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The Impact of Monetary Policy on Financing of Czech Firms

Ruslan Aliyev, Dana Hájková, and Ivana Kubicová*

Abstract

This paper uses firm-level financial data for Czech firms and tests for the role of companies' financial structure in the transmission of monetary policy. Our results indicate that higher short-term interest rates coincide with lower shares of total debt, short-term bank loans, and long-term debt. We find that firm-specific characteristics, such as size, age, collateral, and profit, affect the way in which monetary policy changes are reflected in the external financing decisions of firms. These findings indicate the presence of informational frictions in credit markets and hence provide some empirical evidence of the existence of broad credit and relationship lending channels in the Czech Republic.

Abstrakt

V článku je na základě finančních dat českých firem zkoumána role finanční struktury společností v transmissi měnové politiky. Výsledky ukazují, že v obdobích vyšších krátkodobých úrokových sazeb jsou podíly celkového dluhu, krátkodobých bankovních půjček a dlouhodobého dluhu na aktivech nižší. Firemní charakteristiky, jako je velikost, stáří, výše zastavitelného majetku a zisk, ovlivňují způsob, jakým se změna měnové politiky odráží v rozhodnutích firem ohledně jejich externího financování. Tyto výsledky naznačují existenci informačních frikcí na úvěrových trzích a poskytují tak empirickou podporu pro existenci širšího úvěrového kanálu a vliv firemních vztahů s bankami v transmissi měnové politiky v České republice.

JEL Codes: E44, E51, E52, G21, G32.

Keywords: Credit channel, Czech Republic, external finance, monetary policy transmission.

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Nontechnical Summary

This paper focuses on the financial structure of Czech firms and the impact of monetary policy on the financing decisions of these firms. We describe the available data about Czech firms' financial structure and test whether the financing decisions of firms – as reflected in their balance sheet items – are determined by firm-specific characteristics and the prevailing interest rates. We look for heterogeneities of response to changes in interest rates linked to firm-level characteristics, which could indicate the existence of the broad credit channel of monetary policy transmission.

Our data are based on yearly balance sheet information for firms in the period 2003–2011 and interest rates and economic growth for the same period. We construct four liability-related ratios: the share in total assets of total debt, short-term bank loans, trade credit, and long-term debt. The variability in these ratios is analyzed with respect to market interest rates (which are considered to reflect the monetary conditions which the monetary policy authority wants to achieve), economic growth, and firm-specific characteristics (size, age, collateral, and profit). In addition, to account for the heterogeneity of reaction of firms of different size and age, interaction terms between interest rates and these characteristics are included in the regressions.

The data show that the financing of Czech firms is on average almost evenly divided between debt and shareholder funds, with a slightly larger weight of the latter at the end of the sample. More than three-quarters of the debt is of a short-term nature. Trade credit and other current liabilities play a rather important role. The size and age of a firm are found to be important determinants of its financing structure. Large firms tend to have higher debt ratios than small firms. Older firms have more short-term bank loans than younger firms, but less total and long-term debt and less trade credit.

Regarding monetary policy transmission, our results indicate that higher short-term interest rates coincide with lower shares of total debt, short-term bank loans, and long-term debt, which is in line with the interest channel of monetary policy transmission. At the same time, the size, age, collateral, and profit of individual firms affect the way in which interest rate changes are reflected in the financing decisions of firms. These findings indicate the presence of informational frictions in the credit markets and hence provide some empirical evidence of the existence of broad credit and relationship lending channels in the Czech Republic.

1. Introduction

In a perfect-information world, changes in monetary policy rates would (via the interest rate channel) affect the financing decisions of firms directly by changing their borrowing costs. However, in reality, credit market imperfections influence bank lending and firm financing behavior and (via the broad credit channel) alter monetary policy transmission.

The extent to which changes in monetary policy rates transmit to client rates depends on the functioning of financial markets, which set the financing costs for banks, and then on the conditions on retail-lending markets. In normal times, the first part of the transmission tends to be fast and complete; the second part, however, is slower and often incomplete, while being heterogeneous across agents (Bernanke and Gertler, 1995) and countries (e.g. Sørensen and Werner, 2006). This has also been documented for the Czech Republic (Crespo-Cuaresma, Egert, and Reininger, 2007; Pruteanu-Podpiera, 2007; Horváth and Podpiera, 2012). One of the primary reasons for the delays and unevenness in interest rate transmission is the existence of information asymmetries among banks and clients; a bank's imperfect knowledge about its client's economic situation increases the transaction cost and hence the borrowing costs for the client. Country-specific reasons for the heterogeneity in transmission include differences in the prevailing structure of financing and in the level of competition on the retail-banking market.

The concept of the broad credit channel addresses those aspects of monetary policy transmission that the interest rate channel does not capture. It concerns the supply of and demand for bank loans in general, or in a client-specific relationship. Several mechanisms of operation of the broad credit channel have been established and analyzed in the literature, most of them distinguishing between the effects of bank-level characteristics and firm-level characteristics.

In this paper, we are interested in how firm-specific characteristics are reflected in the financing structure of Czech firms. In order to control for and assess the effects of monetary policy changes, we mainly follow the lines established in the literature regarding the bank lending, balance sheet, and relationship channels. We apply a microeconomic approach to analyze firms' access to and use of external finance. Our approach is to map the patterns in the financing of entrepreneurial firms in the Czech Republic and their implications for monetary policy transmission. We focus on the response of firms' external financing indicators to monetary policy rate changes. The heterogeneity of the individual responses depending on the firm's size, age, collateral, and profitability indicates the importance of the broad credit channel for Czech monetary policy.

It is important to point out that Czech firm financing is characterized by significant use non-market and non-bank financing. Although bank loans are an important source of finance, too, their share in the financial liabilities of Czech firms is lower than in the euro area (CNB, 2011). The use of market financing by equity and commercial paper is limited to a small number of large firms.

The evidence on the balance sheet channel of monetary transmission in the Czech Republic is limited and only covers the period up to 2003. Our study therefore follows up on the previous research on the monetary transmission channels in the Czech Republic and extends the empirical evidence in two respects. First, we cover the years 2003–2011 and build a unique set of firm-level balance sheet data for about 56,000 Czech firms. Second, we directly focus on the role of firm-specific characteristics such as age, size, profitability, and collateral in the relationship between firm-level financing and monetary policy.

The information based on firm-level data reveals that – for Czech firms – the firm’s own capital makes up on average about one half of total liabilities and that financial loans account for about 20 percent of liabilities.¹ About 16–18 percent of the total liabilities of Czech firms are in the form of trade credit. In analyzing the transmission of money market interest rates to firms’ financial structure, we find heterogeneity in the financing of firms depending on their size, age, and balance sheet positions. Besides the balance sheet channel, we also find signs of a bank lending and relationship lending channel.

The paper is organized as follows. In the second section, we explore the existing literature on the topic. In the third and fourth sections, we describe the data and explain our methodology. The fifth section reports our findings and robustness tests, and the sixth section concludes.

2. Literature Review

The mechanism for the balance sheet channel is that after a monetary tightening external financing becomes scarce for firms and households with certain characteristics. For instance, small firms are more likely to be victims of information asymmetries arising from credit market frictions (Gertler and Gilchrist, 1994; Oliner and Rudebusch, 1996). Less capitalized firms with weak balance sheets have lower access to bank credit and/or a higher price of external funds as compared to large, well-capitalized firms. Banks do not have perfect information and therefore approximate the creditworthiness of firms by the strength of their balance sheets. In addition, banks tend to make their lending standards stricter in times of uncertainty. After a monetary tightening, individual firms’ bank debt may decrease not only because of the firm’s own reaction to the higher interest rates, but also because of banks’ tightened lending standards, especially in a situation where they cannot easily replace bank credit with other types of financing. Hence, the balance sheet position of a firm determines the accessibility of market funds for borrowing (Bernanke and Gertler, 1995).

The effects of the balance sheet channel have been intensively analyzed on the micro level from the point of view of the conditions faced by firms and households and the financing behavior of firms and households (Gertler and Gilchrist, 1994; Fidrmuc et al., 2009; Bougheas et al., 2006). In the literature, different firm-specific indicators have been analyzed for their role in the balance sheet channel. For example, De Haan and Sterken (2000) look at the effects of corporate governance and find that private firms are more dependent on bank debt and external funds and thus more sensitive to changes in the monetary policy conditions. Mizen and Yalcin (2002) and Bougheas et al. (2006) show that risky, young, and small firms have decreased access to lending when monetary policy is tight. Also, Prasad and Saibal Ghosh (2005) find that corporations behave differently depending on ownership, size, and period.

However, changes in bank debt in the balance sheets of firms may also result from shifts in the supply of bank debt alone. This channel became relatively important in some countries during the recent economic and financial crisis.² Identification of the supply and demand channels has featured in the literature since the debate between Kashyap et al. (1993 and 1996) and Oliner and Rudebusch (1996a) and requires very detailed data to be addressed correctly. For example, Jiménez et al. (2010) analyze a Spanish micro-dataset with information on old and new loans, credit applications, and loan conditions, along with firm

¹ This is confirmed by aggregate information from the Quarterly Financial Accounts, a statistical system produced by the Czech National Bank which records the financial relationships within the economy.

² The different sources of shocks to the supply of bank debt were discussed, for example, by Acharya and Naqvi (2012) and Dell’Ariccia and Marquez (2006).

and bank characteristics. Ciccarelli et al. (2010) use comprehensive data from the U.S. and euro area bank lending surveys.

The so-called relationship lending channel assumes that the existence of a long-term relationship between banks and their debtors alleviates information asymmetries (Boot, 2000; Elsas, 2005). This long-term relationship hence creates benefits in terms of intertemporal smoothing, increased credit availability, enhancement of borrower's project payoffs, and more efficient decisions if borrowers face financial distress (Petersen and Rajan, 1994).

As regards the relationship channel, Elsas and Krahnén (1998) and Harhoff and Korting (1998) find that companies who have a relationship with a finance provider have easier access to loans. Alternative evidence is presented by De Haan and Sterken (2006), who find higher sensitivity of firms to monetary policy shocks in market-based systems than in bank-based ones.

For the Czech Republic, the evidence on the balance sheet channel of monetary transmission is limited and only covers the period up to 2003.³ Horvath (2006 and 2009) and Fidrmuc et al. (2009) analyze financial accelerator effects in firms' balance sheets in the Czech Republic and find that monetary policy has stronger effects on small firms than on big ones and that debt structure and cash-flow have a significant influence on firm-level interest rates.

Geršl and Jakubík (2010) analyze the relationship banking channel in the Czech Republic and underline the high relevance of single relationship banking for small and young firms in technology- and knowledge-intensive industries.

3. Methodology

We borrow our methodology mainly from Bougheas et al. (2006) and De Haan and Sterken (2006). Following their approach we consider the impact of monetary policy on different indicators of firms' external financing drawn from annual balance sheet data. We analyze how these financing indicators react to monetary policy changes depending on firm heterogeneity and control for firm-specific variables that may influence capital structure choices. To do so, we regress different financing indicators on the monetary policy variable, size, age, profit, collateral, gearing, and their interaction terms with the monetary policy variable and control for some other variables. Our basic regression model is given below:

$$Y_{i,t} = \alpha_1 + \alpha_2 MP_t + \beta X_{i,t} + \gamma MP_t \times X_{i,t} + \alpha_3 \Delta GDP_{t-1} + \varepsilon_{i,t}$$

where

$Y_{i,t}$ denotes one of the following four debt ratios of firm i in period t :

| | |
|--------|--|
| TODEBT | the total debt to total assets ratio, i.e., the overall use of external debt |
| SHLOAN | the short-term bank loans to total assets ratio; this refers to access to market finance versus bank finance, where the majority of short-term |

³ Égert and MacDonald (2008) provide a description of the empirical evidence across the majority of monetary policy transmission channels in the countries of Central and Eastern Europe. The bank lending channel is analyzed by Pruteanu (2007) and Matousek and Sarantis (2009).

| | |
|---------|---|
| | debt is bank finance |
| SHTRADE | the trade credit to total assets ratio; this is a component of working capital which can be a substitute for bank debt (Petersen and Rajan, 1996) |
| LDEBT | the long-term debt to total assets ratio. |

MP_t is a monetary policy indicator, an increase in which corresponds to monetary tightening. Following the standard literature we focus mainly on the short-term market interest rate, which is typically closely linked to the monetary policy rate. As a measure of the short-term interest rate we use the 3-month PRIBOR (Prague Interbank Offered Rate). In the robustness test we check our results using the 1-year PRIBOR. Since interest rates are yearly averages and balance sheet variables are indicators reported at the end of the year, there is a lag in the effect of market rates on firms' financing decisions.

$X_{i,t}$ denotes firm-specific characteristics. These analyzed firm characteristics are:

| | |
|------------|---|
| SIZE | the natural logarithm of total assets (Kashyap and Stein, 1995) |
| AGE | the number of years in existence since 1996 to quantify the firm's reputation build-up and relationship with financial institutions since the establishment of the free market economy. By picking 1996, we disregard some initial years of transition, when the Czech banking sector did not operate fully on prudent principles, which led to a banking crisis in 1996–1997 (Lízal and Svejnar, 2002) |
| COLLATERAL | the ratio of tangible fixed assets to total assets |
| PROFIT | the ratio of earnings before interest and taxes to total assets. |

In order to obtain a straightforward interpretation of the coefficients, we categorize the firm-specific variables into three groups (the top 33 percent, the bottom 33 percent, and the middle third between these two).⁴ In the descriptive part, we compare the top and bottom thirds of size and age, while in the regressions, we include dummies for being in the top and medium third for each firm-specific variable. The regression coefficients are interpreted as the effect relative to the omitted group (the bottom third).

ΔGDP_{t-1} is the one-year-lagged real GDP growth rate. This variable is included to control for the business cycle.

$\epsilon_{i,t}$ is the error term.

We use a panel model to analyze the above-mentioned relationships.⁵ We test for a fixed versus a random effects structure of the model using a Hausman specification test in order to determine the precise structure of the general model. In most cases the null hypothesis of firm-specific effects being uncorrelated with the regressors was rejected and hence the fixed effect model is favored.

⁴ The categorization criteria, i.e., the thresholds and the distribution of each firm-specific variable, are given in Appendix A.

⁵ Given the possible endogeneity problem indicated in the literature, and a lack of good instruments, we considered using the panel GMM estimator suggested by Arellano and Bond (1991), as it ensures efficiency and consistency, being robust to heteroskedasticity and autocorrelation, especially on samples with short time dimensions and large firm dimensions. However, the Sargan test of over-identifying restrictions indicated that all the proposed instruments are invalid. Therefore, we do not report results obtained using the Arellano and Bond GMM methodology.

Our methodology therefore assigns changes in the financing structure of Czech firms to firm-specific characteristics, monetary policy, and the business cycle. We do not control for specific loan-supply effects, which became important in some countries during the financial crisis. Although this is a limitation of our dataset, we believe that its effects on our results are small, since the Czech banking sector remained resilient and profitable throughout the crisis, and loan supply problems caused by bad financial conditions in banks were not apparent in the Czech Republic.

4. Data

The data used in the main part of our paper comprise information on firms' yearly balance sheets and financial results from the Bureau van Dijk Amadeus⁶ database and macroeconomic data on interest rates and output from the CNB's ARAD time series database, all for the 2003–2011 period.

Our final sample contains about 312,000 observations for 57,000 firms from the manufacturing, construction, wholesale, retail, car repair, and transport sectors. We include only active firms belonging to all size categories (named very large, large, medium, and small) in our analysis. The original dataset was much larger and included about a million observations for the 1993–2013 period. The availability of data for 2012 and 2013 was rather limited, so we decided that 2011 would be the last year of the data. In addition, irrespective of year, the financial information for many of the observations was incomplete, and there were occurrences of misleading and wrong numbers, such as negative total assets, inequality between total assets and total liabilities, and components of total liabilities being larger than total liabilities. The raw data also contained bankrupted, dissolved, in liquidation, and inactive firms (defined by health status), which may not react to monetary policy changes properly. To obtain the final dataset, we excluded all the irrelevant observations. We also performed the Grubbs test for outliers, which indicated that the data do not contain any outliers.

The summary statistics of the main variables are given in Table 1. All firm-specific variables except AGE and SIZE are scaled by total assets.

Table 1: Summary Statistics

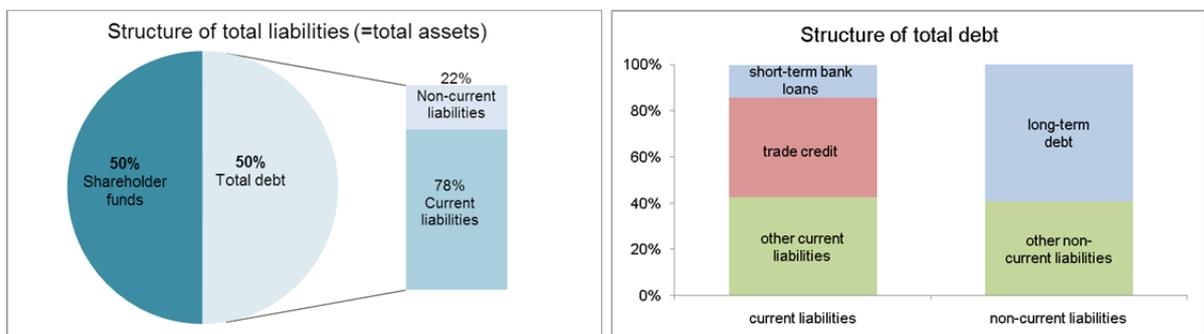
| | | Mean | Standard deviation | Min | Max |
|-------------------|--|------|--------------------|-------|------|
| <i>TODEBT</i> | <i>total debt to total assets ratio</i> | 0.51 | 0.30 | 0 | 1 |
| <i>SHLOAN</i> | <i>short-term bank loans to total assets ratio</i> | 0.04 | 0.11 | 0 | 1 |
| <i>SHTRADE</i> | <i>short-term trade credit to total assets ratio</i> | 0.12 | 0.20 | 0 | 1 |
| <i>LDEBT</i> | <i>long-term debt to total assets ratio</i> | 0.05 | 0.15 | 0 | 1 |
| <i>SIZE</i> | <i>log of total assets</i> | 15.8 | 2.2 | 7 | 25 |
| <i>AGE</i> | <i>age of firm</i> | 8.3 | 4.1 | 0 | 15 |
| <i>COLLATERAL</i> | <i>tangible fixed assets to total assets ratio</i> | 0.2 | 0.3 | 0.0 | 1.0 |
| <i>PROFIT</i> | <i>EBIT to total assets ratio</i> | 0.1 | 0.4 | -19.8 | 19.2 |
| <i>PRIBOR 3M</i> | <i>3-month PRIBOR</i> | 2.6% | 1.0% | 1.2% | 4.1% |
| <i>ΔGDP</i> | <i>real GDP growth rate</i> | 3.4% | 3.5% | -4.5% | 7.0% |

⁶ Amadeus is a database of comparable financial information for public and private companies across Europe. It contains company financial information in a standardized format created by Bureau van Dijk to ensure cross-country comparability. The companies are included in the database based on the availability of financial data, or firm size if financial data are not available. Financial information is gathered from all available official sources.

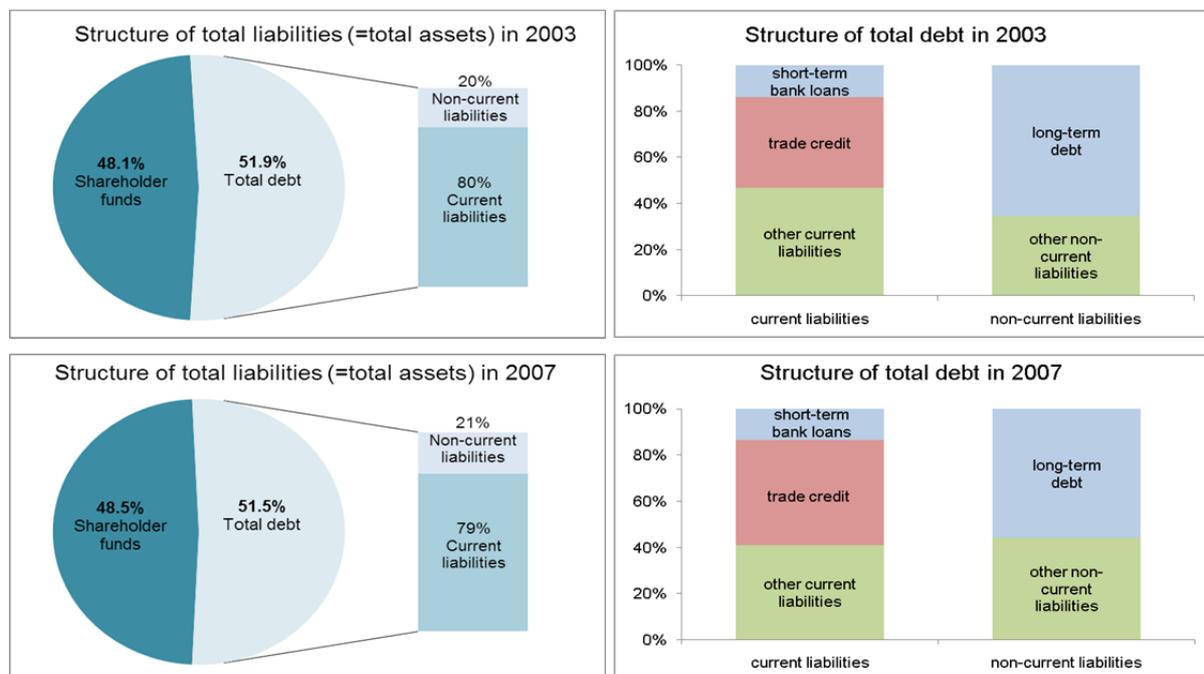
Figure 1 describes the structure of liabilities averaged across firms for different time periods and for different size and age categories. The financing of Czech firms is on average evenly divided between debt and shareholder funds (Panel a). More than three-quarters of the debt financing is of a short-term nature on average: total debt consists mainly of current liabilities, which is made up mostly of trade credit and other current liabilities, while short-term bank loans provide a relatively small proportion of the funds. Just over half of non-current liabilities are in long-term bank debt. Panel b depicts how the structure of the debt has changed over the last decade. We observe that there was very little variation in the debt structure during 2003–2007, when the share of total debt was slightly larger than that of shareholder funds. However, in 2011 the situation changed somewhat, with shareholder funds having a little more weight than the total debt.

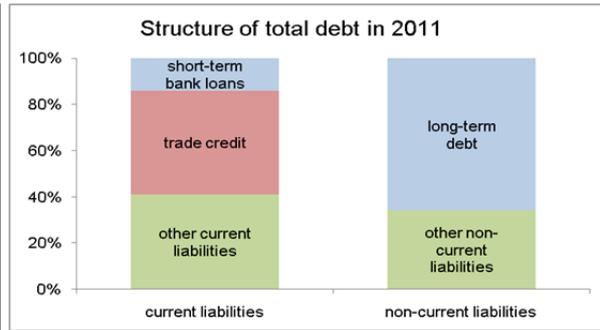
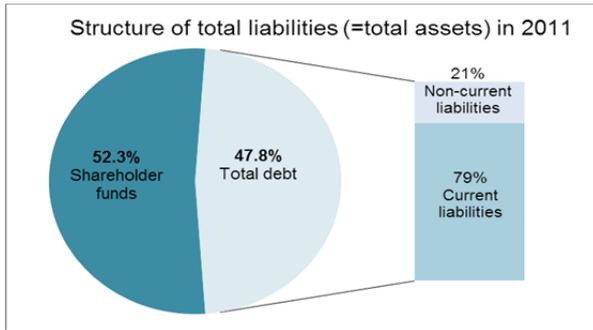
Figure 1: Average Structure of Liabilities

a. aggregate

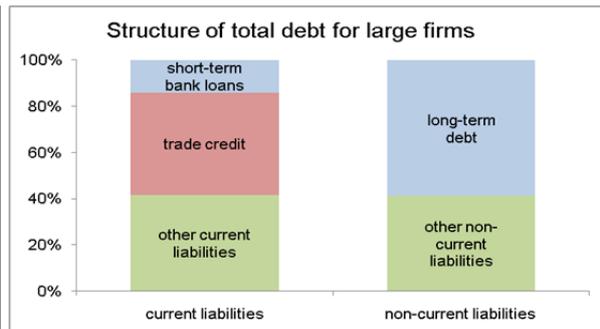
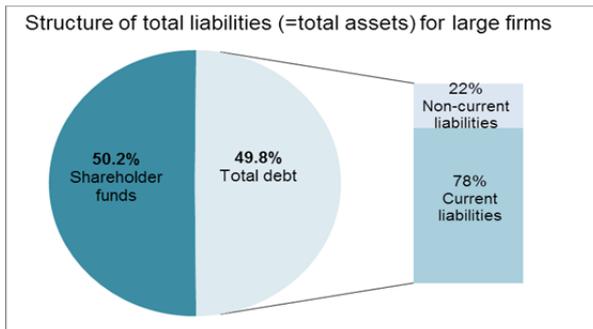
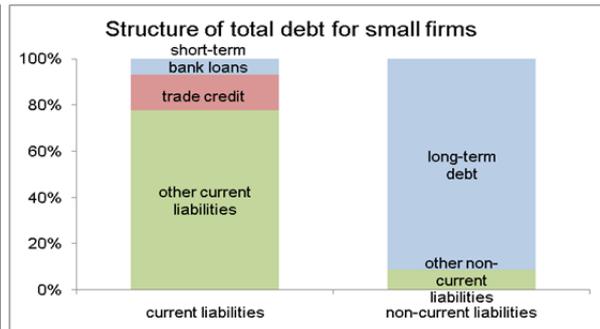
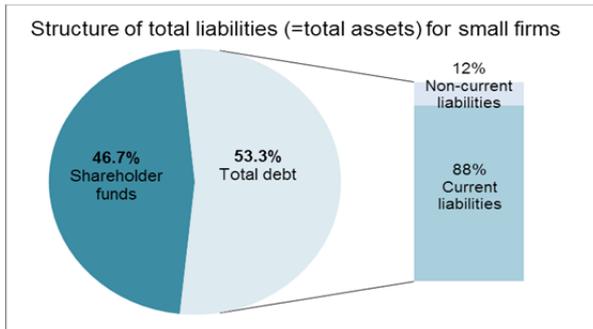


b. in different periods

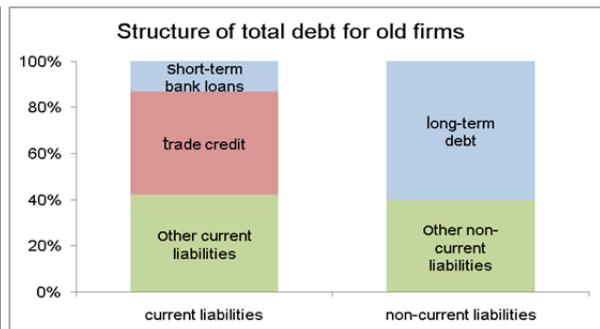
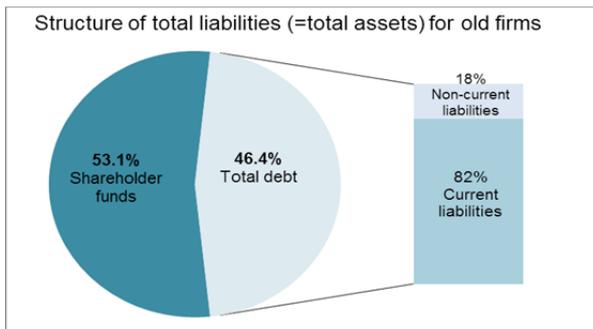
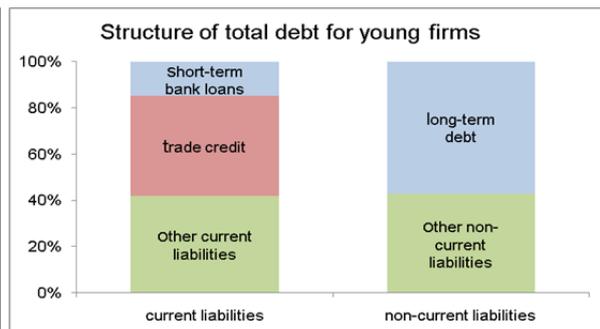
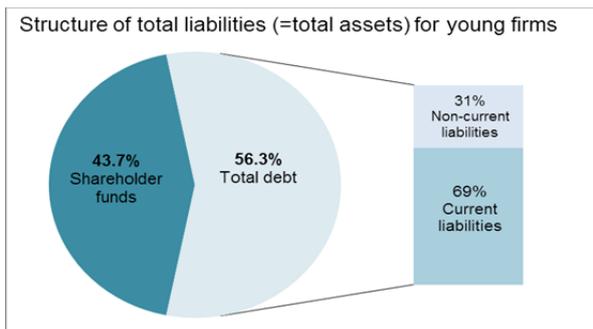




c. for different size categories



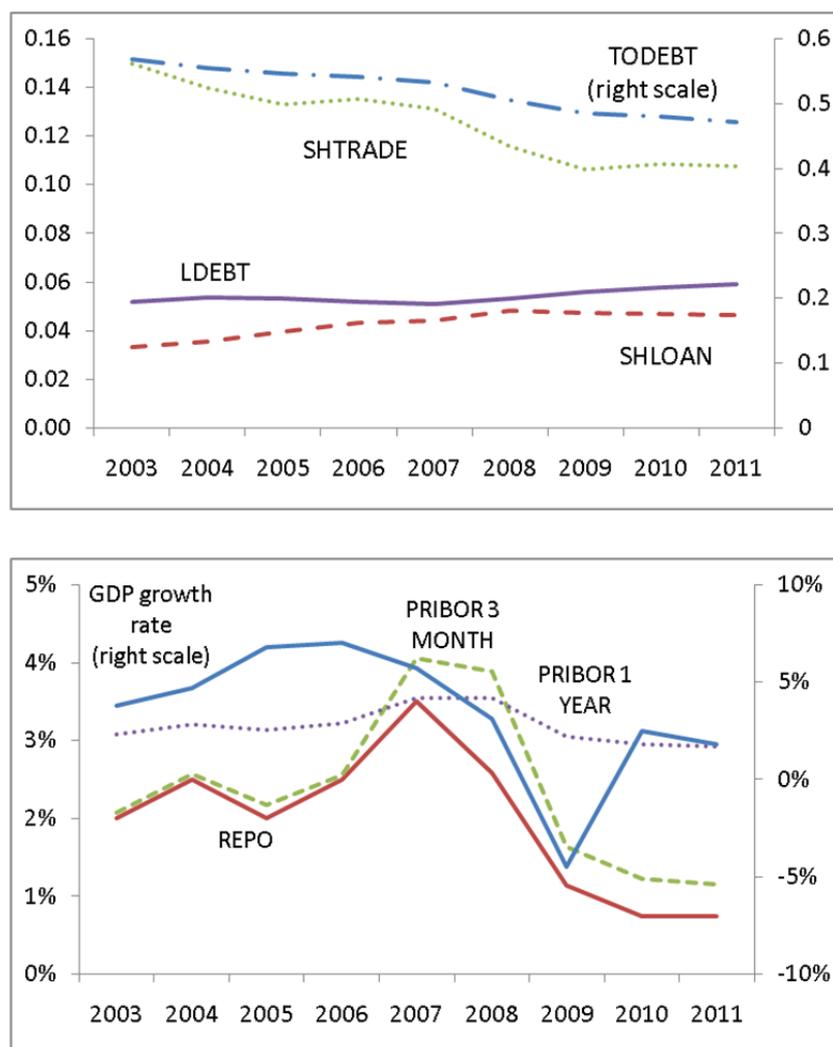
d. for different age categories



There is heterogeneity of financing regarding the size and age of firms. We divide the sample of firms into three equally numerous groups in terms of size into small, medium, and large, and in terms of age into young, medium, and old. This distinction reveals that small and young firms tend to have more debt and less shareholder funds than large and old companies (panels c and d). Firms in different size and age categories also differ in terms of maturity of debt: smaller and older firms hold more short-term debt than larger and younger firms, respectively. Larger firms have a higher share of short-term bank loans and trade credit in their current liabilities,⁷ while age does not play a crucial role for the maturity of short-term debt.

Next, we describe the evolution of our debt ratios, which are depicted in Figure 2. The data reveals that total *TODEBT* decreased continuously between the beginning and the end of the analyzed period, while the decline was more pronounced after 2006. This decline occurred mainly because of a drop in other current liabilities and *SHTRADE*. The variability of *LDEBT* and *SHLOAN* was smaller.

Figure 2: Change in the Average Debt Structure and Macro Variables Over Time



⁷ Other current liabilities appear to be quite important for small firms. Unfortunately, the data set does not yield more details about this item.

In the second graph, we see that the movements in market interest rates traced the changes in monetary policy rates, except for the years affected by the financial crisis, when monetary policy had to be more aggressive to ease the monetary conditions adequately. Since we use market rates in the regressions, we capture the part of the transmission that occurs between money market and client rates, which – in normal times – is a good representation of the transmission of monetary policy rates.

The correlations between the debt ratios and other firm-specific indicators and the interest rate are shown in Table 2. *TODEBT* is positively correlated with all other debt ratios by construction. A positive correlation exists between *SIZE* and all the debt ratios, though the correlation with long-term debt is weaker. We also observe a negative correlation between *AGE* and *TODEBT*. *AGE* and *SIZE* are positively correlated, indicating that the older a firm becomes, the more assets it tends to accumulate.⁸ *PROFIT* does not have strong correlations with the other variables. *COLLATERAL* is positively correlated with both short-term bank loans and long-term debt. The correlations between the 3-month *PRIBOR* and the debt ratios are negligible.

Table 2: Correlation Coefficients

| | <i>TODEBT</i> | <i>SHLOAN</i> | <i>SHTRADE</i> | <i>LDEBT</i> | <i>SIZE</i> | <i>AGE</i> |
|-------------------|---------------|---------------|----------------|--------------|-------------|------------|
| <i>TODEBT</i> | 1.000 | | | | | |
| <i>SHLOAN</i> | 0.260 | 1.000 | | | | |
| <i>SHTRADE</i> | 0.359 | -0.013 | 1.000 | | | |
| <i>LDEBT</i> | 0.270 | -0.047 | -0.084 | 1.000 | | |
| <i>SIZE</i> | 0.230 | 0.160 | 0.295 | 0.051 | 1.000 | |
| <i>AGE</i> | -0.144 | 0.020 | -0.021 | -0.036 | 0.202 | 1.000 |
| <i>PROFIT</i> | -0.042 | -0.022 | -0.013 | -0.037 | 0.065 | -0.031 |
| <i>COLLATERAL</i> | 0.101 | 0.134 | -0.074 | 0.185 | 0.309 | 0.118 |
| <i>PRIBOR 3M</i> | 0.004 | 0.010 | -0.007 | -0.007 | -0.024 | -0.101 |

5. Results

In this section, we present our estimation results and findings. The regression results are summarized in Table 3, where each pair of columns corresponds to one of the four measures of debt. We report the results of the regressions of the financing ratios on market interest rates while controlling for firm specificities, business cycles, and interaction terms between interest rates and firm-specific indicators, which would capture the heterogeneity of responses to monetary policy. While the majority of the explanatory variables have significant effects on the debt ratios, we find some heterogeneity in the reactions to monetary policy.

First, we describe the effects of monetary policy on debt ratios. According to the interest rate channel, an increase in the price of external financing makes debt financing more expensive, which should be reflected in a decreasing share of debt. In our results, an increase in the lagged short-term interbank rate (3 MONTH *PRIBOR*) reduces the overall shares of total debt (*TODEBT*), short-term bank loans

⁸ The reported correlation between the continuous age and size variables is larger than that between the age and size dummies that we use in our regressions (Appendix C). To test for multicollinearity among the variables we estimated the variance inflation factor (VIF) and the condition index. The estimated VIFs are smaller than 10, and the condition index is smaller than 30, which indicates that there is no multicollinearity among the variables used in our analysis.

(SHLOAN), and long-term debt (LDEBT). Hence, the expectations of the interest rate channel have been confirmed. At the same time, we do not observe a significant effect of the interest rate on short-term trade credit (SHTRADE), which is presumably issued independent of market interest rates.

The size and age of a firm are found to be important determinants of debt. For example, large firms tend to have higher debt ratios than small firms, *ceteris paribus*. In terms of age, older firms tend to have less total debt, trade credit, and long-term debt, and more short-term bank debt than younger firms do. This finding, along with the previous one, confirms that smaller and younger firms have less short-term bank loans in their debt structure.

The use of debt is also determined by the firm's COLLATERAL, which is measured as the ratio of tangible fixed assets to total assets. Firms with more collateral tend to have more total debt and short-term and long-term bank debt, but a lower share of trade credit. This would be in line with the hypothesis that – because of better guarantees – this subset of firms can easily access bank debt and therefore is not in need of trade credit.

Table 3: Estimation Results

| | 312 394 | | | |
|--|------------------------|------------------------|------------------------|------------------------|
| | 56 637 | | | |
| Y_{it} | TODEBT | SHLOAN | SHTRADE | LDEBT |
| | (1) | (2) | (3) | (4) |
| 3 MONTH PRIBOR_t | -0.008 *** (0.0010) | -0.001 *** (0.0003) | 0.001 (0.0006) | -0.004 *** (0.0005) |
| SIZE_{it}^{large} | 0.152 *** (0.0047) | 0.028 *** (0.0017) | 0.061 *** (0.0031) | 0.020 *** (0.0026) |
| AGE_{it}^{old} | -0.140 *** (0.0030) | 0.010 *** (0.0012) | -0.032 *** (0.0021) | -0.013 *** (0.0017) |
| COLLATERAL_{it}^{high} | 0.069 *** (0.0034) | 0.029 *** (0.0013) | -0.021 *** (0.0021) | 0.036 *** (0.0020) |
| PROFIT_{it}^{high} | -0.073 *** (0.0023) | -0.013 *** (0.0009) | -0.011 *** (0.0015) | -0.019 *** (0.0013) |
| Δ GDP_{t-1} | 0.104 *** (0.0097) | -0.001 (0.0044) | 0.023 *** (0.0069) | -0.004 (0.0059) |
| INTERCEPT | 0.475 *** 90.0039) | 0.012 *** (0.0013) | 0.106 *** (0.0024) | 0.045 *** (0.0020) |
| 3 MONTH PRIBOR_t * SIZE_{it}^{large} | 0.010 *** (0.0008) | 0.003 *** (0.0003) | 0.005 *** (0.0005) | 0.001 ** (0.0005) |
| 3 MONTH PRIBOR_t * AGE_{it}^{old} | 0.002 ** (0.0007) | 0.000 (0.0003) | 0.000 (0.0005) | 0.001 ** (0.0004) |
| 3 MONTH PRIBOR_t * COLLATERAL_{it}^{high} | -0.003 *** (0.0008) | 0.001 *** (0.0003) | -0.001 * (0.0005) | -0.002 *** (0.0005) |
| 3 MONTH PRIBOR_t * PROFIT_{it}^{high} | 0.016 *** (0.0008) | 0.001 *** (0.0003) | 0.001 ** (0.0005) | 0.004 *** (0.0004) |
| R-squared | 0.09 | 0.03 | 0.11 | 0.02 |

Note: Robust standard errors in parentheses. Significantly different from zero at the 90% (*), 95% (**), and 99% (***) confidence levels.

PROFIT has a negative impact on all our debt ratios, meaning that firms with higher earnings use less external debt. This result is reasonable, since more profitable firms may use more of their own capital – which tends to be less expensive – and hence be less dependent on external financing as compared to less profitable firms.

Finally, higher shares of total debt coincide with higher GDP growth rates. This result would be in line with the hypothesis that more credit is issued in good times because of better economic prospects and higher profitability of investment perceived by both banks and firms. Unfortunately, according to the results for the other debt ratios, this hypothesis does not hold when we look into the structure of the debt. The bank debt ratios appear to be unaffected by GDP growth, and the effect on total debt works only through trade credit, i.e., only among firms, which would be willing to finance their contractors more in good times and less in bad times.

To analyze how firms respond to changes in interest rates depending on their characteristics, we focus on the interaction terms between the interest rate and firm characteristics.

During a monetary contraction, larger and older firms are affected less in terms of total debt and long-term debt, since the coefficient on the interest rate is negative and the coefficients on the interaction terms are positive. This means that larger and older firms reduced their total debt and long-term debt less than smaller and younger firms do. The latter group of firms may be more informationally opaque and therefore more likely to be sensitive to external debt price changes. Moreover, we observe that larger firms reduce their short-term bank loans less than smaller firms do if the interest rate goes up. This finding indicates that during periods of tight monetary policy, larger firms have better access to short-term funding by banks. However, we do not observe similar behavior for age, since the coefficient on the age–interest interaction term is insignificant when the dependent variable is SHLOAN.

Another interesting finding is that during a monetary tightening, more collateralized firms reduce their short-term bank credit less and their long-term debt more than less collateralized ones do. More collateral means better backing of the debt and therefore higher credibility among banks. In other words, highly collateralized firms, which have better access to short-term bank debt, may be more flexible in shifting from long-term to short-term debt during periods of expensive money. We also find that more profitable firms tend to reduce their share of total debt and long-term and short-term bank debt less if interest rates go up.

The above findings about the heterogeneous response of firms with different balance sheet positions indicate the possible existence of a **balance sheet channel** in the Czech Republic. The observed varying response of small firms, which are more dependent on external financing, versus large firms, which are less dependent on external financing, may be an indirect indicator of the existence of a **bank lending channel**, with the caveat that we do not control for the supply of loans. Regarding age, firms with more years of operation in the market may have a higher reputation and stronger relations with the banking sector compared to younger firms. The positive interaction term of the interest rate and age for total debt may therefore indicate the existence of a **relationship lending channel**.

Robustness checks

In this subsection we provide three robustness tests by using long-term interest rates for monetary policy, by including the available data for the year 2012, and by incorporating additional control variables. The

outcomes of the tests are provided in Appendix B. In general, our previous findings are robust to these tests, although there are some interesting differences vis-à-vis our baseline model.

Measures for short-term interest rates are more commonly used in the literature, since these rates more accurately reflect the monetary conditions. However, in order to check the robustness of our results we re-estimate them using the long-term interest rate. Therefore, to capture the effects of the long-term interest rate we use the 1-year PRIBOR instead of the 3-month PRIBOR. As we can see, the signs and significances of the coefficients are identical to our previous estimates (Table B1).

In our benchmark regressions, we excluded the year 2012 due to missing data for about half of the firms. We do have a significant chunk of data for 2012 (about 22,000 observations, or 7% of the total), but we did not include it in our baseline estimation because of concerns about sample selection bias. If we include the year 2012, the results (Table B2) differ from those where it is excluded in two respects: (i) the effect of the market rate on SHTRADE, where the coefficient becomes significant, and (ii) the age–interest rate interaction term, where the coefficient becomes insignificant for the total debt to total assets ratio and negative for the trade credit to total assets ratio.

Finally, consistent with our reference model by De Hahn and Sterken (2000) we add two extra control variables – depreciation and intangible fixed assets – to our benchmark model. Both variables are expressed in ratios to total assets, in the same way as our other control variables. The regression results with these additional variables are summarized in Table B3. We should mention that the large number of missing observations for the added variables means that the new regression results are not comparable with our benchmark specification. In the extended model, the number of observations is diminished from about 312,000 to 233,000 and the number of firms from 57,000 to 46,000. The most noticeable difference of the results of this model compared to our baseline one is the positive effect of a monetary contraction on the total debt to total assets ratio. We also observe differences for some interaction coefficients. These dissimilarities could be due to sample selection bias. As we have already mentioned, about one-fifth of firms did not report added balance sheet indicators and so those firms are excluded from the augmented regressions.

6. Conclusions

In this study we look for evidence of balance sheet, bank lending, and relationship channels of monetary policy transmission in the Czech Republic. We concentrate on the heterogeneous response of firms' financing decisions to monetary shocks depending on their size, age, collateral, and profit. We use the Amadeus firm-level database from Bureau van Dijk and our sample contains financial and other yearly data for about 57,000 firms over the 2003–2011 period.

Our results indicate that a monetary contraction leads to a reduction in the shares of total debt, short-term bank loans, and long-term debt. We also confirm that the size, age, collateral, and profitability of a firm are important determinants of debt.

The main finding of our research is that smaller and younger firms are affected more by a monetary contraction. Specifically, these firms reduced their total debt and long-term debt more compared to larger and older firms during periods of tight monetary policy. We also find that if interest rates go up, more collateralized firms reduce their short-term bank credit less and their long-term debt more than less collateralized ones do. Moreover, more profitable firms tend to reduce their share of total debt and long-

term and short-term bank debt less when interest rates are high. Overall, most of our results exhibit robustness to different tests.

Generally speaking, we find some evidence of the existence of informational frictions in the markets for firm financing in the Czech Republic. All these findings indicate the presence of broad credit and relationship lending channels in the Czech Republic.

References

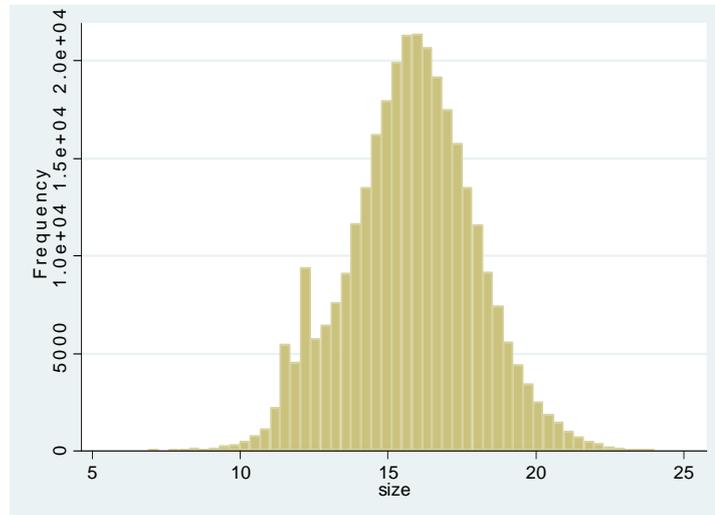
- ACHARYA, V. AND H. NAQVI (2012): “The Seeds of a Crisis: A Theory of Bank Liquidity and Risk-Taking over the Business Cycle.” *Journal of Financial Economics*, Vol. 106, Iss. 2, pp. 349–366.
- ARELLANO, M. AND S. BOND (1991): “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *Review of Economic Studies*, Vol. 58, pp. 277–297.
- BERNANKE, B. AND M. GERTLER (1995): “Inside the Black Box: The Credit Channel of Monetary Policy Transmission.” *Journal of Economic Perspectives*, Vol. 9, No. 4., pp. 27–48.
- BOOT, A. W. A. (2000): “Relationship Lending: What Do We Know?” *Journal of Financial Intermediation*, Vol. 9, pp. 7–25.
- BOUGHEAS, S., P. MIZEN, AND C. YALCIN (2006): “Access to External Finance: Theory and Evidence on the Impact of Monetary Policy and Firm-Specific Characteristics.” *Journal of Banking and Finance*, Vol. 30, pp. 199–227.
- CICCARELLI, M., A. MADDALONI, AND J.-L. PEYDRÓ (2010): “Trusting the Bankers: A New Look at the Credit Channel of Monetary Policy.” ECB Working Paper Series, No. 1228.
- CNB (2011): *Analyses of the Czech Republic’s Current Economic Alignment with the Euro Area*, http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/en/monetary_policy/strategic_documents/download/analyses_of_alignment_2011.pdf
- CRESPO-CUARESMA, J., B. EGERT, AND T. REININGER (2007): “Interest Rate Pass-Through in Central and Eastern Europe: Reborn from Ashes Merely to Pass Away?” *Journal of Policy Modeling*, Vol. 29, pp. 209–225.
- DE HAAN, L. AND E. STERKEN (2000): “Capital Structure, Corporate Governance, and Monetary Policy: Firm-Level Evidence for the Euro Area.” De Nederlandsche Bank, Research Memorandum WO&E No. 637.
- DE HAAN, L. AND E. STERKEN (2006): “The Impact of Monetary Policy on the Financing Behaviour of Firms in the Euro Area and the UK.” *European Journal of Finance*, Vol. 12, No. 5, pp. 401–420.
- DELL’ARICCIA, G. AND R. MARQUEZ (2006): “Lending Booms and Lending Standards.” *The Journal of Finance*, Vol. LXI, No. 5, pp. 2511–2546.
- ÉGERT, B. AND R. MACDONALD (2008): “Monetary Transmission Mechanisms in Central and Eastern Europe: Surveying the Surveyable.” OECD Economics Department Working Paper No. 654.
- ELSAS, R. (2005): “Empirical Determinants of Relationship Lending.” *Journal of Financial Intermediation*, Vol. 14, pp. 32–57.
- ELSAS, R. AND J. P. KRAHNEN (1998): “Is Relationship Lending Special? Evidence from Credit Files in Germany.” *Journal of Banking and Finance*, Vol. 22, pp. 1283–1316.

- FIDRMUC, J., R. HORVATH, AND E. HORVATHOVA (2009): "Corporate Interest Rates and the Financial Accelerator in the Czech Republic." CNB Internal Discussion Paper 4.
- GERŠL, A. AND P. JAKUBÍK (2010): "Relationship Lending in the Czech Republic." Czech National Bank Working Paper 1/2010.
- GERTLER, M. AND S. GILCHRIST (1994): "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms." *Quarterly Journal of Economics*, Vol. 109, No. 2, pp. 309–340.
- HARHOFF, D. AND T. KORTING (1998): "Lending Relationships in Germany: Empirical Evidence from Survey Data." *Journal of Banking and Finance*, Vol. 22, pp. 1317–1353.
- HORVÁTH, R. (2006): "Financial Accelerator Effects in the Balance Sheets of Czech Firms." MPRA Paper No. 829.
- HORVÁTH, R. (2009): "Interest Margins Determinants of Czech Banks." CNB Internal Discussion Paper 3.
- HORVÁTH, R. AND A. PODPIERA (2012): "Heterogeneity in Bank Pricing Policies: The Czech Evidence." *Economic Systems*, Vol. 36, No. 1, pp. 87–108.
- JIMÉNEZ, G., S. ONGENA, J.-L. PEYDRÓ, AND J. SAURINA (2010): "Credit Supply: Identifying Balance-Sheet Channels with Loan Applications and Granted Loans." ECB Working Paper Series, No. 1179.
- KASHYAP, A. K., J. C. STEIN, AND D. W. WILCOX (1993): "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance." *American Economic Review*, Vol. 83, No. 1, pp. 78–98.
- KASHYAP, A. K., J. C. STEIN, AND D. W. WILCOX (1996): "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Reply." *American Economic Review*, Vol. 86, No. 1, pp. 310–314.
- LÍZAL, L. AND J. SVEJNAR (2002): "Investment, Credit Rationing, and the Soft Budget Constraint: Evidence from Czech Panel Data." *The Review of Economics and Statistics*, Vol. 84, No. 2, pp. 353–370.
- MATOUSEK, R. AND N. SARANTIS (2009): "The Bank Lending Channel and Monetary Transmission in Central and Eastern European Countries." *Journal of Comparative Economics*, Vol. 37, Iss. 2, pp. 321–334.
- MIZEN, P. AND C. YALCIN (2002): "Corporate Finance When Monetary Policy Tightens." University of Nottingham Working Paper No. 03-1.
- OLINER, S. D. AND G. D. RUDEBUSCH (1996A): "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Comment." *American Economic Review*, Vol. 86, No. 1, pp. 300–309.

- OLINER, S. D. AND G. D. RUDEBUSCH (1996B): “Is There a Broad Credit Channel for Monetary Policy?” *FRBSF Economic Review*, Number 1.
- PETERSEN, M. A. AND R. G. RAJAN (1994): “The Benefits of Lending Relationships: Evidence from Small Business Data.” *Journal of Finance*, Vol. 49, pp. 3–37.
- PETERSEN, M. A. AND R. G. RAJAN (1996): “Trade Credit: Theories and Evidence.” NBER Working Paper 5602.
- PRASAD, A. AND S. GHOSH (2005): “Monetary Policy and Corporate Behavior in India.” IMF WP/05/25.
- PRUTEANU-PODPIERA, A. M. (2007): “The Role of Banks in the Czech Monetary Policy Transmission Mechanism.” *Economics of Transition*, Vol. 15, No. 2, pp. 393–428.
- SØRENSEN, C. K. AND T. WERNER (2006): “Bank Interest Rate Pass-Through in the Euro Area: A Cross Country Comparison.” ECB Working Paper Series, No. 580.

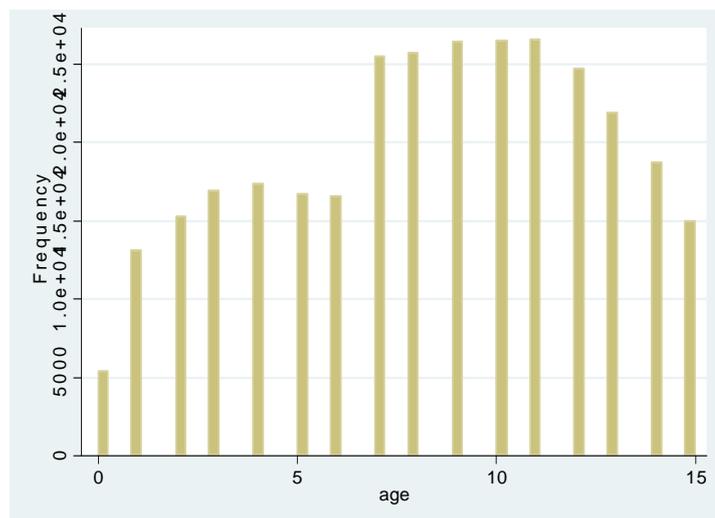
APPENDIX A: Categorization Criteria for Firm-Specific Variables

Figure A1: SIZE



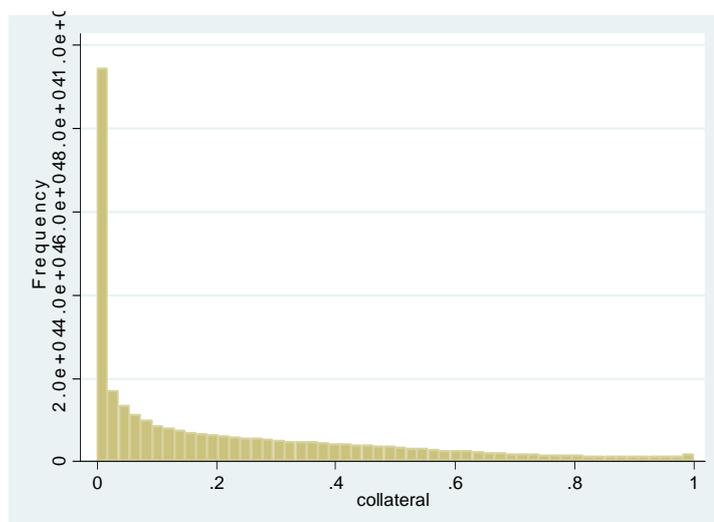
Note: A firm is categorized as small if $\text{size} \leq 14.9$, as medium if $14.9 < \text{size} < 16.7$, and as large if $\text{size} \geq 16.7$.

Figure A2: AGE



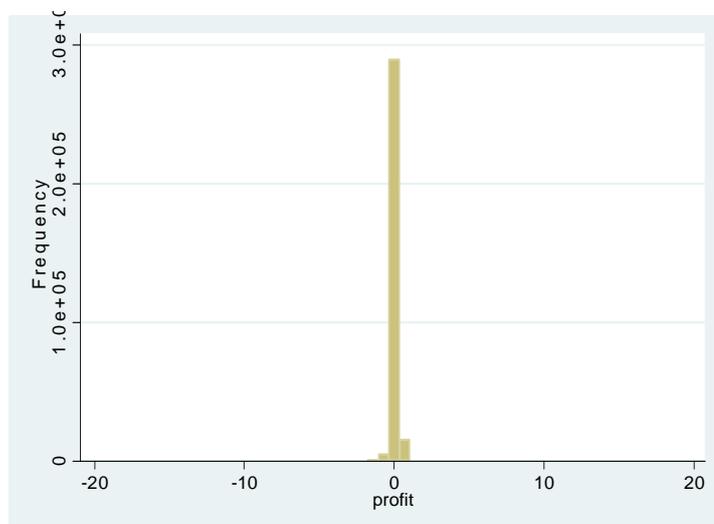
Note: A firm is categorized as young if $\text{AGE} \leq 7$, as medium if $7 \leq \text{AGE} < 11$, and as old if $\text{AGE} \geq 11$.

Figure A3: COLLATERAL



Note: A firm is categorized as low collateralized if $r_tfas \leq 0.027$, as medium collateralized if $0.027 < r_tfas < 0.269$, and as high collateralized if $r_tfas \geq 0.269$.

Figure A4: PROFIT



Note: A firm is categorized as low profitable if $r_ebit \leq 0.019$, as medium profitable if $0.019 < r_ebit < 0.111$, and as high profitable if $r_ebit \geq 0.111$.

APPENDIX B: Robustness Tests

Table B1: Estimation Results With 1-Year PRIBOR

| | 312 394 | | | |
|---|------------------------|------------------------|------------------------|------------------------|
| | 56 637 | | | |
| Y_{it} | TODEBT | SHLOAN | SHTRADE | LDEBT |
| | (1) | (2) | (3) | (4) |
| <i>1 YEAR PRIBOR_t</i> | -0.009 *** (0.0011) | -0.001 *** (0.0003) | 0.001 (0.0006) | -0.004 *** (0.0006) |
| <i>SIZE_{it}^{large}</i> | 0.147 *** (0.0051) | 0.026 *** (0.0019) | 0.058 *** (0.0033) | 0.020 *** (0.0028) |
| <i>AGE_{it}^{old}</i> | -0.147 *** (0.0035) | 0.010 *** (0.0014) | -0.033 *** (0.0024) | -0.014 *** (0.0020) |
| <i>COLLATERAL_{it}^{high}</i> | 0.070 *** (0.0038) | 0.028 *** (0.0016) | -0.021 *** (0.0024) | 0.038 *** (0.0023) |
| <i>PROFIT_{it}^{high}</i> | -0.076 *** (0.0029) | -0.013 *** (0.0011) | -0.010 *** (0.0018) | -0.020 *** (0.0016) |
| ΔGDP_{t-1} | 0.144 *** (0.0097) | -0.007 (0.0044) | 0.037 *** (0.0069) | -0.001 (0.0059) |
| <i>INTERCEPT</i> | 0.481 *** (0.0044) | 0.012 *** (0.0015) | 0.106 *** (0.0027) | 0.047 (0.0023) |
| <i>1 YEAR PRIBOR_t * SIZE_{it}^{large}</i> | 0.010 *** (0.0009) | 0.003 *** (0.0004) | 0.006 *** (0.0006) | 0.001 ** (0.0006) |
| <i>1 YEAR PRIBOR_t * AGE_{it}^{old}</i> | 0.004 *** (0.0009) | 0.000 (0.0003) | 0.000 (0.0006) | 0.001 ** (0.0005) |
| <i>1 YEAR PRIBOR_t * COLLATERAL_{it}^{high}</i> | -0.003 *** (0.0009) | 0.001 *** (0.0004) | -0.001 (0.0006) | -0.002 *** (0.0006) |
| <i>1 YEAR PRIBOR_t * PROFIT_{it}^{high}</i> | 0.015 *** (0.0009) | 0.001 ** (0.0003) | 0.001 * (0.0005) | 0.004 *** (0.0005) |
| R-squared | 0.09 | 0.03 | 0.11 | 0.02 |

Note: Robust standard errors in parentheses. Significantly different from zero at the 90% (*), 95% (**), and 99% (***) confidence levels.

Table B2: Estimation Results With Year 2012

| | 334 767 | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|
| | 56 822 | | | |
| Y_{it} | TODEBT | SHLOAN | SHTRADE | LDEBT |
| | (1) | (2) | (3) | (4) |
| 3 MONTH PRIBOR_t | -0.007 *** (0.0010) | -0.001 *** (0.0003) | 0.001 ** (0.0006) | -0.005 *** (0.0005) |
| $SIZE_{it}^{large}$ | 0.152 *** (0.0046) | 0.028 *** (0.0016) | 0.061 *** (0.0029) | 0.020 *** (0.0025) |
| AGE_{it}^{old} | -0.138 *** (0.0029) | 0.010 *** (0.0011) | -0.030 *** (0.0020) | -0.013 *** (0.0017) |
| $COLLATERAL_{it}^{high}$ | 0.072 *** (0.0032) | 0.028 *** (0.0013) | -0.019 *** (0.0019) | 0.037 *** (0.0019) |
| $PROFIT_{it}^{high}$ | -0.074 *** (0.0022) | -0.013 *** (0.0008) | -0.010 *** (0.0013) | -0.019 *** (0.0012) |
| ΔGDP_{t-1} | 0.071 *** (0.0097) | -0.001 (0.0044) | 0.021 *** (0.0068) | 0.002 (0.0059) |
| INTERCEPT | 0.469 *** (0.0038) | 0.013 *** (0.0012) | 0.103 *** (0.0023) | 0.046 *** (0.0019) |
| $3 \text{ MONTH PRIBOR}_t * SIZE_{it}^{large}$ | 0.011 *** (0.0008) | 0.003 *** (0.0003) | 0.006 *** (0.0005) | 0.002 *** (0.0005) |
| $3 \text{ MONTH PRIBOR}_t * AGE_{it}^{old}$ | 0.001 (0.0008) | 0.000 (0.0003) | -0.001 * (0.0005) | 0.001 *** (0.0004) |
| $3 \text{ MONTH PRIBOR}_t * COLLATERAL_{it}^{high}$ | -0.004 *** (0.0008) | 0.002 *** (0.0003) | -0.002 *** (0.0005) | -0.002 *** (0.0005) |
| $3 \text{ MONTH PRIBOR}_t * PROFIT_{it}^{high}$ | 0.017 *** (0.000) | 0.001 *** (0.0003) | 0.001 *** (0.0004) | 0.004 *** (0.0004) |
| R-squared | 0.09 | 0.03 | 0.11 | 0.02 |

Note: Robust standard errors in parentheses. Significantly different from zero at the 90% (*), 95% (**), and 99% (***) confidence levels.

Table B3: Estimation Results With Additional Control Variables

| | 233 255 | | | |
|--|------------------------|------------------------|------------------------|------------------------|
| | 46 001 | | | |
| Y_{it} | TODEBT | SHLOAN | SHTRADE | LDEBT |
| | (1) | (2) | (3) | (4) |
| 3 MONTH PRIBOR_t | 0.003 *** (0.0010) | -0.002 *** (0.0005) | 0.001 (0.0008) | -0.003 *** (0.0006) |
| SIZE_{it}^{large} | 0.045 *** (0.0043) | 0.023 *** (0.0019) | 0.034 *** (0.0034) | 0.004 * (0.0024) |
| AGE_{it}^{old} | -0.156 *** (0.0031) | 0.010 *** (0.0015) | -0.038 *** (0.0025) | -0.016 *** (0.0019) |
| COLLATERAL_{it}^{high} | 0.023 *** (0.0031) | 0.023 *** (0.0015) | -0.032 *** (0.0023) | 0.025 *** (0.0018) |
| PROFIT_{it}^{high} | -0.086 *** (0.0024) | -0.017 *** (0.0010) | -0.015 *** (0.0017) | -0.017 *** (0.0013) |
| ΔGDP_{t-1} | 0.102 *** (0.0099) | 0.010 ** (0.0052) | 0.024 *** (0.0080) | -0.003 (0.0063) |
| INTERCEPT | 0.633 *** (0.0038) | 0.028 *** (0.0017) | 0.162 *** (0.0029) | 0.063 *** (0.0022) |
| 3 MONTH PRIBOR_t * SIZE_{it}^{large} | 0.005 *** (0.0008) | 0.003 *** (0.0004) | 0.005 *** (0.0006) | 0.000 (0.0005) |
| 3 MONTH PRIBOR_t * AGE_{it}^{old} | 0.001 * (0.0008) | 0.000 (0.0004) | 0.001 (0.0006) | 0.001 ** (0.0005) |
| 3 MONTH PRIBOR_t * COLLATERAL_{it}^{high} | -0.005 *** (0.0008) | 0.003 *** (0.0004) | -0.002 *** (0.0006) | -0.001 *** (0.0005) |
| 3 MONTH PRIBOR_t * PROFIT_{it}^{high} | 0.010 *** (0.0008) | 0.002 *** (0.0003) | 0.000 (0.0005) | 0.003 *** (0.0004) |
| DEPRECIATION_{it} | -0.301 *** (0.0167) | -0.004 (0.0073) | -0.114 *** (0.0091) | 0.005 (0.0095) |
| INTANGIBLE_{it} | 0.068 ** (0.0304) | 0.032 ** (0.0162) | 0.007 (0.0164) | 0.033 * (0.0188) |
| R-squared | 0.07 | 0.02 | 0.09 | 0.03 |

Note: Robust standard errors in parentheses. Significantly different from zero at the 90% (*), 95% (**), and 99% (***) confidence levels.

APPENDIX C: Testing for Multicollinearity*Table C1: Correlation Coefficients*

| | age | size | d_age_ol | d_size_la | d_age_me | d_size_me |
|-----------|--------|------|----------|-----------|----------|-----------|
| age | 1 | | | | | |
| size | 0.2023 | 1 | | | | |
| d_age_ol | | | 1 | | | |
| d_size_la | | | 0.1241 | 1 | | |
| d_age_me | | | | | 1 | |
| d_size_me | | | | | 0.0015 | 1 |

Table C2: Multicollinearity Diagnostics

| Variable | VIF | SQRT VIF | Tolerance | R-Squared |
|-----------------|-------------|----------|-----------|-----------|
| r_tdt | 1.14 | 1.07 | 0.8783 | 0.1217 |
| pribor_3m | 2.16 | 1.47 | 0.4634 | 0.5366 |
| d_size_me | 1.58 | 1.26 | 0.6339 | 0.3661 |
| d_size_la | 1.73 | 1.31 | 0.5789 | 0.4211 |
| d_age_me | 1.42 | 1.19 | 0.7019 | 0.2981 |
| d_age_ol | 1.5 | 1.23 | 0.6659 | 0.3341 |
| d_rtfas_me | 1.56 | 1.25 | 0.6399 | 0.3601 |
| d_rtfas_hi | 1.61 | 1.27 | 0.6213 | 0.3787 |
| d_rebit_me | 1.44 | 1.2 | 0.6928 | 0.3072 |
| d_rebit_hi | 1.43 | 1.2 | 0.6996 | 0.3004 |
| r_gdp_gl | 2.23 | 1.49 | 0.4478 | 0.5522 |
| Mean VIF | 1.62 | | | |

| | Eigenval | Cond Index |
|-------------------------|----------|----------------|
| 1 | 6.1686 | 1 |
| 2 | 1.1938 | 2.2731 |
| 3 | 1.0195 | 2.4598 |
| 4 | 0.964 | 2.5297 |
| 5 | 0.896 | 2.6238 |
| 6 | 0.5528 | 3.3405 |
| 7 | 0.333 | 4.3039 |
| 8 | 0.2842 | 4.6591 |
| 9 | 0.2453 | 5.0142 |
| 10 | 0.195 | 5.6249 |
| 11 | 0.1059 | 7.6333 |
| 12 | 0.0419 | 12.1305 |
| Condition Number | | 12.1305 |

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