

Working Papers

Default Rates in the Loan Market for SMEs: Evidence from Slovakia

Jarko Fidrmuc
Christa Hainz

Ifo Working Paper No. 72

June 2009

An electronic version of the paper may be downloaded from the Ifo website www.ifo.de.

Default Rates in the Loan Market for SMEs: Evidence from Slovakia*

Abstract

The current crisis raises the question whether loans to SMEs in emerging markets are inherently more risky. We use a unique unbalanced panel of nearly 700 loans made to SMEs in Slovakia between 2000 and 2005. Several probit and panel probit models show that liquidity and profitability factors are important determinants of SME defaults. Moreover, we find that indebtedness significantly increases the probability of default. Finally, liability as proxied by the legal form of SMEs has important incentive effects. In sum, default rates and factors converged to values found in developed financial markets.

JEL Code: G33, G21, C25.

Keywords: SMEs, banking, loan default, incentives, asymmetric information, probit, financial crisis.

Jarko Fidrmuc
University of Munich
and Comenius University Bratislava
Geschwister-Scholl-Platz 1
80539 Munich, Germany
Phone: +49(0)89/2180-5544
jarko.fidrmuc@lrz.uni-muenchen.de

Christa Hainz
Ifo Institute for Economic Research
at the University of Munich
Poschingerstr. 5
81679 Munich, Germany
Phone: +49(0)89/9224-1237
hainz@ifo.de

* The authors would like to thank Peter Huber, David Kemme, Stefanie Kleimeier, Evžen Kočenda, Zuzana Fungáčová, Monika Schnitzer, and seminar participants at the University of Munich and at CERGE Prague as well as participants of the workshop on “Entrepreneurship, Firm Demography and Industrial Location” in Vienna and of the Conference on “Risk, Regulation and Competition: Banking in Transition Economies” in Ghent for helpful comments and suggestions. The usual disclaimer applies. Christa Hainz gratefully acknowledges financial support from the German Science Foundation, under SFB-Transregio 15 and Jarko Fidrmuc acknowledges financial support from the European Commission FP7 project “New Issues in Agricultural Trade” (AGFoodTrade).

1. Introduction

The current financial crisis has hit Eastern Europe particularly severe (IMF, 2009). This implies that banks expect running big losses in their credit business in the near future. Since the banking sectors in Eastern Europe are dominated by foreign banks from Western Europe, their parent banks will have to bear these losses. There are several reasons why the default rate of loans will rise. First, firms in these open economies are negatively affected by the global economic downturn. Second, in some countries many loans are denominated in foreign currency, which renders their repayment less likely if the local currency devaluates. Apart from these two factors that increase credit risk, the question arises whether loans in emerging markets are inherently more risky?

There are some papers about default rates of SMEs mainly in developed countries (Jacobson et al., 2005; Agarwal and Hauswald, 2007).¹ The evidence of the default pattern of loans to individual firms in emerging markets in general and the new EU member states in particular is still missing. In this paper, we study the default rates on loans to SMEs in Slovakia. In addition, we address the following questions: Is there a common pattern in the financial indicators and the business development of defaulters? What is the role of the incentives related to the liability requirements for different legal forms of the SMEs?

We analyze these issues by using a unique set of data about loans made to around 700 SMEs in Slovakia between January 2000 and June 2005. This period of time is particularly well suited to address the question of credit risk because the rate of loan growth was rather moderate. The default rate among loans made to SMEs was relatively moderate at 6.0 per cent. The default rates clearly differ between industries; they are highly above average in the service sector and in agriculture. Moreover, the default rates are much lower for natural persons than for legal bodies. We also provide evidence that lower profitability and lower liquidity increase the risk of default. Furthermore, we show that indebtedness increases the risk of default only for highly indebted firms. These results suggest that incentive effects determine the probability of default.

¹ For emerging markets, there are some papers about other segments of the credit market, for example, Lin and Yan (2003) on home mortgages and Kočenda and Vojtek (2006 and 2009).

The paper is structured as follows. The next section provides a survey of the literature on loan defaults and derives the predictions to be tested empirically. Section 3 describes our data set, and Section 4 analyzes factors determining the probability of default in probit models including sensitivity analysis, which tries to address possible selection bias and endogeneity problems. Section 5 looks at the pattern of sectoral end legal form effects from the perspective of incentive structure. The last section concludes.

2. Determinants of Default Rates and Literature Review

The determinants of corporate defaults in developed financial markets are discussed intensively in the literature. Loan default is closely related to corporate bankruptcy (Lízal, 2002). The causes of bankruptcy are problems in the fields of indebtedness, profitability, liquidity and solvency (Altman, 1968). Firms are more likely to default if they are highly indebted, less profitable, less liquid, and if the legal system does not create efficient incentives to repay the loans. Selected financial ratios related to these factors are commonly used to predict the probability of corporate bankruptcy in developed financial markets (Altman, 1968; Beaver, 1966), but less evidence is available for the new member states.

Our first hypothesis is related to the literature on default rates and the problems of asymmetric information. Problems of asymmetric information play an important role in financing SMEs. The adverse selection and ex ante moral hazard should be more severe in the new member states of the EU. According to the so-called “observed-risk hypothesis”, banks can observe the firm’s risk ex ante and can adjust the terms of the credit contract accordingly so as to adjust pricing to the riskiness of the loan (Blazy and Weill, 2006).

Highly indebted firms have to pay a high proportion of their payoff to the bank if they are successful. As a result, ceteris paribus, the difference between the payoffs for success and failure decreases. This reduces the incentives to exert effort in order to increase the success of the project. Moreover, this introduces incentives to make riskier investments than originally agreed upon in the credit contract. This moral hazard behavior decreases the probability of success. Therefore, we expect that indebted firms are more likely to default (hypothesis 1). Low profitability and liquidity are also generally seen as important default determinants (hypothesis 2). On the one hand, low

profits may mean that the investment was not successful. On the other hand, low liquidity can cause financial bottlenecks, which may also cause defaults.

In addition, there are other characteristics of the firm, which influence the degree of the moral hazard problems and ultimately the risk of default. If the debtor is fully liable, the effects of investment decisions are internalized in the payoffs. In contrast, when the degree of debtor's liability is restricted, for example, if there are insufficient assets that can be used as collateral and can be liquidated in the case of failure, the debtor repays only in the case of a successful outcome. As a consequence, the incentives of the debtor are distorted if he is not (fully) liable (see Bester, 1987, Holmström, 1996, and Hainz, 2003).²

A similar argument applies to strategic default. Suppose that the creditor cannot observe the actual outcome of a project. This allows the debtor to claim that his project has failed (although it was successful) and to keep the return. If the debtor is liable and loses assets in the case of failure, the likelihood of strategic default is much lower (see Bester, 1994). The debtor's liability is largely determined by the legal form. On the one hand, natural persons are fully liable for their losses. On the other hand, owners can limit their liability more easily by incorporating the firm as a legal body with a limited liability. The higher the debtor's liability, *ceteris paribus*, the less likely the firm is to default (hypothesis 3).

3. Data Description

Profit oriented commercial banking was introduced in Slovakia, as well as in other transition countries, only at the beginning of the 1990s. The first year of economic transition were characterized by an underdeveloped financial sector especially with respect to SMEs. In the early reform years, Lízal and Švejnar (2001) find evidence of a soft budget constraint mainly for the former state enterprises in the Czech Republic and Slovakia. Access to finance remained difficult as shown by EBRD (2005a) reporting that it was one of the most important business constraints on small private firms. During the 1990s, from the point of view of banks, bad loans and credit defaults represented a

² According to EBRD (2005b), an overwhelming majority (92 per cent) of loans to SMEs in Slovakia had to pledge collateral that was a high 150 per cent of the loan value. Nevertheless, the recovery rates of loans may be very different in individual cases.

major problem (see Tkáčová, 2001). Only in the last few years has the total volume of loans started to grow strongly.

We have a unique data set on SMEs in Slovakia between 2000 and 2005. Our data set is from a major commercial bank in Slovakia that provided all types of loans in all regions of the country. In the bank's strategy, lending to SMEs was viewed as core business whose importance should further increase. Similarly to other banks in the region, the bank was privatized to a large Western European banking group at the beginning of the period analyzed here.³ As a result, our analysis is likely to be applicable to other countries of the enlarged EU, although we cannot present direct comparisons.

The anonymous data set is used for an ex post evaluation of the credit risk of various types of the SMEs. Our data set consists of two parts. First, we have information on whether a SME defaulted on its loan during five partially overlapping periods of 18 months, which start in January (e.g. the first period being January 2000 to June 2001, the last period being January 2004 to June 2005). Default companies are dropped from the sample after the period in which insolvency occurred. In order to preserve a consistency between the time periods, clients who repaid their loans before the end of the period analyzed were not included in the sample.⁴ The data set includes only SMEs with double-entry bookkeeping in order to ensure a reliable data base. The original data set was checked on consistency before estimations.

This information set on defaults is merged with selected financial data from the firms' annual balance sheets published in December of the respective year before the reported period (e.g. December 1999 is used for the explanation of defaults between January 2000 and June 2001).⁵ All items are reported as shares in total assets or liabilities. Total sales indicate the size of the SMEs, and they are also used for the definition of the SMEs as being between SKK 30 million (approximately EUR 1

³ We also used a shorter period including only observations after privatization, which does not change our findings. Detailed results are available upon request.

⁴ The debtors are unlikely to default if credits are already nearly repaid. The inclusion of those firms could bias the results.

⁵ Unfortunately, the lack of data on fixed assets as a proxy for collateral restricts our analysis in this respect.

million) and SKK 300 million (approximately EUR 10 million). The same nominal interval was applied during the whole available period, while the average inflation was about 8 per cent annually. However, the majority of the reported entities have total sales in the lower range of the spectrum.

Following the general practice of the financial institutions, we define defaults if a loan is written off, or after the delay in repayment exceeds 90 days, or a client is classified by the bank as substandard, doubtful or loss-making during the observed period. With a few exceptions, the bank terminated the relationships with defaulting companies after either eventual repayment of the obligations or the company became bankrupt. We do not have any data for recoveries of defaulting companies, which are supervised by a specialized unit of the bank.

Insert Figure 1 about here

For Slovakia, the volume of credits to private domestic non-financial corporations grew by 1.7 per cent, on average, between 2001 and 2005 (see NBS, 2006). Thus, the share of domestic corporate loans to GDP declined to 7.6 per cent in 2004 (see Figure 1). More recently, however, the total volume of corporate loans expanded by 23 per cent and 34 per cent in 2005 and 2006, respectively. Figure 2 shows the development of loans granted and defaults for our dataset, during the period analyzed. We can see only a slightly higher default rate between January 2002 and June 2003, which corresponded to the business cycle in Slovakia. Similarly, we can see a moderate expansion of credits to the SMEs in 2004 and 2005. This development pattern approximately follows the development of credits granted in Slovakia (see Figure 1).

Insert Figure 2 about here

For the whole period, we have 1496 observations available for 667 SMEs. Of this number, 90 SMEs (6.0 per cent of observations) defaulted on their loan during the observation period. The share of default loans in total loans is nearly the same (also 6.0 per cent of total loans). Among all Slovak banks, the average share of non-performing

loans⁶ in total assets decreased from 24.3 per cent in 2000 to 7.2 per cent in 2004 (EBRD, 2005a). Thus, the quality of the bank's portfolio is above average.

In an international comparison, the default rates we observe in our analysis are (slightly) above reported figures. Agarwal and Hauswald (2007) and Jacobson et al. (2005) report a default rate of 2.7 per cent for SMEs in the US and of default rates between 0.9 and 2.3 per cent for Swedish SMEs. Moreover, Altman and Suggitt (2000) report average default probabilities for a five year period (measured by a similar indicator based on the number of issuers) of about 4.5 per cent for loans to companies with an original S&P rating B and 23 per cent for companies with rating Caa.⁷ Slightly more evidence is available on the default recovery rates of loans that range between mean values of 65 and 87 per cent in developed countries, depending on the data set (Carty and Lieberman, 1998; Asarnow and Edwards, 1995; Grossman et al., 1997).

Insert Table 1 about here

In each year, we have about 300 observations. However, there are only few SMEs with a longer history at the bank. Moreover, we do not have any information about them before and after the credit window. This is also true if the SMEs had had earlier credits provided by the bank analyzed. As a result, the average reported duration of the lending relationship between the SME and the bank in the last available period (January 2004-June 2005) is 2.6 years. This is largely comparable to an average loan length of 29 months as reported by EBRD (2005b). Only 66 SMEs had received loans from the bank continuously during the whole period. There are also few SMEs with credit relationships in only a few selected years of the whole period.

Our data sample does not include companies without bank loans.⁸ Nevertheless, the descriptive statistics in Table 1 show that the share of credits is relatively small on average (15 per cent of total liabilities). In turn, we have SMEs from those with nearly

⁶ According to Jurča and Zeman (2008), a significant part of non-performing loans was already removed from the banking sector at the beginning of 2001.

⁷ A broad comparison with the firms analyzed in this contribution may be given by the S&P rating of the long-run bank activities, which is BB. The SMEs (with no ranking available) instead could represent a rather more risky activity of the bank, which is then comparable with the latter firm group analyzed by Altman and Suggitt (2000).

⁸ According to EBRD (2005b), approximately 56 per cent of Slovak SMEs had no loans in 2005.

zero loans up to those with 85 per cent of total liabilities. This indicates that the selection bias should not play an overwhelmingly important role in our data set. Also other papers show that the selection bias is not severe. Using data on both firms with and without loans, Chakraborty and Hu (2006) show that the selection bias is not severe when estimating whether a loan is collateralized or not. A similar result is found by Fungáčová (2007a and 2007b) for delisting the shares of companies on the stock exchanges in Slovakia and the Czech Republic. Furthermore, the dummies for years, industries and legal forms are likely to reduce selection bias as well (see Djankov and Murrell, 2002). We also estimate sector-specific and time-varying effects to see whether the effects remain statistically robust, as selection bias is likely to be different between sectors and time periods.

Table 1 shows that there is only weak statistical evidence that the size of the defaulting SMEs is larger than that of the whole data sample.⁹ In particular, the F -test, for the equality of means of sales of defaulting and non-defaulting companies, can be rejected only at a 10% significance level, while variances in the sub-samples are not significantly different. In Table 1 we can see that the mean and variance of the selected financial ratios (earnings before taxation as well as cash and bank accounts as shares of total assets) between the sub-samples of default and non-default SMEs are significantly different. By contrast, there is only weak evidence that the mean and variance of bank loans are significantly different between the two sub-samples.

4. Factors Influencing the Probability of Default

4.1 Default Factors

We estimate several specifications of probit models for loan defaults of SMEs in Slovakia between January 2000 and June 2005 (that is, for five partially overlapping periods). Our dependent variable is the conditional probability at time t , given the available information set on the firm i time $t - 1$, Ω , that the firm defaults on its loan,

$$P(q_{i,t} = 1 | \Omega_{t-1}) = \beta_1 + \beta_2 C_{i,t-1} + \beta_3 L_{i,t-1} + \beta_4 P_{i,t-1} + \mathbf{Z}_{i,t} \gamma + \varepsilon_{i,t}, \quad (1)$$

⁹ Klapper et al. (2006) show that by using balance sheet data for the years between 1998 and 2002 smaller SMEs in Poland tend to be more liquid.

where C , L , and P denote financial ratios on firms' indebtedness, liquidity and profitability, and \mathbf{Z} is a vector of additional control variables (industry, time and legal form dummies). We do not include any explanatory variables that characterize the bank structure, because all loans are reported by a single bank. However, we include time effects in selected specifications, which may also reflect the business cycle and bank-specific developments. Note that all explanatory variables are lagged, hence we consider them to be exogenous.

Equation (1) includes factors mentioned in the rich literature on default probability estimations (see Chan-Lau, 2006), credit scoring models (see Rona-Tas, 2008, Mester, 1997, and Kočenda and Vojtek, 2006 and 2009), and enterprise restructuring in transition economies (see Djankov and Murrell, 2002). Bris et al. (2006) estimate a similar logit model of default recoveries in the US. Furthermore, the control variables follow the traditional literature on financial ratios and bankruptcies reviewed by Altman (1968) and Beaver (1966). However, our model concentrates on fewer variables than credit scoring models (see Mester, 1997, Berger et al., 2005) because we include only robust variables that can also be easily interpreted.¹⁰

Insert Table 2 about here

From the point of view of the discussion on financial ratios in the earlier literature (see Altman, 1968, Altman and Suggitt, 2000), bank loans as a share of total liabilities represent the debt factors of financial distress. Both the theoretical literature on agency problems and the empirical literature on the determinants of corporate bankruptcy (as formulated in hypothesis 1 in section 2) suggest that more highly indebted firms are more likely to default.

If banks have efficient credit evaluation tools for excluding the excessively risky firms in advance, and sufficient control or monitoring mechanisms over the activities of the SMEs during the duration of the loans, we would expect the influence of bank loans on defaults to be largely insignificant. By contrast, we find adverse and significant effects of bank loans (see specification P1 in Table 2) indicating that the creditor cannot fully enforce his controlling role. This effect is robust to the inclusion of time and

¹⁰ Estimation results for a broader set of explanatory variables are available upon request from the authors.

industry dummies, as well as the dummies indicating the legal form of the SMEs (see specification P2).

The positive coefficient may largely reflect the higher default probabilities of highly indebted SMEs (debt channel), while the banks still own relatively efficient tools for assessing the *a priori* risk.¹¹ Because our explanatory variables are lagged by one year, we consider them as exogenous and use bank loans as a criterion for sample splitting. In particular, we include only SMEs with lagged loans above the median level of loans (that is, approximately 12 per cent of current short-term liabilities). Indeed, we find a highly positive and significant coefficient (see specification P3) for this subsample.¹²

In our estimation, we control for other determinants of corporate defaults. We expect that firms are more likely to default if they face liquidity problems and low profitability (hypothesis 2). Based on the existing literature on bankruptcy and regression analysis including a broader set of variables, we selected two further variables, which are crucially important for the financial wealth of the firms. First, the SMEs that have relatively higher cash amounts and finance available in their bank accounts (relative to total assets) are significantly less likely to default on their loans in the next 18 months than the rest of the sample (see Table 2). This variable reflects the liquidity and solvency channels. Second, companies that have high earnings before taxation (as a share of total assets) are also less likely to default on their loan in the following reporting period than the average of the sample. This channel indicates the profitability of the SMEs stressed in the earlier literature.

In our further sensitivity analysis (not reported here), we controlled for possible nonlinearities. The quadratic terms were insignificant for all explanatory variables.

¹¹ Unfortunately, we cannot include information on collateral, which is not available in the data set. Possibly collateral and interest rates are high enough to guarantee profitability in the presence of higher risk firms too. We also computed the implicit loan-specific interest rate similarly to Fidrmuc et al. (2009) from the available indicators, which was insignificant.

¹² By contrast, bank loans are insignificant in the sub-sample with firms with indebtedness below the median level. Detailed results are available upon request.

Furthermore, the link test for model specification (see Pregibon, 1980) also reveals no problems with the specification of our estimations (see Table 2).¹³

4.2 Default Factors by Sectors

Default probabilities may differ largely between the sectors for a variety of reasons. First, capital intensity is highly different for the individual sectors. More capital intensive sectors are more dependent on external capital. At the same time, the nature of business and the available collateral are different for specific branches. Therefore, we estimate the default equation (1) with all coefficients being specified for the individual sector,

$$P(q_{i,t} = 1 | \Omega_{t-1}) = \beta_1 + \sum_{j=1}^5 \beta_{2,j} C_{i,t-1} + \sum_{j=1}^5 \beta_{3,j} L_{i,t-1} + \sum_{j=1}^5 \beta_{4,j} P_{i,t-1} + \mathbf{Z}_{i,t} \boldsymbol{\gamma} + \varepsilon_{i,t}, \quad (2)$$

Moreover, an estimation of equation (2) may provide hints on possible selection bias of our estimations. In particular, our data set only includes firms which passed the initial criteria for credits. It is likely that those criteria have different effects on different sectors.

Table 3 shows robustness of our results especially with respect to profitability and liquidity. These variables are significant for all one-digit sectors. In contrast, bank loans are robust only for agriculture and services. Highly indebted firms are also likely to default in industry. Somewhat surprisingly, debt has no significant relationship on default probabilities in the construction sector. The effect of this variable is possibly even negative if we consider also the legal form effects. This can be explained by the real estate boom in Slovakia in the analyzed period, which had positive effects on this sector in general. For all explanatory variables, the test of coefficient equality confirms that the effects are clearly different between the sectors. The joint test confirms that the effects are significantly different from zero for all variables (not reported in Table 3).

¹³ The link test is based on the regression of the left hand variable (default probabilities in our case) on the fitted values from the tested regression as well as the squares of those values. The values squared should not be significant if the model is specified correctly. This is confirmed by the reported link test statistics in Table 2.

4.3 Time Varying Default Factors

Next, we analyze the stability of the relationships between default probabilities and our explanatory variables. We can see that there was actually a structural change, especially with respect to bank loans. In particular, we test whether coefficients in equation (1) are stable for the individual time periods. The test on coefficient equality confirms that profitability and liquidity are not statistically different during the sample period, but the null of equal coefficients in five available periods was rejected for bank loans.

Table 4 shows that there is convergence to the expected relationship between defaults and bank loans, which possibly started in the second year of our sample. Thus, during the period analyzed, the influence of bank loans on the probability of default in Slovakia has become similar to what we observe in other industrialized countries.

Given the changes in the institutional and macroeconomic environment, we can see two potential explanations for the convergence of default factors to what we know from the literature. First, the bad loans of the bank were transferred to specialized consolidation institutions in two steps in 1999 and 2000 (see Tkáčová, 2001). Second, the privatization of the bank was completed in 2001. Both the burden of a huge stock of bad loans and state ownership distorted incentives of banks and thereby caused big inefficiencies in the financial sector. Privatization and the transfer of bad loans improved incentives for prudent lending; the entry of foreign banks contributed to the emergence of standard procedures for credit evaluation in Slovakia. Similar effects are found in other transition economies (Bonin et al., 2005).

4.4 Panel Estimation

As another sensitivity check, we include random effects for the individual SMEs in (1), although we have to keep in mind that we have an unbalanced panel with a relatively short time dimension.¹⁴ Nevertheless, firm-specific effects cover all unobservable characteristics of the SMEs, and thus, also reduce the possible selection bias (see

¹⁴ We cannot use fixed effect probit or conditional logit estimators because fixed effects are perfect predictors of non-defaults. Furthermore, fixed effect estimators of nonlinear panel models can be severely biased due to the so called incidental parameters problem (see Fernández-Val, 2009).

Djankov and Murrel, 2002). Actually, the coefficient for bank loans is no longer significant in the basic specifications (see REP1 and REP2 in Table 5), although it retains the positive sign, while all other determinants of defaults remain unchanged.

It seems that unobservable firm-specific factors to a large extent explain the relationship between bank loans and defaults of the SMEs. However, default rates of highly indebted firms are still positively related to bank loans when we include firm-specific effects (specification REP3). Thus, it seems that high indebtedness is of crucial importance for defaults. This result is consistent with the agency theory that incentives deteriorate in more highly indebted firms.

Insert Table 5 about here

5. Incentive Structure and the Effects of Legal Forms

Various specifications of (1) also involve dummies for sectoral and legal form effects, which can provide further insights to factors of defaults of SMEs with focus on incentive structure. In particular, we include sectoral effects to selected specifications of (1) in order to cover for possible differences between the economic sectors. On the one hand, such differences can be driven by the different nature of the business and collateral. On the other hand, a bank may specialize in particular sectors. In fact, one third of the credit cases is given to the SMEs active in the industrial sector, while de la Rocha (2001) reports that about 15 per cent of firms are registered in industry. The difference is even larger for agriculture, which received about one quarter of all credits analyzed here, although it represents less than six per cent of Slovak firms according to de la Rocha (2001). A possible explanation of this structure is that collateral is particularly high in the agricultural sector. In turn, retail trade and other services might receive less credit than their share in the economy (three quarters of all registered firms against about one third of the credits). However, those differences can also be caused by the higher need for the external financial funds in sectors with high fixed assets.

Figure 3 shows the estimated sectoral effects for the one-digit NACE industries according to selected specifications (see Table 2, columns P2, P3, and Table 3, columns REP2 and REP3) of (1). Industrial SMEs, as the largest category, were selected as the base sector for comparisons. For our base probit specification (see column P2 in Table 2), the estimated effects confirm approximately equal default probabilities between the

sectors. Nevertheless, retail trade seems to be more secure than industry, while we find higher sectoral default probabilities for agriculture, construction, and other services.

However, the picture changes if we consider only highly indebted firms. Figure 3 shows that highly indebted SMEs in agriculture have much higher default probabilities than in any other sectors in Slovakia. This adverse effect in agriculture is also confirmed by panel probit estimation for the highly indebted firms. In turn, the estimated effects for the remaining sectors also remain stable for different credit size and panel estimations.

Insert Figure 3 about here

For legal entities, a minimum endowment with equity is mandatory, but only at a relatively low level. In contrast, natural persons are fully liable and may lose all their personal assets if they fail. Choosing to operate a business as a legal entity may, therefore, be a deliberate choice by an entrepreneur to limit its liability. Liability, however, has important effects on incentives. Therefore, we expect that natural persons are less likely to default than legal bodies (hypothesis 3).

Descriptive analysis indicates that the legal form determines the liability of a debtor. Limited liability companies (denoted by s.r.o.) represent over half of the sample. Their default probabilities, of approximately 5.4 per cent, are slightly below the average. The joint stock companies (denoted by a.s.) and cooperatives represent 24 per cent and 20 per cent of the sample, with default probabilities of approximately 7 per cent in both categories. Our data sample also involves 66 loans to private businesses of natural persons with only one single default (1.5 per cent). Finally, we have three loan cases of small state enterprises with no defaults.

The effects estimated for legal forms (see Figure 4) confirm that natural persons are much less likely to default than other legal forms. However, the number (66 natural persons, of whom one defaulted) is possibly too low to draw final conclusions. The limited liability companies (s.r.o.) are only slightly less risky than the joint stock companies (a.s.), according to our base probit specification. For large credits, however, the risk for the limited liability companies increases more than for the joint stock companies. The same behavior can be seen for panel probit for large credits.

This may reflect the different legal standards of these types of companies. The limited liability companies can be founded with a low amount of starting capital (only

SKK 200,000 which is approximately EUR 5,000 or about 75 percent of annual GDP/capita in 2005). Unlike the joint stock companies, the limited liability companies are not obliged to provide any public reports for their business activity. There is anecdotal evidence that, among SMEs, limited liability companies are less confident business partners than any other types of business, and this is confirmed by our results.

Insert Figure 4 about here

6. Conclusions

The emerging markets seem particularly prone to financial crises. They are hit strongly by the current financial crisis and were previously subject to crises, such as the Asian crisis. Does the relatively frequent occurrence of crisis imply that the credit business is particularly risky in these countries? We analyze this question for loans granted by one bank in Slovakia during the period 2000 and 2005. This period is very well suited for the analysis because loan growth was moderate and did not show the extremely high growth rates of the following years. Actually, the literature suggests that banking crises are preceded by financial liberalization (Kaminsky and Reinhard, 1999) and high rates of loan growth (Caprio and Klingebiel, 1997). In the case of the current crisis, however, it is not as clear how much rapid loan growth contributed to the emergence of the crisis. It seems that the outbreak of the global financial and economic crisis has immediate contagion effects also in Eastern Europe.

During the period 2000 to 2005, on average about 6.0 per cent of the SMEs defaulted on their loans. We find that the level of defaults was somewhat higher than the default rates found for SMEs in Sweden and in the US. However, the higher margins earned by banks in Slovakia should compensate banks for bearing more risk. The default factors (high indebtedness as well as low profitability and liquidity) are very similar to those of developed financial markets. Therefore, these factors can also be used to carefully evaluate potential risks of outstanding credits in Slovakia.

With respect to the role of incentives, our results confirm that businesses of natural persons are much less likely to default than legal entities with restricted liability of their owners. This is consistent with the effects of full personal liability, which provides proper incentives to debtors. We also find important differences between sectors, legal forms and credit size.

The level of indebtedness indicates one important source of risk in the expansion of credits to the SMEs. Thus, attempts (for instance, by foreign banks) to gain market shares may come at the cost of a higher risk. This might be the case especially if loan growth is achieved mainly by larger credits to both new and incumbent customers. Currently, however, the most important source of risk is a long-term negative impact of the financial crisis on profitability and liquidity of the borrowing firms.

References

- Agarwal, S., Hauswald, R., 2007. Distance and Information Asymmetries in Lending. Mimeo. Washington, D.C.: American University.
- Altman, E. I., 1968. Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance*, 23(4), 589-609.
- Altman, E. I., Suggitt, H. J., 2000. Default Rates in the Syndicated Bank Loan Market: A Mortality Analysis. *Journal of Banking and Finance*, 24(1-2), 229–253.
- Asarnow, E., Edwards, D., 1995. Measuring Loss on Defaulted Bank Loans: A 24 Yr. Study. *Journal of Commercial Lending*, 77(7), 11-19.
- Beaver, W. H., 1966. Financial Ratios as Predictors of Failure. *Journal of Accounting Research*, 14(5), 71-111.
- Berger, A. N., Frame, W. S., Miller, N. H., 2005. Credit Scoring and the Availability, Price and Risk of Small Business Credit. *Journal of Money, Credit, and Banking*, 37(2), 191-222.
- Bester, H., 1987. The Role of Collateral in Credit Markets with Imperfect Information. *European Economic Review*, 31(4), 887-899.
- Bester, H., 1994. The Role of Collateral in a Moral Hazard Model of Debt Renegotiation. *Journal of Money, Credit, and Banking*, 26(1), 72-86.
- Blazy, R., Weill, L., 2006. Why do Banks Ask for Collateral?, Mimeo, Strasbourg: University of Strasbourg. <http://ssrn.com/abstract=675803> (October 2006).
- Bonin, J.P., Hasan, I., Wachtel, P., 2005. Privatization Matters: Bank Efficiency in Transition Countries, *Journal of Banking and Finance*, 29(8-9), 2155-2178.
- Breyer, P., 2004. Central and Eastern Europe – The Growth Market for Austrian Banks. *Monetary Policy & The Economy*, 3. Vienna: Oesterreichische Nationalbank, 63-88.

- Bris, A., Welch, I., Zhu, N., 2006. The Costs of Bankruptcy: Chapter 7 Liquidation vs. Chapter 11 Reorganization. *Journal of Finance*, 61(3), 1253-1303.
- Caprio, G. Jr. and Klingebiel, D. (1997). Bank Insolvency: Bad Luck, Bad Policy, or Bad Banking? in Bruno, M. and Pleskovic, B. (eds.), *Annual World Bank Conference on Development Economics 1996*, Washington, DC: The World Bank, 79-114.
- Carty, L. V., Lieberman, D., 1998. *Defaulted Bank Loan Recoveries*, New York: Moody's Investors Services.
- Chakraborty, A., Hu, Charles X., 2006. Lending Relationships in Line-of-Credit and Nonline-of-Credit Loans: Evidence from Collateral Use in Small Business. *Journal of Financial Intermediation*, 15(1), 86-107.
- Chan-Lau, J. A., 2006. *Fundamentals-Based Estimation of Default Probabilities: A Survey*. Working Paper No. 149, Washington: IMF.
- de la Rocha, M., 2001. *Corporate Sector and SME's Environment in the Slovak Republic*. Background Paper, Washington: World Bank.
- Djankov, S., Murrell, P., 2002. Enterprise Restructuring in Transition: A Quantitative Survey. *Journal of Economic Literature*, 40(3), 739-792.
- EBRD, 2005a. *Transition Report 2005, Business in transition*, London: EBRD.
- EBRD, 2005b. *The Business Environment and Enterprise Performance Survey (BEEPS) 2005: A brief report on observations, experiences and methodology from the survey*, London: EBRD.
- Fernández-Val I., 2009. Fixed Effects Estimation of Structural Parameters and Marginal Effects in Panel Probit Models, *Journal of Econometrics*, forthcoming.
- Fidrmuc, J., Horváth, R., Horváthová, E., 2009. *Corporate Interest Rates and the Financial Accelerator in the Czech Republic*. *Emerging Markets Finance and Trade*, forthcoming.
- Fungáčová, Z. 2007a. *Can the Market Fix a Wrong Administrative Decision? Massive Delisting on the Prague Stock Exchange*. Working Papers No. 335, CERGE-EI, Prague.
- Fungáčová, Z. 2007b. *Delisting in the Slovak and Czech Republic: Gradual Versus Big Bang Approach*. Mimeo. BOFIT, Helsinki.

- Grossman, R. J., Brennan, W. T., Vento, J., 1997. Syndicated Bank Loan Recovery Study, Structured Finance Credit Facilities Report. Fitch IBCA.
- Hainz, C., 2003. Bank Competition and Credit Markets in Transition Economies. *Journal of Comparative Economics*, 31(2), 223-45.
- Holmström, B., 1996. Financing of Investment in Eastern Europe: A Theoretical Perspective. *Industrial and Corporate Change*, 5, 205-237.
- IMF, 2009. How Linkages Fuel the Fire: The Transmission of Financial Stress from Advanced to Emerging Economies. *World Economic Outlook*, Chapter 4, April 2009: Crisis and Recovery. International Monetary Fund, Washington, 139-175.
- Jacobson, T., Lindé, J., Roszbach, K., 2005. Credit Risk Versus Capital Requirements Under Basel II: Are SME Loans and Retail Credit Really Different? *Journal of Financial Services Research*, 28 (1, 2, 3), 43-75.
- Jurča, P., Zeman, J., 2008. Macro Stress Testing of the Slovak Banking Sector. Working Paper No. 1/08, National Bank of Slovakia, <http://www.nbs.sk/PUBLIK/ROK2008A.HTM> (June 2008).
- Kaminsky, G. L., Reinhart, C. M. 1999. The Twin Crises: The Causes of Banking and Balance-of-Payments Problems. *American Economic Review*, 89(3), 473-500.
- Klapper, L., Sarria-Allende, V., Zaidi, R. 2006. A Firm-Level Analysis of Small and Medium Size Enterprise Financing in Poland. Policy Research Working Paper No. 3984, Washington: World Bank.
- Kočenda, E., Vojtek, M., 2006. Credit Scoring Methods. *Finance a úvěr/Czech Journal of Economics and Finance*, 56 (3-4), 152-167.
- Kočenda, E., Vojtek, M., 2009. Default Predictors and Credit Scoring Models for Retail Banking. Mimeo. CERGE-EI, Prague.
- Lin, C.-T., Yang, S.-Y., 2003. A Forecasting Model for the Likelihood of Delinquency, Default or Prepayment: The Case of Taiwan. *International Journal of Business*, 8(2), 204-211.
- Lízal, L., 2002. Determinants of Financial Distress: What Drives Bankruptcy in a Transition Economy? The Czech Republic Case. Working Papers No. 451, William Davidson Institute, University of Michigan, Michigan.

- Lízal, L., Švejnar, J., 2001. Investment, Credit Rationing, and the Soft Budget Constraint: Evidence From Czech Panel Data. *The Review of Economics and Statistics*, 84(2), 353–370.
- Mester, L. J., 1997. What's the Point of Credit Scoring? *Business Review*, September/October 1997, Philadelphia: Federal Reserve Bank of Philadelphia, 3-16.
- NBS, 2006. Monthly Credit Reports (Mesačný výkaz o úveroch). Bratislava: National Bank of Slovakia. Available at <http://www.nbs.sk/STATIST/ZSU/UVERY.HTM#V33-12> (June 2008).
- Pregibon, D., 1980. Goodness of Link Tests for Generalized Linear Models. *Applied Statistics* 29(1), 15-24.
- Rona-Tas, A., 2008. Rational Calculation and Trust: A Comparative Institutional Analysis of Emerging Credit Card Markets in Post-Socialist Societies.
- Tkáčová, D., 2001. Banking Sector in the Slovak Republic: Development, Restructuring And Privatisation, Parts I to III, Biatec No. 8-10, National Bank of Slovakia, Bratislava.

Figure 1: Development of Loan Volumes in Slovakia, 2000 – 2006



Source: National Bank of Slovakia, own calculations (current prices).

Figure 2: Development of Loans and Defaults by Reporting Periods

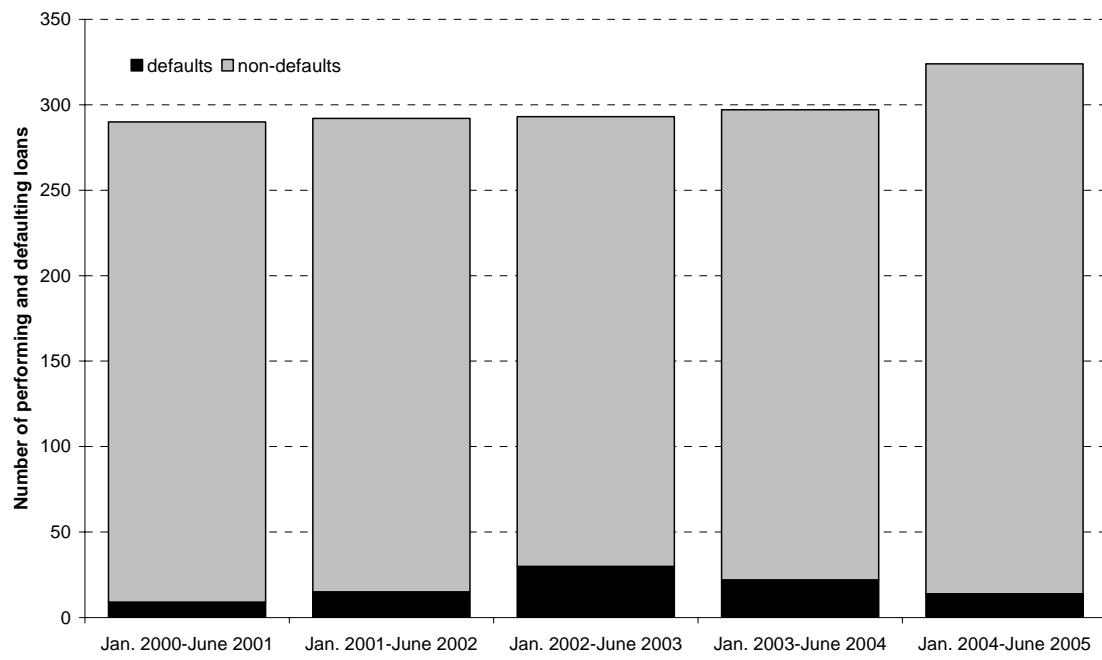


Table 1: Descriptive Statistics of Selected Variables

	Total sales SKK million	Bank loans	Earnings before taxation	Cash and bank accounts
<i>A: Non-default companies</i>				
Mean	100319	0.152	0.033	0.298
Median	78046	0.117	0.019	0.146
Max	298431	0.853	0.488	27.727
Min.	30115	-	-0.321	-
Std. Dev.	65584	0.125	0.078	0.832
<i>B: Default companies</i>				
Mean	114200	0.177	-0.038	0.100
Median	89271	0.118	-0.001	0.054
Max	291358	0.666	0.171	0.715
Min.	30142	0.006	-0.617	-
Std. Dev.	71465	0.147	0.119	0.138
<i>C: F-Test of equal mean and variance between the sub-samples</i>				
Mean	3.747 [*]	3.258 [*]	66.804 ^{***}	5.082 ^{**}
	[0.053]	[0.071]	[0.000]	[0.024]
Variance	1.187	1.381 [*]	2.343 ^{***}	36.439 ^{***}
	[0.300]	[0.052]	[0.000]	[0.000]

Notes: All indicators are defined as a share of total liabilities/assets. *p*-values are reported in brackets. *, **, *** denote significance at the 10, 5 and 1 per cent level, respectively.

Table 2: Determinants of Loan Default, January 2000 – June 2005

	P1	P2	P3
Bank loans	0.055** (2.17)	0.066*** (3.06)	0.131*** (6.33)
Earnings before taxation:	-0.320*** (-5.17)	-0.287*** (-6.35)	-0.268*** (-4.96)
Cash and bank accounts	-0.116*** (-3.15)	-0.099*** (-3.31)	-0.117** (-2.37)
Industry, time, and legal form dummies	No	Yes	Yes
Indebtedness level	All	All	High
Number of observations	1496	1496	748
Link Test	-0.62 [0.537]	-0.24 [0.810]	-0.06 [0.953]
Pseudo-R ²	0.134	0.183	0.144
Log-likelihood	-294.587	-278.025	-147.907

Notes: All indicators are defined as a share of total liabilities/assets. The sample with the high level of indebtedness included firms bank loans as a share of total liabilities above the median. The coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables. *z*-statistics computed with robust standard errors adjusted for clustering on two-digit industries are reported in parentheses and *p*-values are reported in brackets. *, **, *** denote significance at the 10, 5 and 1 per cent level, respectively.

Table 3: Sector-Specific Determinants of Loan Default, January 2000 – June 2005

	IND1	IND2	IND3
Bank loans: Agriculture	0.190 ^{***} (4.240)	0.171 ^{***} (3.590)	0.264 ^{***} (2.680)
Bank loans: Industry	0.061 (1.410)	0.037 (0.810)	0.094 ^{**} (2.400)
Bank loans: Construction	0.050 [*] (1.900)	-0.092 ^{**} (-2.520)	0.001 (0.020)
Bank loans: Retail	0.001 (0.030)	0.075 ^{***} (10.100)	0.126 ^{***} (10.190)
Bank loans: Services	0.098 ^{***} (5.620)	0.095 ^{***} (4.690)	0.153 ^{***} (5.220)
Earnings before taxation: Agriculture	-0.285 ^{***} (-9.110)	-0.269 ^{***} (-8.620)	-0.351 ^{***} (-3.730)
Earnings before taxation: Industry	-0.396 ^{***} (-3.610)	-0.370 ^{***} (-3.800)	-0.226 [*] (-1.750)
Earnings before taxation: Construction	-0.113 ^{***} (-6.310)	-0.094 ^{***} (-4.260)	-0.113 ^{**} (-2.340)
Earnings before taxation: Retail	-0.340 ^{***} (-13.330)	-0.303 ^{***} (-15.590)	-0.262 ^{***} (-11.380)
Earnings before taxation: Services	-0.362 ^{**} (-2.570)	-0.338 ^{***} (-2.740)	-0.413 ^{***} (-5.750)
Cash and bank accounts: Agriculture	-0.161 ^{***} (-7.910)	-0.161 ^{***} (-37.350)	-0.237 ^{***} (-6.560)
Cash and bank accounts: Industry	-0.107 [*] (-1.760)	-0.117 [*] (-1.830)	-0.164 [*] (-1.950)
Cash and bank accounts: Construction	-0.095 ^{***} (-6.490)	-0.146 ^{***} (-5.070)	-0.098 ^{***} (-14.690)
Cash and bank accounts: Retail	-0.053 ^{***} (-6.050)	-0.027 ^{***} (-11.780)	-0.013 ^{***} (-4.740)
Cash and bank accounts: Services	-0.074 ^{***} (-2.810)	-0.072 ^{***} (-11.320)	-0.132 ^{***} (-3.810)
Coef. equality test: bank loans	71.73 ^{**} [0.00]	32.48 ^{**} [0.00]	14.18 ^{***} [0.01]
Coef. equality test: earnings before taxation	235.50 ^{***} [0.00]	313.86 ^{***} [0.00]	148.17 ^{***} [0.00]
Coef. equality test: cash and bank accounts	465.57 ^{***} [0.00]	778.39 ^{***} [0.00]	118.63 ^{***} [0.00]
Industry, time, and legal form dummies	No	Yes	Yes
Indebtedness level	All	All	High
Number of observations	1496	1496	748
Pseudo-R ²	0.189	0.198	0.163
Log-likelihood	-275.802	-272.748	-144.713

Notes: All indicators are defined as a share of total liabilities/assets. The sample with the high level of indebtedness included firms bank loans as a share of total liabilities above the median. The coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables. z-statistics computed with robust standard errors adjusted for clustering on two-digit industries are in parentheses. *, **, *** denote significance at the 10, 5 and 1 per cent level, respectively.

Table 4: Time-Varying Determinants of Loan Default, January 2000 – June 2005

	T1	T2	T3
Bank loans: January 2000-June 2001	0.095 ^{***} (2.630)	0.098 ^{***} (2.630)	0.168 ^{**} (0.077)
Bank loans: January 2001-June 2002	-0.010 (-0.180)	0.000 (0.010)	-0.006 (0.107)
Bank loans: January 2002-June 2003	0.027 (0.530)	0.033 (0.740)	0.127 ^{**} (0.065)
Bank loans: January 2003-June 2004	0.069 (1.080)	0.075 (1.410)	0.226 ^{***} (0.079)
Bank loans: January 2004-June 2005	0.106 [*] (1.760)	0.122 ^{**} (2.300)	0.101 (0.058)
Earnings before taxation	-0.100 ^{***} (-3.000)	-0.098 ^{***} (-3.390)	-0.113 ^{**} (0.040)
Cash and bank accounts	-0.309 ^{***} (-6.090)	-0.293 ^{***} (-6.030)	-0.278 ^{***} (0.056)
Coef. equality test: bank loans	15.83 ^{***} [0.00]	17.01 ^{***} [0.00]	8.08 [*] [0.09]
Industry, time, and legal form dummies	No	Yes	Yes
Indebtedness level	All	All	High
Number of observations	1496	1496	748
Pseudo-R ²	0.176	0.185	0.150
Log-likelihood	-280.317	-277.186	-146.927

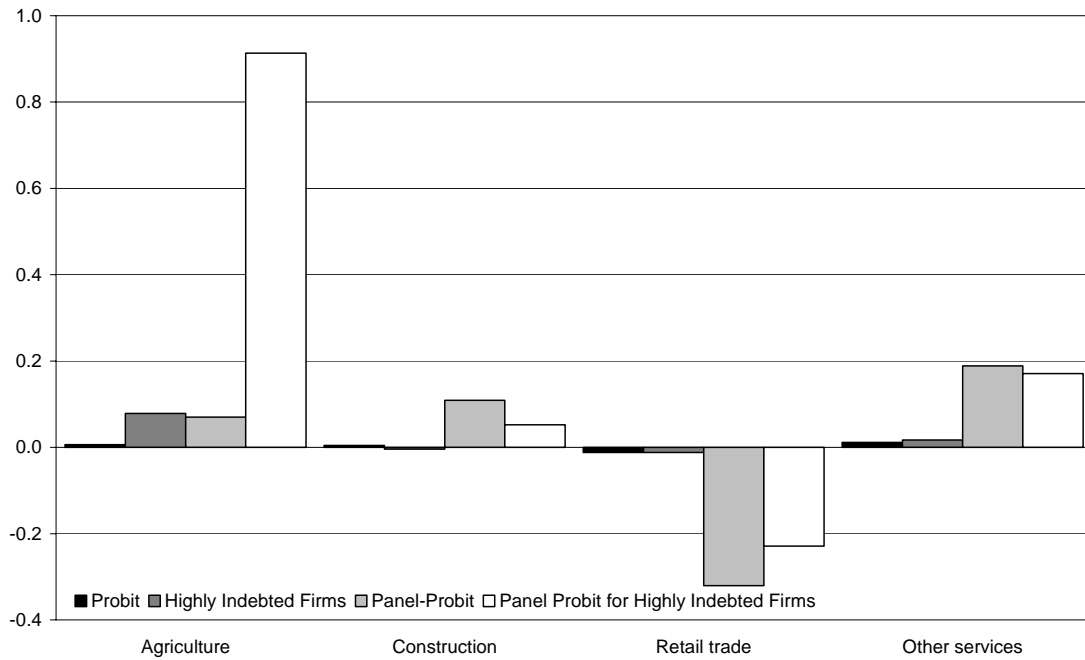
Notes: All indicators are defined as a share of total liabilities/assets. The sample with the high level of indebtedness included firms bank loans as a share of total liabilities above the median. The coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables. z-statistics computed with robust standard errors adjusted for clustering on two-digit industries are in parentheses. *, **, *** denote significance at the 10, 5 and 1 per cent level, respectively.

Table 5: Sensitivity Analysis, Panel Probit, January 2000 – June 2005

	REP1	REP2	REP3
Bank loans	0.791 (1.28)	1.471* (1.82)	2.948** (2.22)
Earnings before taxation	-5.294*** (-5.08)	-6.623*** (-4.90)	-4.865** (-2.36)
Cash and bank accounts	-2.205*** (-3.89)	-2.564*** (-3.81)	-2.392** (-2.38)
Industry, time and legal form dummies	No	Yes	Yes
Indebtedness level	All	All	High
Number of observations	1496	1496	748
Log-likelihood	-284.825	-268.014	-140.546

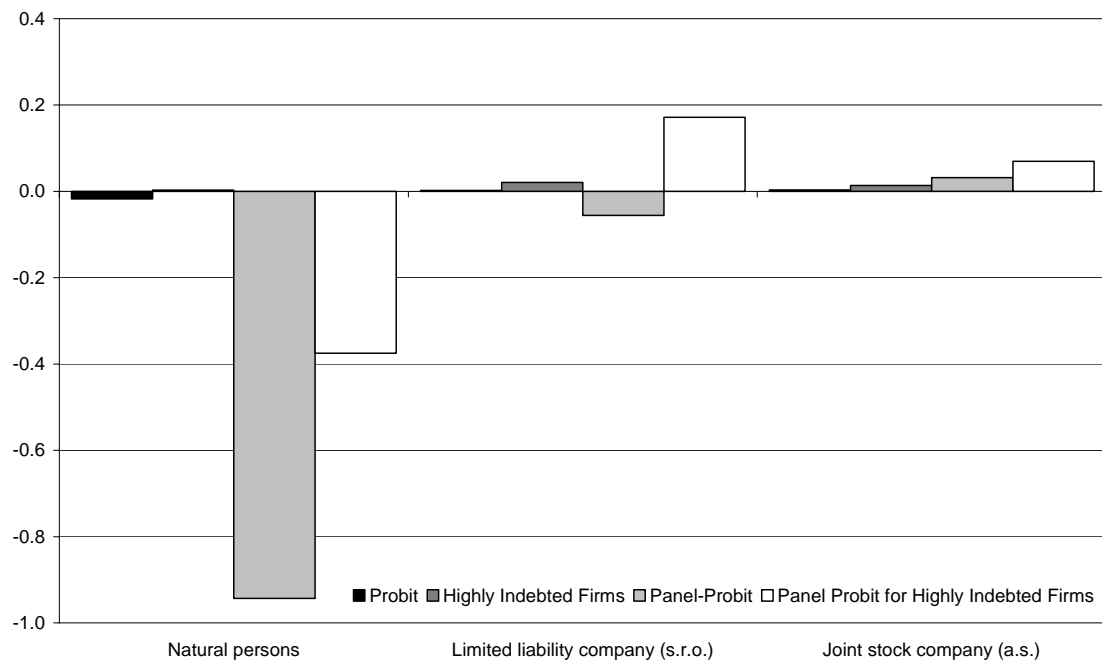
Notes: All indicators are defined as a share of total liabilities/assets. The coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables. The sample with the high level of indebtedness included firms bank loans as a share of total liabilities above the median. z-statistics are reported in parentheses. *, **, *** denote significance at the 10, 5 and 1 per cent level, respectively.

Figure 3: Estimated Sectoral Effects for Selected Specifications



Note: See Table 2, specifications P2, P3, and Table 5 REP2 and REP3 for details on the other explanatory variables. Industry is selected as the reference category. The figure reports changes in the probability for a discrete change in the probability for dummy variables.

Figure 4: Estimated Legal-Form Effects for Selected Specifications



Note: See Table 2, specifications P2, P3, and Table 5 REP2 and REP3 for details on the other explanatory variables. State enterprises and cooperatives are selected as the reference category. The figure reports changes in the probability for a discrete change in the probability for dummy variables.

Ifo Working Papers

- No. 71 Hainz, C. and H. Hakenes, The Politician and his Banker, May 2009.
- No. 70 Röhn, O., S. Orazbayev and A. Sarinzhipov, An Institutional Risk Analysis of the Kazakh Economy, May 2009.
- No. 69 Ziegler, C., Testing Predictive Ability of Business Cycle Indicators, March 2009.
- No. 68 Schütz, G., Does the Quality of Pre-primary Education Pay Off in Secondary School? An International Comparison Using PISA 2003, March 2009.
- No. 67 Seiler, C., Prediction Qualities of the Ifo Indicators on a Temporal Disaggregated German GDP, February 2009.
- No. 66 Buettner, T. and A. Ebertz, Spatial Implications of Minimum Wages, February 2009.
- No. 65 Henzel, S. and J. Mayr, The Virtues of VAR Forecast Pooling – A DSGE Model Based Monte Carlo Study, January 2009.
- No. 64 Czernich, N., Downstream Market structure and the Incentive for Innovation in Telecommunication Infrastructure, December 2008.
- No. 63 Ebertz, A., The Capitalization of Public Services and Amenities into Land Prices – Empirical Evidence from German Communities, December 2008.
- No. 62 Wamser, G., The Impact of Thin-Capitalization Rules on External Debt Usage – A Propensity Score Matching Approach, October 2008.
- No. 61 Carstensen, K., J. Hagen, O. Hossfeld and A.S. Neaves, Money Demand Stability and Inflation Prediction in the Four Largest EMU Countries, August 2008.
- No. 60 Lahiri, K. and X. Sheng, Measuring Forecast Uncertainty by Disagreement: The Missing Link, August 2008.
- No. 59 Overesch, M. and G. Wamser, Who Cares about Corporate Taxation? Asymmetric Tax Effects on Outbound FDI, April 2008.

- No. 58 Eicher, T.S: and T. Strobel, Germany's Continued Productivity Slump: An Industry Analysis, March 2008.
- No. 57 Robinzonov, N. and K. Wohlrabe, Freedom of Choice in Macroeconomic Forecasting: An Illustration with German Industrial Production and Linear Models, March 2008.
- No. 56 Grundig, B., Why is the share of women willing to work in East Germany larger than in West Germany? A logit model of extensive labour supply decision, February 2008.
- No. 55 Henzel, S., Learning Trend Inflation – Can Signal Extraction Explain Survey Forecasts?, February 2008.
- No. 54 Sinn, H.-W., Das grüne Paradoxon: Warum man das Angebot bei der Klimapolitik nicht vergessen darf, Januar 2008.
- No. 53 Schwerdt, G. and J. Turunen, Changes in Human Capital: Implications for Productivity Growth in the Euro Area, December 2007.
- No. 52 Berlemann, M. und G. Vogt, Kurzfristige Wachstumseffekte von Naturkatastrophen – Eine empirische Analyse der Flutkatastrophe vom August 2002 in Sachsen, November 2007.
- No. 51 Huck, S. and G.K. Lünser, Group Reputations – An Experimental Foray, November 2007.
- No. 50 Meier, V. and G. Schütz, The Economics of Tracking and Non-Tracking, October 2007.
- No. 49 Buettner, T. and A. Ebertz, Quality of Life in the Regions – Results for German Counties, September 2007.
- No. 48 Mayr, J. and D. Ulbricht, VAR Model Averaging for Multi-Step Forecasting, August 2007.
- No. 47 Becker, S.O. and K. Wohlrabe, Micro Data at the Ifo Institute for Economic Research – The “Ifo Business Survey”, Usage and Access, August 2007.
- No. 46 Hülsewig, O., J. Mayr and S. Sorbe, Assessing the Forecast Properties of the CESifo World Economic Climate Indicator: Evidence for the Euro Area, May 2007.
- No. 45 Buettner, T., Reform der Gemeindefinanzen, April 2007.