

# Collateral Requirements of SMEs: Evidence from Less Developed Countries

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## Abstract

Access to credit markets, in terms of both the availability and the cost of financing, strongly affects the growth of businesses. Given their dependence on banks for external capital, Small and Medium Enterprises SMEs are particularly exposed to banks' loan conditions. The main goal of our paper was to investigate whether collateral requirements on loans extended to SMEs set in less developed countries refer mainly to firm-specific or market-specific characteristics. We observe that, rather than firm-specific variables, country-specific variables are more important in determining both the presence of collateral in loan contracts and the collateral-to-loan-value ratios. The strongest evidence of our paper addresses the importance of asymmetric information between borrowers and lenders. In countries where lenders have better information about borrowers, both the probability of the presence of collateral and the degree of that collateral decrease in loan contracts. Accordingly, collateral serves as a tool to resolve asymmetric information problems regarding the borrower's quality.

*JEL classification codes:* G21

*Keywords:* Collateral, SMEs, loan conditions

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## 1. Introduction

Access to credit markets, in terms of both the availability and the cost of financing, strongly affects the growth of businesses. Small and medium enterprises (SMEs) are particularly exposed to banks' loan conditions, given their dependence on financial institutions, typically banks, for external capital. Both the information asymmetry between the bank and the firm (Berger and Udell, 1998; Baas and Schrooten, 2006) and the overall banking market structure (Petersen and Rajan, 2002; Berger and Udell, 2006) influence the borrower-bank relationship. The banking relationship is reflected in a loan's characteristics, which include the interest rate charged, guarantees, covenants, and collateral requirements. Financing difficulties can be one of the most important obstacles in starting and running a business, especially in developing and transition economies. As theoretical models acknowledge, the collateral requirements are tighter in developing countries due to more opaque information and weak enforcement (Hainz, 2003; Menkhoff et al. 2006 and 2012). However, evidence addressing the determinants

of collateral for a loan to an SME in an emerging market is scarce. The aim of our paper is to investigate whether the collateral requirement for loans extended to SMEs set in transition countries primarily depends upon firm-specific or market-specific characteristics. According to the World Business Environment Survey (WBES<sup>1</sup>), collateral requirements are referred to as a major financing obstacle by 16% of the firms that require external loans<sup>2</sup>. Similarly, using the WBES, Beck et al. (2006) report that collateral requirements are the third most important obstacle among the 12 financing obstacles that they examined. The Business Environment and Enterprise Performance Surveys (BEEPS) of firms in Eastern Europe and Central Asia highlight that high collateral requirements are the fourth most important reason why firms are not applying for external loans, with an importance that ranked immediately below those of the complexity of application processes and high interest rates<sup>3</sup>. Therefore, collateralisation appears to be a crucial aspect of a firm's access to external finance, which access can determine the eventual disappearance or survival of a firm.

A wide body of literature refers to collateral requirements as a tool that can reduce the cost of external funds for firms in the presence of agency problems and decrease credit rationing (e.g., Bester 1987; Coco 1999; Berger et al. 2011b; Jiménez et al. 2011)<sup>4</sup>. Bester (1985) and Besanko and Thakor (1987a) demonstrated that, for situations in which the joint use of collateral and interest rates is employed, rationing disappears in a competitive credit market. Bester (1987) implies that rationing occurs only if certain borrowers cannot provide sufficient collateral. Jiménez et al. (2011) establish that both the use of collateral and the market concentration increase the availability of credit for firms affected by information asymmetries. In developing countries, where borrowers' probability of holding collateralisable assets is relatively low and collateral requirements are higher, firms are more likely to have problems in accessing external financing (Menkhoff et al. 2006 and 2012). The empirical literature on collateralisation is largely concentrated on developed countries, whereas only a few studies examine this issue for less developed and transition economies. As an example of the studies on developing economies, Feder et al. (1988) emphasise the role of collateral in decreasing the cost of creditworthiness assessments for the lenders and

<sup>1</sup> The WBES is a survey conducted by the World Bank Group over 10,000 firms in 80 countries with the aim of evaluating business conditions in a uniform way for a cross-regional set of member countries. Based on face-to-face interviews with firm managers/owners, WBES assesses both the constraints affecting enterprise, which can depend on firm size and ownership, and the business environment, in terms of the local economic policy, corruption, the judiciary system, lobbying, market transparency, the regulatory environment, infrastructure, financial barriers, and services to businesses.

<sup>2</sup> See Table A of the Appendix.

<sup>3</sup> See Table B of the Appendix for a detailed picture.

<sup>4</sup> For a review of recently growing empirical research on collateral as a remedy for credit rationing, see Steijvers and Voordeckers (2011).

thereby increasing credit supply in rural Thailand<sup>5</sup>. Using firm-level data from Mexico, Gelos and Werner (2002) address the importance of collateral in the form of real estate for investments by firms, especially after the financial liberalisation of that nation. Caballero and Krishnamurthy (2001) relate the incidence of crises in developing economies to shortages of international collateral<sup>6</sup>.

The aim of our paper is to understand the determinants of both (i) the presence of collateral in loan contracts and (ii) the collateral-to-loan-value ratios for SMEs that are located in less-developed countries. Our primary data source is The Business Environment and Enterprise Performance Survey (BEEPS). Our data set provides deep and detailed information, not only regarding borrower firms but also concerning firms' perceptions of the business environment in which they operated. As there have been few empirical studies that use this type of survey data, and there is a consequent dearth of empirical data regarding collateral for less-developed and transition economies, our study yields important policy implications for businesses and financial institutions. Moreover, to the best of our knowledge, few other studies on SMEs in less-developed markets focus on the collateral-to-loan-value ratio<sup>7</sup>. Additionally, most available research into collateral requirements is conducted within a single country, whereas we perform a cross-country analysis. In particular, by specifically analysing loans extending to SMEs and using BEEPS data, we aim to investigate how important the firm- and country-specific factors are by testing the following: (i) whether higher borrower quality reduces the collateral-to-loan-value ratio; (ii) whether the possibility of information sharing among lenders can decrease collateralisation; and (iii) to what extent lending-market and macroeconomic conditions affect the presence of collateral in loan contracts.

The rest of the paper is organised as follows. Section 2 reviews the theoretical and empirical literature addressing collateral requirements. The tested hypotheses and the empirical model are introduced in Section 3. Data and descriptive statistics are presented in Section 4. The results of the model's estimates are discussed in Section 5, and conclusions follow in Section 6.

<sup>5</sup> Using data from Thailand, Menkhoff et al. (2012) show that lack of collateral is resolved by using substitutes for collateral, such as relationship-lending, modification of loan terms (e.g., reducing the loan size), and including third-party guarantees.

<sup>6</sup> In their theoretical model, international collateral determines the amount of financing that foreign investors extend to these firms. As an example of international collateral, they consider export sector revenues that international investors can seize in the event of loan default. For domestic collateral, they provide the example of real estate.

<sup>7</sup> For a review of empirical research on the degree of collateral, see Menkhoff et al. 2006.

## 2. Literature review

A wide body of theoretical literature addresses collateral as a tool to resolve informational asymmetry problems regarding the borrower's quality, in the context of either ex-ante adverse selection or ex-post moral hazard issues. According to the adverse selection hypothesis, collateral acts as a signalling tool for the borrower's creditworthiness (Stiglitz and Weiss, 1981; Bester, 1985; Besanko and Thakor, 1987a; Chan and Kanatas, 1985; Chan and Thakor, 1987; Boot et al., 1991). The bank screens firms by offering both loan contracts with higher collateral and lower interest rates and loan contracts with lower collateral and higher interest rates. Even if risk factors cannot be readily observed, lower-risk borrowers will pledge more and better collateral than riskier ones, given that the lower the risk, the lower the likelihood of losing the collateral, and thus the less costly this pledge becomes. According to the moral hazard hypothesis, the probability of losing collateral acts as a disciplinary tool for the borrower. The pledging of collateral leads to a higher level of effort to satisfy loan conditions, thus reducing the borrower's default probability. In this sense, collateral serves as a tool to resolve moral hazard problems (Aghion and Bolton, 1992, Boot et al., 1991; Boot and Thakor, 1994; Holmstrom and Tirole, 1997). To provide support for these two divergent hypotheses regarding the role of collateral, empirical studies investigated whether a reduction in asymmetric information impacts collateral decisions. As noted by Godlewski and Weill (2011), a lack of substantial empirical support for the adverse selection hypothesis in the use of collateral is evident. Consequently, although several studies support the role of collateral as a tool to mitigate adverse selection problems (Jiménez et al., 2006; Berger et al. 2011b), others (Cressy and Toivanen, 2001) find evidence that risk and collateral are not significantly correlated. Instead, a positive relation between collateral and the loan spread is consistently demonstrated: that is, as banks are able to distinguish borrowers' quality, they charge higher interest rates and require higher collateral for riskier borrowers, thus confirming the observed-risk hypothesis (Berger and Udell, 1990; Berger and Udell, 1995; Jiménez and Saurina, 2004; Gonas et al., 2004; Chen, 2006, Menkhoff et al., 2006; Chakraborty and Hu, 2006; Brick and Palia, 2007)<sup>8</sup>. Within this debate, several authors indicate that both hypotheses might be empirically validated and reconciled through consideration of the degree of information asymmetries present in a country. The observed-risk hypothesis tends to empirically dominate when asymmetric information is low (Berger et al., 2011a; Godlewski and Weill, 2011). A recent study of Steijvers and Voordeckers (2011) suggests several explanations for why results may differ across

<sup>8</sup> A recent study by Niinimäki (2011) yields a new insight on the decision to post collateral. That study reveals that the choice between unsecured and secured lending of high-risk borrowers depends on the expectations of the change in value of the collateral in question. In particular, borrowers are more likely to choose secured loan contracts if they expect a depreciation in the value of their collateral.

various empirical studies.<sup>9</sup>

Several studies assume that the strength of the lender–borrower relationship is an inverse proxy for the degree of asymmetric information (for an overview, see, e.g., Boot, 2000). In particular, the stronger this relationship, the more reliable the borrower’s risk information becomes, and thus the more favourable are the terms of the loan contract that results (Boot and Thakor, 1994; Petersen and Rajan, 1995)<sup>10</sup>. However, another stream of literature predicts that a strong relationship may induce the banks to exploit their information monopoly and extract a rent by requiring more collateral (Sharpe, 1990). Empirical research show that the variables employed as proxies for the strength of the relationship can affect the empirical results. If measuring this strength by the duration of the relationship, several studies find no significant effect between the duration of bank–firm relationships and the pledging of collateral (Menkhoff et al., 2006) or report a positive effect (Machauer and Weber, 1998; Ono and Uesegi, 2009, Uchida, 2011). However, the majority of empirical studies find a negative relationship between these two variables (Berger and Udell, 1995; Harhoff and Körting, 1998; Degryse and Van Cayseele, 2000; Chakraborty and Hu, 2006; Jiménez et al., 2006; Brick and Palia, 2007). Empirical studies have related the strength of the bank–borrower relationship to the number of banks with which the borrower has transactions and assumed that the more exclusive the relationship is, the stronger it is; however, the results from these studies are conflicting. Investigations by Harhoff and Körting (1998), Chakraborty and Hu (2006), and Jiménez et al. (2006) find a negative relationship, demonstrating that relationships with multiple banks increase the probability of pledging collateral in a loan. By contrast, studies by Machauer and Weber (1998), Menkhoff et al. (2006), Voordeckers and Steijvers (2006) and Hernández-Cánovas and Martínez-Solano (2007) report a positive relationship, suggesting that relationships with multiple banks lower the probability of collateral pledging.

The “lender-based” theory of collateral assesses the presence of collateral in loans by considering two different banks in the credit market: one local bank, which benefits from possessing an information advantage on the borrower and another bank, which is distant from the borrower but introduces competition in the local market (Inderst and Mueller, 2007). In such cases, studies reveal that collateral allows the local lenders to profit from their superior information advantage; for instance, empirical research by Jiménez et al. (2009) indicates that the use of collateral is higher for loans granted by

<sup>9</sup> They argue that the most relevant limitations in empirical research consist of (i) the exclusion of other information opaqueness reducing tools, such as the strength of the borrower–lender relationship, loan maturity and covenants, and (ii) the ignoring of the moderating or interaction effects between the different tools that mitigate informational asymmetries.

<sup>10</sup> However, it must be noted that access to private information by the lender can lead to conflicting predictions of the required collateral, given that the information on the borrower’s quality can be either favourable or unfavourable.

local lenders<sup>11</sup>. Other researchers investigate the relationship between the different types of lender or loan and the pledging of collateral. The results from all of these studies have relevance to asymmetric information theories and/or the relationship issue. Chakraborty and Hu (2006) indicate that non-line-of-credit loans are less likely to be collateralised if borrowers use more services. Jiménez and Saurina (2004) conclude that for savings banks, which face the greatest adverse selection, collateral appears to be an effective device for decreasing borrower risk. Uchida (2011) finds that, compared with large banks, small banks place greater emphasis on both the ability to pledge collateral and on the lending relationship. However, Voordeckers and Steijvers (2006) conclude that firm and relationship characteristics are more important determinants of collateral than loan and lender characteristics.

Another stream of literature investigates the role played by market competition in collateralisation. An initial theoretical view argues that, as bank competition increases, the bank's incentive to invest in information collection diminishes, as there is a high probability of borrowers switching to other banks. The bank's power to extract rent is reduced, thus increasing the likelihood of the use of collateral (Besanko and Thakor, 1987; Petersen and Rajan, 1995). From an empirical perspective, by assuming a negative relationship between competition and loan market concentration, Jiménez et al. (2006a) find support for the negative relationship between the use of collateral and the loan market concentration<sup>12</sup>, thus suggesting that collateral and a bank's market power appear to be substitutes. A second theoretical view asserts that bank competition may induce banks to focus even more deeply on relationship lending, which can alleviate the price competition pressures, as a client-driven lending system can help a bank become more unique relative to its competitors (Boot and Thakor, 2000; Berlin and Butler, 2002). Voordeckers and Steijvers (2006) empirically show that, if a company introduces a credit request with more banks, it diminishes the likelihood that the company will grant any kind of collateral in the eventual loan. Finally, in Berger et al. (2011b), lending market concentration does not appear to have a significant effect on the use of collateral.

Moreover, the existing literature also explores whether collateral requirements help to reduce the cost of external funds and credit rationing<sup>13</sup>. Additionally, an extensive literature analyses whether collateral requirements should improve a bank's monitoring

<sup>11</sup> They define the organisational distance as the distance between top decision-making power and the operating branches serving customers in local markets and physical distance as the distance between borrowers and banks.

<sup>12</sup> However, the authors find that credit market concentration does not change the effect that relationship duration has on the likelihood of collateral use.

<sup>13</sup> Bester, 1985; Besanko and Thakor, 1987a; Feder et al., 1988; La Porta et al., 1997; Coco 1999; Gelos and Werner, 2002; Berger et al. 2011b; Jimenez and Saurina, 2011; Menkhoff et al. 2011. For a review of recently empirical research on collateral as a remedy for credit rationing, see Steijvers and Voordeckers (2011).

activity<sup>14</sup>. Empirical research supporting these theories is recent<sup>15</sup>. To conclude, the theoretical literature additionally analyses (i) the existence of a “collateral channel”, through which a large decline in asset markets adversely affects the value of collateralisable assets and the real economy<sup>16</sup>; and (ii) how collateral affects recovery rates within the Basel II framework.<sup>17</sup>

### 3. The hypotheses and the empirical model

We seek to investigate how collateral requirements are related to a borrower’s characteristics and/or to credit market features. The collateral requirement of a loan is measured not only by the presence of collateral, but also by the ratio of collateral to loan value. Regarding borrower characteristics, we analyse whether the risk profile of the borrower positively affects the collateral requirement (hypothesis 1). Regarding market features, we investigate how the presence of asymmetric information (hypothesis 2) and the concentration of the bank market (hypothesis 3) affect the presence of collateral in loans and the ratio of collateral to loan value. Thus, in accordance with the literature surveyed above, the following hypotheses will be tested.

#### 3.1. The hypotheses

**H1** *As the default risk of borrowers increases, the presence of collateral in SME loan contracts is more likely, and collateral-to-loan ratios are higher for these high-risk borrowers*

According to the observed-risk hypothesis, observable higher-risk borrowers will more likely be required to provide collateral for loans, to defray the costs of the lender in case of a default (Leeth and Scott, 1989; Berger and Udell, 1990; Jimenez and Saurina, 2004; Chen, 2006; Niinimäki, 2011). In a hidden-action scenario, collateral can serve as a means of aligning the interests of both the lender and the borrower, thus acting as a deterrent for the borrower to assume opportunistic, risk-shifting behaviours that can hinder the success of the project that uses the borrowed funds (Boot et al., 1991; Boot and Thakor, 1994; Holmstrom and Tirole, 1997). The credible threat of losing collateral (Aghion and Bolton, 1992) disciplines the borrower’s actions by producing a higher level of effort to satisfy loan requirements and thus reducing the

<sup>14</sup> Berglöf and von Thadden, 1994; Rajan and Winton, 1995; Holmstrom and Tirole, 1997; Repullo and Suarez, 1998; Gorton and Kahn, 2000; Longhofer and Santos, 2000; Park, 2000; Manove et al., 2001.

<sup>15</sup> Voordeckers and Steijvers, 2006; Cerqueiro et al., 2011; Ono and Uesugi, 2009; Bharath et al., 2011.

<sup>16</sup> Mattesini, 1990; Kiyotaki and Moore, 1997; Feder et al., 1988; Krishnamurthy, 2003; Gan, 2007; Niinimäki, 2009; Benmelech and Bergman, 2011.

<sup>17</sup> Jokivuolle and Peura, 2003; Hui et al., 2006; Chalupka and Kopecsni, 2009; Grunert and Weber, 2009; Altman and Kalotay, 2010.

borrower’s default probability. We expect to find evidence of a positive relationship between the risk of the SMEs and the collateral requirements to which they are subjected, particularly given the even higher perceived risk of small and medium businesses in less developed countries.

**H2** *The collateral requirements in SME loan contracts become softer as the information gap between borrowers and lenders decreases*

In less-developed countries, we expect that the higher information asymmetries that often derive from the presence of less-developed financial institutions lead to more severe credit risk measurement difficulties. As a consequence, greater opaqueness regarding borrowers’ characteristics results in a higher probability of collateral requirements and a greater degree of collateral needed for any given loan. We expect, therefore, positive relationships between the information gap and both the presence of collateral in loans and the collateral-to-loan ratio.

**H3** *The likelihood of requiring collateral and the degree of collateral in SME loan contracts are positively associated with banking concentration*

Several literature sources assert that higher banking concentration is expected to decrease the collateral requirements. By assuming a negative relationship between competition and concentration, empirical research on a sample of bank loans in 70 countries by Hainz et al. (2008) demonstrated that the presence of collateral is more likely in more concentrated loan markets. In accordance with this finding, we expect to discover a positive relationship between the concentration of the credit markets and both the presence of collateral in loans and the magnitude of the collateral-to-loan-value ratio. The demonstration of such a relationship would suggest that collateral and a bank’s market power could be complementary features that vary inversely with each other. As we expect that in less developed countries, the banking sector is less developed and competitive than it is in developed countries, we assume that oligopolistic banks in less-developed countries will extract rents by frequently requiring collateral and mandating higher collateral to loan ratios.

### *3.2. The model*

Two types of dependent variables are used in the study. We first use the presence of collateral, which is expressed by a dummy variable that equals one if the most recent loan or line of credit required collateral, and zero otherwise ( $COLL_1$ ). The information for this dependent variable  $COLL_1$  is extracted in the form of “yes” or “no” as an answer to the following question: “Referring only to this most recent loan or line of credit, did the financing require collateral?” We secondly use a continuous variable, which is the percentage of collateral relative to loan value ( $COLL_2$ ). To determine  $COLL_2$ , the answers of firms to the following question are used: “Referring only to this



most recent line of credit or loan, what was the approximate value of the collateral required, as a percentage of the value of the loan or line of credit?”<sup>18</sup>

**Table 1:** Variables definition and sources

<b>Variable</b>	<b>Definition</b>	<b>Source</b>
<b>LHS variables</b>		
<i>COLL1</i>	Dummy=1 if the firm has pledged collateral to obtain an external loan, and zero otherwise.	BEEPS
<i>COLL2</i>	The ratio of collateral value to loan size (%)	BEEPS
<b>RHS variables</b>		
<b>Borrower characteristics</b>		
<i>AGE</i>	The number of years that the firm has been operating	BEEPS
<i>SIZE</i>	The size of the firm, as measured by the number of fulltime employees.	BEEPS
<i>LNEMPDIFF</i>	The natural logarithm of the difference between the number of fulltime employees in the survey year and the number of fulltime employees three years prior to the survey year.	BEEPS
<i>QUALITY</i>	Dummy=1 if the firm has an internationally recognised quality certification, such as ISO9000 or ISO9002, and zero otherwise.	BEEPS
<i>INNOVATION</i>	Dummy=1 if the firm has introduced new products or services, and zero otherwise.	BEEPS
<i>CRIME</i>	=0 if crime, theft and disorder are no obstacle to the current operations of the firm, =1 if these factors are a minor obstacle, =2 if they are a moderate obstacle, =3 if they are a major obstacle, or =4 if they are a very severe obstacle.	BEEPS
<i>OVERDUE_ UT IL</i>	Dummy=1 if the firm has utility payments overdue by more than 90 days, and zero otherwise.	BEEPS
<i>FEMALE</i>	Dummy=1 if the firm has at least one female owner.	BEEPS
<i>CITY</i>	Dummy=1 if the firm is located in the capital or in a city with population over one million, and zero otherwise.	BEEPS
<b>Information sharing (country level)</b>		
<i>PRVTBR</i>	The percentage of individuals or firms listed by a private credit bureau with current information regarding repayment history, unpaid debts, or credit outstanding to the adult population.	WB
<i>PUBREG</i>	The percentage of individuals and firms listed in a public credit registry with current information regarding repayment history, unpaid debts, or credit outstanding to the adult population.	WB
<b>Lender market characteristics (country level)</b>		
<i>CR</i>	The asset share of the three largest banks within the commercial banks of the country as a measure of concentr. in banking (%).	Beck et (2009)
<i>BRKM</i>	The number of commercial bank branches per 1,000 km.	IMF
<i>BRPC</i>	The number of commercial bank branches per 100,000 adults.	IMF
<i>FOREIGN</i>	The asset share of foreign banks in total banking system assets (%).	EBRD
<i>STATE</i>	The asset share of state-owned banks in total banking system assets (%).	EBRD
<b>Macroeconomic variables</b>		
<i>LNGDPPC</i>	The natural logarithm of the GDP per capita in US dollars.	EBRD
<i>GOVDEBT</i>	Government debt (% of GDP)	EBRD

<sup>18</sup> See Tables F and G in the Appendix for the survey questions used in our analysis.

We model these two firm-level dependent variables as functions of firm-specific and country-specific variables. To test our hypotheses, we grouped the determinants of collateral existence in loan contracts and the collateral-to-loan-value ratios into four categories: firm characteristics<sup>19</sup>, the availability of information on borrowers, banking market characteristics<sup>20</sup>, and macroeconomic variables<sup>21</sup>. The precise definitions of each variable in these four categories are provided in Table 1. The first empirical model tests the presence of collateral in loan contracts using the following model (1).

$$\text{prob}(COLL_1 = 1) = f(\textit{Firm\_Characteristics}, \textit{Information\_Sharing}, \textit{Lender\_Market\_Characteristics}, \textit{Macro}) \quad (1)$$

As an initial step towards estimation of the first model, the logit technique is used. The coefficient estimates of  $\beta$ s provide the change in the log-odds (the logarithm of relative probabilities) of the outcome, which in this case is  $COLL_1 = 1$ , for a one-unit increase in the independent variable, holding all other independent variables constant. It should be noted here that our sample contains reasonable representations of both alternative choices.

Using the same explanatory variables, the second empirical model aims to estimate the determinants of the collateral value to loan size ratio. The degree of collateral, expressed as the percentage of collateral value relative to the loan size ( $COLL_2$ ), is used as the dependent variable in this second set of estimates. To estimate the determinants of this variable, we used the Tobit model rather than standard OLS estimation, as the Tobit model is appropriate for estimating linear relationships between variables if there is censoring in the dependent variable. In this case, the percentage of the collateral value relative to the loan size must be greater than zero, as otherwise, the firm has not pledged collateral; thus, our empirical model in which  $COLL_2$  is the dependent variable remains censored accordingly.

$$COLL_2 = f(\textit{Firm\_Characteristics}, \textit{Information\_Sharing}, \textit{Lender\_Market\_Characteristics}, \textit{Macro}) \quad (2)$$

To test the first hypothesis, we use seven firm-specific variables. Of these seven variables, five variables are used as proxies for borrower quality. *SIZE* stands for the size of the firms and is measured by the number of full-time employees. *AGE* is the number of years that the firm has been operating. *LNEMPDIFF* is the natural logarithm of the difference between the current number of employees and the number

<sup>19</sup> These variables account for borrower quality, allowing us to test the first hypothesis.

<sup>20</sup> Because the majority of loans are borrowed from banks, we consider banking sector characteristics to be a proxy for lending market characteristics. This group of variables serves to test for the third hypothesis.

<sup>21</sup> This set of variables accounts for business cycles and are used as country-level control variables.

of employees present three years before the survey was conducted. *QUALITY* and *INNOV* are dummy variables that account for borrower quality. *QUALITY* is set equal to one if the firm has an internationally recognised quality certification, such as ISO9000 or ISO9002, and zero otherwise. *INNOV* is set equal to one if the firm has introduced new products or services, and zero otherwise. As higher values of these variables reflect greater borrower quality, we expect negative coefficients for these variables. Of the seven firm-level variables, two variables are employed as inverse proxies for borrower quality: *CRIME* and *OVERDUE\_UTIL*. *CRIME* is set equal to zero if crime, theft, and disorder are no obstacle to the current operations of the firm, one if they are a minor obstacle, two if they are a moderate obstacle, three if they are a major obstacle, and four if they are a very severe obstacle. *OVERDUE\_UTIL* is a dummy variable, which is set equal to one if the firm has utilities payments overdue by more than 90 days, and zero otherwise. We expect lenders to be less willing to lend to a firm if that firm has unpaid utility bills or if the firm is located in environments where criminal activities are intense. Accordingly, lenders are more likely to implement more stringent loan conditions for these firms, including higher collateral requirements. Thus, we expect a positive association between our dependent variables and these two metrics of borrower riskiness. We also examine two firm-level control variables: *FEMALE* and *CITY*. *FEMALE* is a dummy variable that is set equal to one if there is at least one female among the firm's owners. Previous studies show that, due to the weaker entrepreneurial relationships with bankers caused by sexual stereotyping and discrimination, women are more likely to face higher interest rates and stricter conditions in loan contracts even if there is no difference in the objective riskiness or situation between the male and female borrowers in question (Carter and Rosa, 1998; Alesina et al. 2009; Bellucci et al. 2009, Beck et al. 2011). Accordingly, we can expect greater collateral requirements for female entrepreneurs. It should be noted, however, that there is another body of literature that considers women to be better borrowers than men. This result is mostly attributed to women's difficulty in accessing credit, which reduces their risk of moral hazard. Accordingly, female borrowers have lower default rates than male borrowers<sup>22</sup>. *CITY* is a dummy variable which is set equal to one if the firm is located in the capital or in a city with population over one million, and zero otherwise. We expect loan contract conditions to be more lenient in larger cities because financial centres are mostly located in these cities. Thus, we expect a negative correlation between this variable and the dependent variables.

As information regarding borrower-lender relationships is not available in this survey, we use two different country-level variables to test our second hypothesis. We use the percentage of individuals or firms listed by a private credit bureau with current

<sup>22</sup> See D'Espallier et al. (2011) for a review of the literature regarding the gender effect on default rates in micro-finance institutions.

information on repayment history, unpaid debts, or credit outstanding to the adult population (*PRVTBR*). In addition to this variable, we use a measure of public credit registry coverage (% adults), which gives the percentage of individuals and firms listed in a public credit registry with current information on repayment history, unpaid debts, or credit outstanding (*PUBREG*). A public registry is a database owned by public authorities, such as the Central Bank or Banking Supervisory Authority, that collects information regarding the standing of borrowers in the financial system and makes it available to financial institutions. Because lenders are less strict with borrowers for whom they have better information, we expect negative coefficients for these variables.

To test our third hypothesis, we again use country-level variables that provide information about the structure of the banking system. We use the asset share of the three largest banks (*CR*) within the commercial banks to act as a proxy for competition in the lending market. Secondly, we use the number of commercial branches per 1,000 km<sup>2</sup> (*BRKM*) and per 100,000 adults (*BRPC*) to account for branch penetration. As foreign banks frequently face difficulties in evaluating subjective information about borrowers, they mostly use objective information and standardised decision techniques in their lending decisions, whereas domestic banks are more apt to use soft information and long-term relationships (Berger and Udell, 1995; Berger et al. 2001; Petersen and Rajan, 2002). As Berger and Udell (2006) indicate, state-owned lenders frequently use government support in the form of subsidies to supply additional credit to SMEs, generally for political purposes. Accordingly, they are expected to help the firms that they lend to by easing collateral requirements. We use the asset share of foreign banks and state-owned banks in total banking system assets (as a percentage) as a measure of ownership structure in lending markets and expect a positive coefficient for *FOREIGN* and a negative coefficient for *STATE* when relating these two variables to our dependent variables.

Finally, to control for the changes in the macroeconomic conditions in the countries, we use two different variables. One, *LNGDPPC*, is the natural logarithm of the per capita gross domestic product. As *LNGDPPC* increases, we expect the presence of collateral to decrease due to possible credit expansion and more lenient loan conditions, which would also result in lower collateral to loan value ratios. Secondly, we consider Government Debt (*GOVDEBT*) as a substitute for bank lending to firms. In this context, as *GOVDEBT* increases, firms are more likely to face strict loan conditions. Accordingly, *GOVDEBT* can also have important effects on collateralisation.

#### **4. Data and descriptive statistics**

The primary data set used in this study is BEEPS, which is a joint project of the EBRD and the World Bank Group (the World Bank). These surveys are promulgated

through 27 countries of Eastern Europe and Central Asia (including Turkey) to assess the local environments for private enterprise and business development<sup>23</sup>. The BEEPS sample is selected using stratified random sampling. Three levels of stratification were used in all countries: industry, establishment size and region. In all countries, the sample was stratified along manufacturing, retail trade and other services. Size stratification was defined using the standardised definition: small (less than 19 permanent, full-time employees), medium (20 to 99 permanent, full-time employees), and large (more than 99 permanent, full-time employees). In several of the countries, there were specific target numbers of interviews for more detailed sector and size categories within these three groups<sup>24</sup>.

**Table 2:** Summary statistics

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<i>COLL1</i>	8,299	0.794	0.404	0	1
<i>COLL2</i>	5,814	148.03	98.92	1	2,000
<i>SIZE</i>	8,299	26.97	23.83	1	99
<i>AGE</i>	8,259	12.92	11.07	0	165
<i>LNEMPDIFF</i>	4,063	1.81	1.043	0	4.49
<i>QUALITY</i>	8,239	0.204	0.403	0	1
<i>INNOV</i>	7,520	0.471	0.499	0	1
<i>CRIME2</i>	7,993	1.11	1.250	0	4
<i>OVERDUE_UTIL</i>	7,014	0.053	0.225	0	1
<i>FEMALE2</i>	6,237	0.326	0.469	0	1
<i>CITY</i>	8,299	0.129	0.335	0	1
<i>PRVTBR</i>	8,299	32.96	31.25	0	100
<i>PUBREG</i>	8,299	10.83	14.47	0	57.2
<i>CR</i>	7,840	64.67	20.78	11	100
<i>BRKM</i>	5,892	15.94	16.23	0.2	55.9
<i>BRPC</i>	5,742	22.57	23.07	3.5	91.9
<i>FOREIGN</i>	7,714	55.02	33.29	4.4	99.4
<i>STATE</i>	7,442	13.74	16.96	0	77.9
<i>LNGDPPC</i>	8,032	8.531	0.882	5.272	10.10
<i>GOVDEBT</i>	7,089	32.91	18.32	4.6	106.9

We argue that this data set has a number of advantages relative to the data sets used in previous studies. Most importantly, it enables us to extract valuable information regarding not only firm characteristics but also firms' perceptions about

<sup>23</sup> Albania, Belarus, Georgia, Tajikistan, Turkey, Ukraine, Uzbekistan, Russia, Poland, Romania, Serbia, Kazakhstan, Moldova, Bosnia, Azerbaijan, Macedonia, Armenia, Kyrgyz, Estonia, Czech Republic, Hungary, Latvia, Lithuania, Slovakia, Slovenia, Bulgaria, Croatia, and Montenegro. Surveys were conducted in 2002, 2005, 2007, 2008 and 2009. Each year 6153, 10421, 1952, 3375, and 7815 firms were surveyed, respectively.

<sup>24</sup> See BEEPS Reports on methodology and observations for information on stratification on regions and for more details on sampling. <http://www.ebrd.com/pages/research/analysis/surveys/beeps.shtml>.

financial and business environments, aiding our empirical analysis. Moreover, the data include firms in the rural areas as well as large cities. Thus, these data enable us to analyse diverse firms in a large number of countries.

To choose our final sample, we conduct a number of data cleaning processes<sup>25</sup>. At the end of this cleaning procedure, we obtained a sample of 11,943 observations. In accordance with the firm size definition of BEEPS, we define firms that have less than 19 permanent, full-time employees as small firms, and we define medium sized firms as those with between 20 and 99 permanent, full-time employees. Out of 11,943 firms in the cleaned sample, 8,299 are SMEs, and the results from these firms comprised our final sample. Out of 8,299 firms that have an external loan, 6,590 firms had collateral in their loan contracts. The ratio of the collateral to the loan value was 148% on average, with a standard deviation of nearly 98%<sup>26</sup>. Our data show that collateral was present in loan contracts for 78% of the loans from private commercial banks, whereas state owned banks and government agencies required collateral for 75% of the loans that they granted. This figure decreases to 56% for the loans granted by the non-bank financial institutions, which include microfinance institutions, credit cooperatives, credit unions, and finance companies<sup>27</sup>. Land and buildings of the borrowing firm are the most preferred type of collateral, whereas machinery and equipment are the secondary choice for collateral in loan contracts<sup>28</sup>. Table 2, as observed above, provides more detailed summary statistics of the variables used in our empirical analysis.

## 5. Estimation results

Table 3 reports the estimation results for the underlying parameters of the econometric models presented in the previous section. The first panel of Table 3 indicates the logit model estimation results of the first empirical model, using the

<sup>25</sup> First, we exclude the unreliable observations from our sample. To decide on the reliability of an observation, we use the answers of the interviewers regarding their opinions and perceptions of the responses. If the interviewer reports that responses to the questions are not truthful, we exclude those observations. We also exclude the observations for which the interviewer reported that “the responses to the questions regarding figures are arbitrary and unreliable numbers”. Secondly, we exclude any repeated observations from the same firm until we have a pure cross-sectional sample. Certain observations that are not given a panel ID number remained in the sample, however, as it is unclear if these are duplicated. We then exclude the firms that have been surveyed in more than one year. In particular, we first exclude the firms that do not report the *COLL2*. If the firm reported *COLL2* in both years, we excluded the observation from the year that at least one of the explanatory variables was missing and the data from year 2009. If the observations are complete with all explanatory variables for more than one year, we arbitrarily excluded the observation from the year 2002.

<sup>26</sup> In the whole sample, the mean value of the collateral to the loan value was 144%, with a standard deviation of 94%.

<sup>27</sup> See Table E in the Appendix for the figures.

<sup>28</sup> See Table D in the Appendix.

probability of the presence of collateral in loan contracts ( $COLL_1$ ) as the dependent variable<sup>29</sup>. The second panel of Table 3 presents the estimation results of Tobit model, using collateral to the loan value ratio ( $COLL_2$ ) as the dependent variable. We chose not to employ the highly correlated explanatory variables in the same model to avoid multicollinearity bias. Nine columns of estimations are thus produced for each estimation panel.

< Table 3 here >

For the first hypothesis, our estimation results yield a positive and significant coefficient for *SIZE* when the dependent variable is  $COLL_1$ , which contradicts our expectations. However, this finding can be explained by considering the notion that because small firms do not have collateralisable assets, they conduct business with lenders with whom they have a relationship, such as their families or microfinance institutions. Such lenders would not typically require collateral. *SIZE* does not have a significant effect on the dependent variable  $COLL_2$ . *AGE* has a positive and significant relationship with  $COLL_2$ , which implies that once older firms received a loan that requires collateral, they agree to higher collateral-to-loan-value ratios. As for *LNEMPGROWTH*, the presence of collateral in loan contracts is more likely for growing firms. As with *SIZE*, this result can be attributable to the lender type sought out by the borrower. In this case, firms whose growth rates are low mostly borrow from sources that do not require collateral. *INNOV*, *QUALITY* and *OVERDUE\_UTIL* do not have significant impacts on either the presence of collateral or the collateral to loan ratio.

Regarding firm-level control variables, firms in bigger and capital cities are less likely to have loan contracts that require collateral. The collateral-to-loan-value ratios are also lower for these firms, as observed in Panel B of the estimations. This result may be attributed to the fact that financial centres are mostly located in larger and capital cities, allowing firms greater access to loans with lower collateral-to-loan-value ratios. Regarding the control variable *FEMALE*, although we could expect collateral requirements to increase with female ownership, we find that loan contracts those belong to firms that have at least one female owner among the owners are actually less likely to include collateral, although this effect is as significant in only two models in Table 3 for  $COLL_1$  but ambiguous for  $COLL_2$ . This result can be explained by the borrower characteristics of female entrepreneurs. Previous literature indicates that women are more likely to use relationships and social networks when they are borrowing; moreover, women are less likely to default compared with men. These two

<sup>29</sup> Additionally, we conducted probit models; however, as the results obtained through those means were quite similar to those already presented, we chose not to tabulate and include those data in this manuscript.

characteristics of female entrepreneurs could be an explanation for the negative coefficient estimates related to female ownership.

For the second hypothesis, the coefficient estimates for *PRVTBR* and *PUBREG* yield a negative and significant relationship for both the *COLL1* and *COLL2* variables, as expected. As the percentage of individuals or firms listed by private credit bureaus and public credit registries increases in a country, both the presence and degree of collateral decrease. In countries where lenders have better information about borrowers' repayment history and unpaid debts through public and private credit bureaus, both the probability of the presence and degree of collateral decrease in loan contracts.

For the third hypothesis, both the presence and degree of collateral requirements are positively related to banking concentration. However, this relationship is found to be statistically significant only in models VII and VIII in both estimation panels. This result indicates that in countries with concentrated banking environments, the presence of collateral in loan contracts is more likely, and collateral-to-loan-value ratios are higher for the borrowers. We can hypothesise that this occurs because relationship banking becomes unimportant as concentration ratios increase. For the effect of penetration of banking services, as approximated by *BRPC* and *BRKM*, we find a positive and significant association for *COLL<sub>2</sub>* but no statistically significant effect on *COLL<sub>1</sub>*. As for the asset share of foreign banks, the positive and significant coefficient of *FOREIGN* indicates that the likelihood of collateral presence and the degree of collateral is higher in countries with a greater proportion of foreign banks. This result can be explained by foreign banks' intensive usage of objective information and standardised decision techniques in their lending decisions due to their difficulties in accurately evaluating subjective information about borrowers. We find that *STATE* has a negative effect on both *COLL<sub>1</sub>* and *COLL<sub>2</sub>*, thus confirming that state-owned banks play a role in easing SME credit conditions by lowering collateral requirements.

Regarding country-level control variables, our estimation results for the effect of *LNGDPPC* indicate mostly negative and statistically significant associations between *LNGDPPC* and our dependent variables. Thus, as macroeconomic conditions obtain better, collateral requirements soften. We find evidence regarding a negative association between *GOVDEBT* and *COLL<sub>1</sub>*; however, this relationship is not significant from a statistical point of view. In contrast, we find a stronger positive relationship for the effect of *GOVDEBT* on *COLL<sub>2</sub>*, which indicates that as government borrowing increases, collateral requirements become stricter. This result is attributable to the preference of lenders for funding government rather than small- and medium-sized enterprises.

## 6. Conclusion

This main goal of our paper was to investigate whether the collateral requirement on



loans extended to SMEs set in transition countries depends mainly upon firm-specific or market-specific characteristics. Using the Business Environment and Enterprise Performance Survey (BEEPS), we could evaluate extensive information not only addressing borrowers themselves but also incorporating their perceptions regarding their local business environments. Our study yields important policy implications for firms and financial institutions both because it helps address the scarcity of empirical evidence for less developed and transition economies and because it employs the relatively novel approach of examining and comparing survey data across countries.

When evaluating our estimation results, we note that country-specific variables (*hypothesis 2* and *hypothesis 3*) rather than firm-specific variables (*hypothesis 1*) are more important in determining both the presence of collateral in loan contracts, and the collateral-to-loan-value ratios of those contracts. We find that not all of the borrower's characteristics explain the collateral requirement. The strongest evidence of our paper addresses the importance of asymmetric information between borrowers and lenders. In countries where lenders have better information about borrowers' repayment history and unpaid debts through public and private credit bureaus, both the probability for the presence of collateral and the degree of that collateral decrease in loan contracts. Thus, collateral requirements serve as a tool to resolve the problem of asymmetric information about the borrower's quality. In this study, we also found evidence for the positive relationship between banking concentration and the collateral requirement. This can be linked to the weakness of relationship banking as concentration ratios increase.

In contrast to previous empirical research on collateral, we not only focus on the presence of collateral but also on the degree of collateral. Thus, from a methodological point of view, we contribute to the literature by examining the determinants of the degree of collateral. To the best of our knowledge, this is one of the few studies addressing the degree of collateral. Moreover, previous literature on developing economies typically concentrates on a single country. Our paper, by contrast, presents a wide range of cross-country data from less developed nations, including transition economies from Eastern Europe and Central Asia. The analysis helps to emphasise the country-specific factors affecting the collateral requirement, in addition to the borrower's characteristics, which have typically been the major focus of previous investigations. Our paper could be enriched if our survey data had provided information regarding the duration of loans and addressing the features of the relationship banking that occurred<sup>30</sup>.

This paper can be extended in several ways. First, a panel sample can be constructed to observe the changes in a single firm over the course of time periods that

<sup>30</sup> BEEPS only provides information about the lender type in four categories: private commercial banks; state-owned banks or government agencies; non-bank financial institutions, which include microfinance institutions, credit cooperatives, credit unions, and finance companies; and other types of lenders.

the same firm is surveyed. Although the sample size will be smaller than that used in our study of cross-sectional data, it will provide insights from a time-variant perspective. The effects of collateral requirements on firm performance could also be questioned using the same data set employed here; moreover, investigations into this topic could evaluate this effect separately for start-up and older firms, generating potentially intriguing conclusions.

## 7. Appendix

**Table A:** Why firms don't apply for new loans?: WBES 2006–2011

(Source: Author's calculations using data from World Bank Enterprise Surveys)

<b>Main reason for not applying for new loans</b>	<b># of firms</b>	<b>Percentage</b>
Don't know	416	1.21
No need for a loan and firm has enough capital	18,467	53.54
Interest rates are not favourable	4,780	18.86
Application procedures for loans are complex	3,484	10.01
Collateral requirements are too high	2,418	7.01
Did not think it would be approved	2,171	6.29
It is necessary to make informal payments	1,098	3.18
Size of loan or maturity are insufficient	603	1.75
Other	1,055	3.07
<b>Total</b>	<b>34,492</b>	<b>100</b>

**Table B:** Why don't firms apply for new loans?

(Source: Author's calculations using data from BEEPS)

<b>Main reason for not applying for a new loan</b>	<b># of firms</b>	<b>Percentage</b>
No need for a loan - establishment has sufficient capital	1,141	67.51
Interest rates are not favourable	164	9.70
Application procedures for loans or lines of credit are complex	72	4.26
Collateral requirements are too high	57	3.37
Did not think it would be approved	52	3.08
Size of loan or maturity are insufficient	28	1.66
It is necessary to make informal payments to get bank loans	20	1.18
Other	93	5.5
Don't know	63	3.73
<b>Total</b>	<b>1,690</b>	<b>100</b>

**Table C:** Collateral requirements across financial institutions  
(Source: Author's calculations using data from BEEPS)

Type of financial institution that granted the line of credit or loan	No collateral required	Collateral required	Total
Private commercial banks	714	2,483	3,197
State-owned banks or government agencies	144	441	585
Non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies	83	106	189
Other	26	23	49
<b>Total</b>	<b>967</b>	<b>3,053</b>	<b>4,020</b>

**Table D:** Forms of collateral pledged by firms  
(Source: Author's calculations using data from BEEPS)

	(1)	(2)	(3)	(4)	(5)
(1) Land, buildings under ownership of the establishment	5,381				
(2) Machinery and equipment including movables	1,099	2,536			
(3) Accounts receivable and inventories	445	402	959		
(4) Personal assets of owner (house, etc.)	565	370	236	1,555	
(5) Other forms of collateral	223	207	150	151	1327

**Note:** This table shows the number of collateral types that were required. The intersection indicates that firms are asked to provide both forms of collaterals. These numbers are in line with Niinimäki (2009), which indicate that real estate is the most common and dominant form of collateral across countries.

**Table E:** Sample

Country	Year of survey					Total
	2002	2005	2007	2008	2009	
Albania	36	81	131	0	18	266
Belarus	62	92	0	70	0	224
Georgia	30	59	0	99	0	188
Tajikistan	27	35	0	76	0	138
Turkey	0	468	0	349	0	817
Ukraine	77	182	0	136	0	395
Uzbekistan	63	69	0	30	0	162
Russia	135	137	0	0	224	496
Poland	173	290	0	0	134	597
Romania	52	201	0	0	137	390
Serbia	35	78	0	0	146	259
Kazakhstan	52	183	0	0	105	340
Moldova	54	125	0	0	88	267
Bosnia	71	85	0	0	133	289
Azerbaijan	14	25	0	0	48	87
FYROM	31	40	0	0	141	212
Armenia	16	146	0	0	105	267
Kyrgyz	24	65	0	0	30	119
Estonia	47	79	0	0	89	215
Czech Rep.	71	87	0	0	76	234
Hungary	62	261	0	0	66	389
Latvia	35	70	0	0	78	183
Lithuania	39	65	0	0	90	194
Slovakia	38	74	0	0	73	185
Slovenia	93	112	0	0	108	313
Bulgaria	29	88	318	0	74	509
Croatia	51	116	306	0	29	502
Montenegro	5	4	0	0	53	62
<b>Total</b>	<b>1,422</b>	<b>3,317</b>	<b>755</b>	<b>760</b>	<b>2,045</b>	<b>8,299</b>

**Table F:** Source of  $COLL_1$  variable

<b>K.13</b>	Referring only to this most recent loan or line of credit, did the financing require collateral?	
Yes	1	<b>GO TO QUESTION K.16</b> <b>GO TO QUESTION K.16</b>
No	2	
<b>Don't know (spontaneous)</b>	<b>-9</b>	
		<b>k13</b>

**Table G:** Source of *COLL<sub>2</sub>* variable

<b>K.15</b>	Referring only to this most recent line of credit or loan, what was the approximate value of the collateral required as a percentage of the value of the loan or line of credit?
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	<b>Percent</b>
Value of collateral as percent of loan/line of credit value	<b>k15 %</b>

**INTERVIEWER: THE ANSWER COULD BE GREATER THAN 100%**

**Table H:** Source of *CRIME* variable

<b>I.30</b>	Are <b>crime, theft and disorder</b> No Obstacle, a Minor Obstacle, a Moderate Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment? <b>SHOW CARD 15</b>
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	No obstacle	Minor obstacle	Moderate obstacle	Major Obstacle	Very Severe Obstacle	Do Not Know (spontaneous)	Does Not Apply (spontaneous)
Crime, theft and disorder <b>i30</b>	0	1	2	3	4	<b>-9</b>	<b>-7</b>

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**Table 3: Estimation results**

	Estimation Panel 1: Dep Var: CollateralII (Logit model)									Estimation Panel 2: Dep Var: Collateral2 (Tobit model)								
	I	II	III	IV	V	VI	VII	VIII	IX	I	II	III	IV	V	VI	VII	VIII	IX
Size	0.009*** (0.003)	0.009*** (0.003)	0.011*** (0.002)							-0.010 (0.082)	-0.009 (0.082)	-0.102 (0.068)						
Age				-0.001 (0.006)	-0.001 (0.006)	0.001 (0.005)	-0.0101 (0.008)	-0.009 (0.008)	-0.006 (0.008)				0.450** (0.160)	0.437** (0.159)	0.370* (0.146)	0.045 (0.230)	0.056 (0.230)	0.202 (0.208)
Lnempdiff							0.332*** (0.074)	0.330*** (0.074)	0.362*** (0.061)							1.013 (2.589)	0.957 (2.596)	-0.585 (2.040)
Quality	0.0199 (0.141)	0.0203 (0.141)	0.027 (0.115)	0.146 (0.139)	0.147 (0.138)	0.165 (0.113)	0.183 (0.190)	0.185 (0.190)	0.167 (0.155)	-1.004 (5.389)	-1.092 (5.398)	1.649 (4.446)	-1.674 (5.334)	-1.738 (5.340)	-0.0394 (4.417)	1.729 (7.622)	1.817 (7.590)	2.131 (5.817)
Innov	-0.113 (0.107)	-0.113 (0.107)	-0.121 (0.088)	-0.0744 (0.106)	-0.0746 (0.106)	-0.0753 (0.087)	-0.205 (0.148)	-0.203 (0.148)	-0.137 (0.123)	0.869 (3.759)	0.902 (3.755)	-1.048 (3.210)	0.445 (3.705)	0.504 (3.700)	-1.595 (3.171)	0.438 (5.089)	0.484 (5.094)	-2.945 (4.442)
Crime2	0.101* (0.043)	0.102* (0.043)	0.0806* (0.035)	0.103* (0.043)	0.104* (0.043)	0.0884* (0.035)	0.190** (0.063)	0.192** (0.063)	0.126* (0.051)	-1.476 (1.667)	-1.543 (1.669)	-1.69 (1.392)	-1.601 (1.672)	-1.658 (1.675)	-1.806 (1.394)	-4.266* (2.104)	-4.185* (2.108)	-4.544* (1.842)
Overdue_util	0.039 (0.294)	0.036 (0.293)	0.158 (0.222)	0.037 (0.295)	0.034 (0.294)	0.159 (0.223)	-0.113 (0.463)	-0.126 (0.462)	0.183 (0.374)	-10.44 (11.590)	-9.807 (11.610)	-9.502 (7.720)	-11.11 (11.610)	-10.5 (11.630)	-9.676 (7.729)	-7.677 (22.870)	-8.2 (22.860)	0.216 (14.650)
Female2	-0.194 (0.108)	-0.193 (0.108)	-0.0764 (0.089)	-0.222* (0.108)	-0.221* (0.108)	-0.103 (0.089)	-0.051 (0.153)	-0.050 (0.153)	0.005 (0.125)	0.552 (4.204)	0.504 (4.210)	-0.437 (3.413)	0.431 (4.232)	0.393 (4.237)	-0.224 (3.435)	-6.477 (5.746)	-6.551 (5.762)	-4.042 (4.681)
City	-0.573*** (0.131)	-0.576*** (0.131)	-0.272* (0.112)	-0.537*** (0.132)	-0.541*** (0.132)	-0.221 (0.113)	-0.523** (0.178)	-0.529** (0.177)	-0.247 (0.154)	-23.39*** (6.342)	-22.89*** (6.332)	-21.67*** (5.094)	-23.47*** (6.329)	-22.98*** (6.319)	-22.07*** (5.061)	-17.82* (8.098)	-16.18* (8.142)	-16.18* (6.707)
Pubreg	-0.011* (0.004)	-0.011* (0.003)	-0.005 (0.003)	-0.011** (0.004)	-0.011* (0.005)	-0.00535 (0.003)	-0.010 (0.005)	-0.011 (0.006)	-0.005 (0.004)	0.186 (0.114)	0.176 (0.114)	-0.133 (0.143)	0.043 (0.193)	0.009 (0.184)	-0.127 (0.145)	-0.0673 (0.187)	-0.0345 (0.200)	-0.292* (0.147)
Prvtlbr	-0.015*** (0.003)	-0.014*** (0.002)	-0.006*** (0.002)	-0.015*** (0.003)	-0.015*** (0.002)	-0.007*** (0.002)	-0.015*** (0.003)	-0.015*** (0.003)	-0.006** (0.002)	-0.227** (0.080)	-0.276** (0.090)	-0.237*** (0.061)	-0.227** (0.079)	-0.271** (0.089)	-0.234*** (0.061)	-0.088 (0.130)	-0.0514 (0.115)	-0.127 (0.088)
Cr	-0.001 (0.003)	-0.001 (0.003)		-0.001 (0.003)	-0.001 (0.003)		0.001 (0.004)	0.001 (0.004)		0.186 (0.114)	0.176 (0.114)	0.164 (0.114)	0.164 (0.114)	0.157 (0.114)		0.421** (0.154)	0.427** (0.152)	
Brpc										0.097 (0.105)		0.065 (0.103)				0.052 (0.127)		
Brkm	0.002 (0.005)			0.001 (0.005)			0.008 (0.007)			0.258 (0.160)				0.213 (0.159)		0.185 (0.192)		
Foreign			0.006*** (0.002)			0.006*** (0.002)			0.008*** (0.002)		0.302*** (0.061)				0.297*** (0.061)			0.346*** (0.088)
State	-0.006* (0.003)	-0.006* (0.003)	(0.002)	-0.005 (0.003)	-0.005 (0.003)		-0.007* (0.004)	-0.006 (0.004)		-0.353*** (0.102)	-0.362*** (0.094)	-0.385*** (0.103)	-0.385*** (0.103)	-0.389*** (0.095)		-0.377** (0.144)	-0.376* (0.153)	
Lnglppc	0.082 (0.098)	0.075 (0.099)	-0.363*** (0.074)	0.102 (0.097)	0.0975 (0.099)	-0.354*** (0.074)	0.0454 (0.130)	0.0156 (0.133)	-0.339*** (0.094)	-22.57*** (3.652)	-22.21*** (3.516)	-18.83*** (2.239)	-22.59*** (3.594)	-22.37*** (3.464)	-19.53*** (2.231)	-24.37*** (4.365)	-24.53*** (4.444)	-22.74*** (2.930)
Govdebt	-0.0007 (0.004)	-0.0001 (0.004)	-0.004 (0.003)	-0.001 (0.004)	-0.0007 (0.004)	-0.005* (0.003)	0.0003 (0.005)	0.002 (0.005)	-0.003 (0.004)	0.584*** (0.112)	0.526*** (0.119)	0.175 (0.101)	0.573*** (0.113)	0.522*** (0.120)	0.183 (0.101)	0.332 (0.177)	0.375* (0.173)	0.009 (0.143)
_cons	1.566* (0.795)	1.597* (0.812)	4.445*** (0.641)	1.603* (0.796)	1.613* (0.813)	4.645*** (0.644)	1.182 (1.060)	1.334 (1.091)	3.677*** (0.829)	324.9*** (28.45)	324.4*** (27.68)	303.4*** (19.42)	322.5*** (28.47)	322.7*** (27.72)	302.7*** (19.58)	329.4*** (34.49)	329.1*** (35.16)	336.8*** (24.84)
Sigma										84.86*** (4.940)	84.83*** (4.960)	83.19*** (3.907)	84.75*** (4.969)	84.72*** (4.987)	83.05*** (3.948)	83.78*** (6.925)	83.80*** (6.906)	81.68*** (5.543)
#	2708	2708	3780	2697	2697	3765	1391	1391	1937	1980	1980	2729	1972	1972	2718	1012	1012	1401