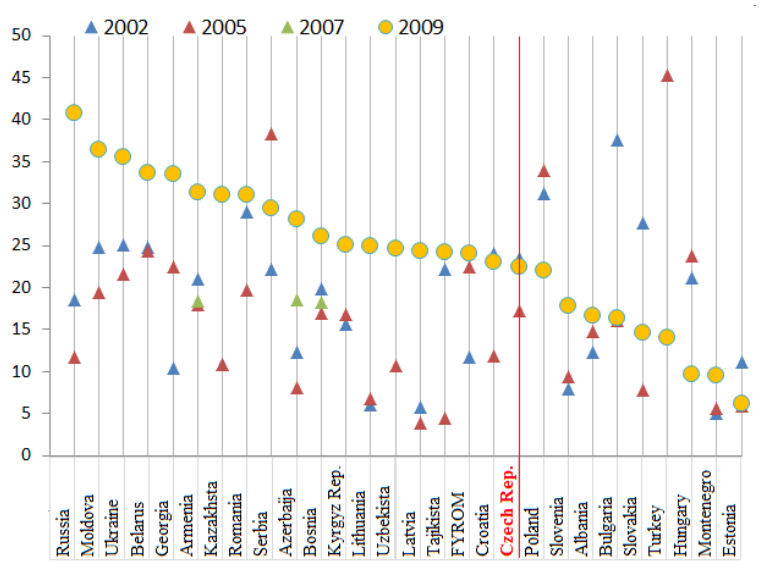
$$\frac{\partial C(I_t, K_t)}{\partial I_t} = \frac{1}{\alpha_1}[(\frac{I}{K})_t - \alpha_2(\frac{I}{K})_{t-1} - \alpha_i + \alpha_t] \tag{A.8}$$

where α_1, α_2 are constants, α_i is the firm-specific level of investment (fixed effect), and α_t is a time effect.

To get the empirical equation we linearize the Euler equation and use first-Euler Taylor approximation around the means.

Appendix B: Additional Figures

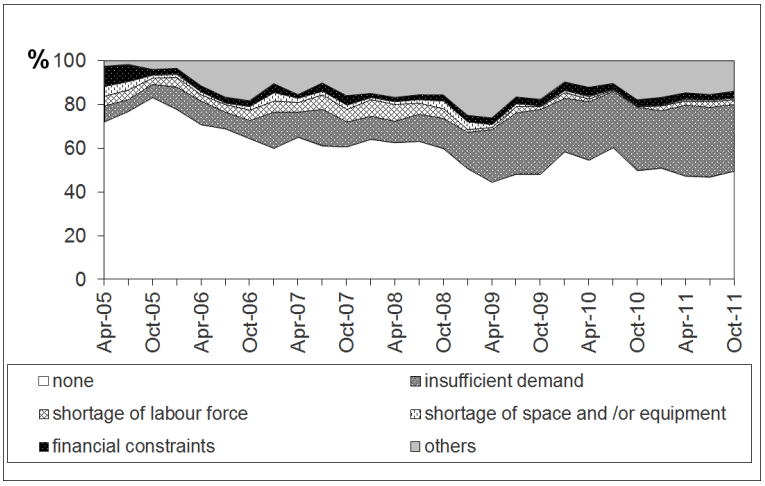
Figure B.1: Finance as a Major or Severe Obstacle



Note: The figure depicts the share of companies that assess finance as a major or severe obstacle for their business growth. Finance as an obstacle varies significantly across countries: from 6% in Estonia to 41% in Russia. In the Czech Republic, 24% of firms noted that finance is a major or severe barrier to their growth. Interestingly, this share is very stable over the 2000s.

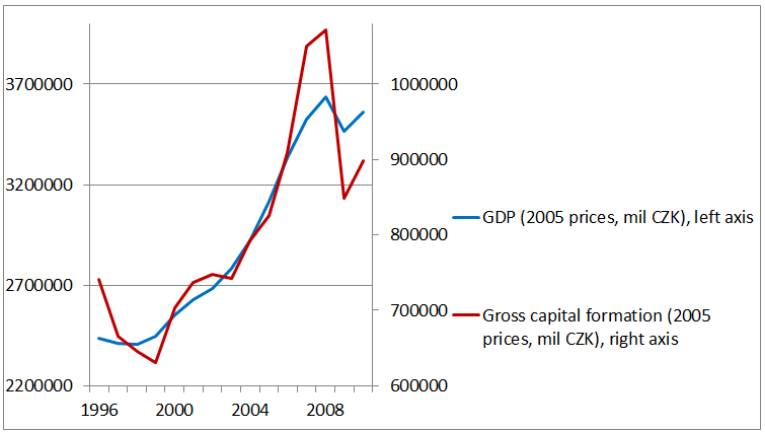
Source: BEEPS, authors' calculations.

Figure B.2: Barriers to Growth in Services



Note: The evolution of barriers (limits) to growth in services in the Czech Republic. Finance is not among the two biggest constraints on business growth.
Source: Czech Statistical Office, authors' calculations.

Figure B.3: Gross Capital Formation and GDP in the Czech Republic



Note: We see a sharp decline in gross capital formation after 2008, which is clearly related to the financial crisis and subsequent events.
Source: Czech Statistical Office, authors' calculations.

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