Cross-Border Banking, Credit Access, and the Financial Crisis*

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Abstract

We study the sensitivity of credit supply to bank financial conditions in 16 emerging European countries before and during the financial crisis. We use survey data on 10,701 applicant and non-applicant firms that enable us to disentangle effects driven by positive and negative shocks to the banking system from demand shocks that may vary across lenders. We find strong evidence that firms' access to credit was affected by changes in the financial conditions of their banks. During the crisis firms were more credit constrained if they were dealing with banks that experienced a decline in equity and Tier 1 capital, as well as losses on financial assets. We also find that access to credit reflects the balance sheet conditions of foreign parent banks. The effect of positive and negative shocks to a bank is greater for riskier firms and firms with fewer tangible assets.

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1 Introduction

The increasing integration of the European banking industry offers the prospect of important gains in terms of efficiency and diversification, but it also creates potential risks. One such risk is that the effects of a shock to the capital of a bank that is active internationally may be propagated across borders. Given the size and penetration of western European banks in central and eastern Europe, the supply of credit to firms and consumers may be sensitive to shocks that these borrowers would otherwise be spatially insulated from. This would suggest that lending by foreign-owned banks would likely increase when the financial condition of the parent improved. However, it also implies that parent bank financial distress, like that associated with the recent financial crisis, would have the opposite effect.[1] The impact of the crisis on borrowers is, of course, a matter of considerable policy attention.[2] This paper confirms that lending in central and eastern Europe is sensitive to bank financial conditions in general, and to negative shocks and to financial conditions at foreign parent banks in particular.

We investigate one key mechanism through which the effect of bank financial conditions may have been transmitted to borrowers, namely through the supply of credit to small and medium enterprises. SMEs dominate the corporate landscape in central and eastern Europe, comprising up to 99% of all firms. Moreover, because of their opacity SMEs may be particularly sensitive to changes in the supply of credit. With immature capital markets and little or no corporate bond finance, banks are by far the main provider of external funds. An important feature of the central and eastern European banking market is its ownership structure. In particular, foreign ownership in the banking sector has grown dramatically in the recent decade – so much so that by 2008 foreign banks controlled around four fifths of the assets in the region's banking industry.[3] Shocks to the

[1] See, for example, Brunnermeier (2009), Gorton (2010), and Ivashina and Scharfstein (2010) for a timeline of the 2007-2008 global financial crisis.

[2] Signs of the negative effects of the global financial crisis on business firms in emerging Europe through the channel of bank lending were seen as early as the Fall of 2007. For instance, in October, the EBRD's chief economist Erik Berglof warned that "the crisis in the West will be a serious one which will last for some time and this means it will definitely have an impact on our countries [...] due to the difficulties and higher costs associated with obtaining credit" (EBRD (2007)). The ECB's Bank Lending Survey indicated that euro area banks started tightening lending standards in Q3:2007 (ECB (2008)).

[3] For summaries of the literature on the motivations for foreign entry into banking markets and the relative performance/behavior of foreign versus domestic banks (including behavior in credit markets) see Degryse, Havrylchyrk, Jurzyk, and Kozak (2010) and Berger, DeYoung, Genay, and Udell (2000).

balance sheets of large multinational banks - both positive ones during the early 2000s and negative ones during the recent financial crisis - provide a natural experiment to study how such shocks are propagated across borders.[4]

Our key data come from a survey of a large group of SMEs in emerging Europe administered in April 2005 and April 2008. These data allow us to directly observe firms' access to finance. Specifically we observe firms whose loan application was approved or turned down and firms who were discouraged from applying for bank credit by the anticipation of being turned down, by high rates, or by unfavorable collateral requirements. While we do not observe the bank which granted or denied the loan, we observe the extent of the operations of all banks present in the firm's city of incorporation. By using balance sheet data on the parent banks, foreign or domestic, we construct an index of locality-specific financial health (distress) for each locality in 16 countries in the region, which we then map into data on firm credit constraints. We also separate, for each locality, the balance sheet conditions of domestic and of foreign banks. The final data consist of 10,701 firms in 1,978 localities served by a total of 155 banks over the 2005-2008 period. The majority of localities, however, are served by just a handful of banks, with the degree of foreign ownership of those varying by both country and locality.

This empirical set-up allows us to study the following important questions:

1) How sensitive is the supply of credit to bank balance sheet conditions?,

and, as special cases of 1),

2) What were the consequences to borrowers of bank balance sheet problems in the early stages of the 2007–2008 crisis?, and

3) Did business lending by the subsidiaries of foreign banks reflect their parents' financial condition?

The analysis of shocks to bank balance sheets raises the classic problem of disentangling demand and supply effects. For example, a firm's demand for credit likely shifts downward due to the deterioration of its own balance sheet at the same time that the supply of credit contracts. This

[4]It is worth noting that the problems afflicting these banks during the crisis were completely unrelated to their operation in central and eastern Europe. They emanated instead from the fallout from the financial crisis that started in the U.S. and spread throughout the global economy.

would not be an issue if the shock to bank balance sheets in our analysis included the cross-border transmission of financial conditions into an economic area insulated from that shock through all other channels but the bank lending channel. As the sub-prime mortgage crisis was associated since its very beginning with the expectations of a global recession, the measured effect of bank loan supply shocks will likely be contaminated by demand shifts.

Some studies that identify demand use the decline in loan applications across differentially affected lenders to argue that there haven't been variations in the decrease in demand across lenders. One problem with that identification approach may be limited data availability on loan applications. However, even when one observes the universe of loan applications, applicant firms could be a systematically truncated sub-sample of all firms: some firms do not apply because they do not need credit, while others do not apply because they are discouraged. Not accounting for discouraged firms results in a poor proxy for credit constraints, especially in the region of central and eastern Europe, where recent studies (Brown, Ongena, Popov, and Yesin (2011)) have shown that the share of firms discouraged from applying is up to twice as large as the share of firms which applied and had their loan application rejected. Then it could well be that, for example, for banks negatively affected by the crisis, it is the financially healthy borrowers that are selecting themselves out of the application process (firms that do well during a recession), while for other banks, it is the weak firms that do so, discouraged the contraction in lending. Thus, at different types of banks, non-applicant firms may have systematically different reasons for selecting themselves out of the application process, confounding identification and making it difficult to separate the bank lending channel from the balance sheet channel.[5]

We overcome this obstacle by employing observable survey information on firms that choose to select themselves out of the bank credit application process, be it because they were discouraged, or because they do not need credit. Thus we are able to account not just for the change in firms' demand, but also for the *composition* of firms that account for the demand shift. While there is

[5] The balance sheet channel emphasizes that the impact of a macro shock on access to credit runs through the balance sheets of borrowers. The shock affects the net worth, the collateral and general financial condition of borrowers exacerbating the principle-agent problem that inhibits access to credit. This is in contrast to the lending channel that emphasizes that a macro shock is amplified through changes in the financial condition of lenders, e.g., banks.

already extensive evidence on the real effects of this financial crisis[6], our paper is the only one that we know of which simultaneously 1) studies the transmission of parent bank financial conditions in foreign markets, 2) accounts for the changes in the level and composition of loan demand, and 3) is able to construct a proxy for credit constraint based on discouragement as well as on actual rejection. As such, our paper adds to a very scarce literature employing data on the selection process involved in the granting of business loans.[7]

This paper confirms the hypothesis that positive and negative shocks to banks' balance sheets were transmitted from banks to firms in central and eastern Europe. Focusing on the negative shocks to bank balance sheets in the relatively early stages of the 2007-2008 crisis, for example, we find a higher probability of firms' being credit constrained in localities served by banks with a low ratio of equity to total assets, a low Tier 1 capital ratio, and high losses on financial assets, including ABSs and MBSs. The result is strongest and most consistent for Tier 1 capital. The key results hold when we assume equal access of each firm to all banks present in the firm's locality, when we weight access by the branch penetration of each bank, or when we weight it by bank assets. Numerically, firms faced a 10% higher probability of being credit constrained if they did business with banks that experienced at least a one-standard deviation deterioration in their financial health between 2005 and 2008 relative to otherwise identical firms (evaluated at their sample means) that did business with banks whose financial health on average declined by less. As a still another special case, we find that the probability of banks' adjusting their loan portfolio in response to shocks to their balance sheets is higher for foreign-owned banks than for domestic banks. This confirms that bank lending is sensitive to the balance sheet conditions of foreign parent banks. Finally, we find that financial conditions are transmitted differently across firms and industries, in that firms that are high-risk and firms with fewer tangible assets are most sensitive to shocks to bank balance sheets.

Our paper relates to a number of studies that have aimed at identifying the transmission of

[6] De Haas and van Horen (2009), Ivashina and Scharfstein (2010), Cetorelli and Goldberg (2011), Jimenes, Ongena, Peydro, and Saurina (2011), Puri, Rochol, and Steffen (2011), and Santos (2011), among others, all provide evidence on the credit crunch associated with the 2007-2008 financial crisis.

[7] The very few studies known to us that do so are Chakravarty and Yilmazer (2009), Brown, Ongena, Popov, and Yesin (2011), and Ongena and Popov (2011).

shocks from banks' balance sheets to lending activity in various economic circumstances. The bank lending channel has been studied extensively (e.g., Kashyap and Stein (2000)), and banks have been found to rely heavily on the use of internal capital markets in order to dampen domestic liquidity shocks (e.g., Stein (1997); Houston, James, and Marcus (1997)). The U.S. credit crunch in 1990-92 spawned a large literature that investigated its causes and its effects (e.g., Bernanke and Lown (1991); Berger and Udell (1994); Peek and Rosengren (1995); Wagster (1996); Hancock and Wilcox (1998)). Banking crises and liquidity shocks elsewhere in the world similarly generated considerable academic attention (e.g., Woo (1999); Kang and Stulz (2000); Hayashi and Prescott (2002); Khwaja and Mian (2008); Paravisini (2008)). Peek and Rosengren (1997) were one of the first to identify the international transmission of financial shocks when they investigated how the collapse of asset prices in Japan during the early 1990s affected the operations of Japanese bank subsidiaries abroad. In particular, they show that the decline in the parents' risk-based capital ratio translated into a significant decline in total loans by their U.S. subsidiaries. Chava and Purnanandam (2010) and Schnabl (2011) use the exogenous shock provided by the Russian crisis of 1998 to study the effect on lending to U.S. and Peruvian borrowers, respectively. Cetorelli and Goldberg (2009) show that the existence of internal capital markets with foreign bank affiliates contributes to an international propagation of domestic liquidity shocks to lending by affiliated banks abroad.

In the context of the financial crisis of 2007-2008, Ivashina and Scharfstein (2010) document that new loans to large borrowers declined by 79% by the end of 2008 relative to the peak of the credit boom (Q2:2007). They analyze the effect that the failure of Lehman Brothers had on the syndicated loan market to identify the reduction in new lending. Jimenez, Ongena, Peydro, and Saurina (2011) use the universe of bank loans by Spanish banks to identify separately the bank lending channel and the balance sheet channel, and find that they dampen each other: more liquid firms are less vulnerable to the contraction of bank lending, and if banks have ample liquidity, the balance sheet channel partially shuts down. Puri, Rocholl, and Steffen (2011) test the effect of the deteriorating condition of German banks hit by the crisis on lending to domestic retail customers. Berrospide, Black, and Keeton (2011) examine the mortgage lending behavior within the U.S. in the "peripheral markets" of multi-market banks after these banks suffer mortgage losses in other markets. Finally,

Cetorelli and Goldberg (2011) examine the relationships between adverse liquidity shocks on main developed-country banking systems to emerging markets across Europe, Asia, and Latin America, isolating lending supply from lending demand shocks. They find that lending supply in emerging markets was affected through three separate channels: a contraction in direct, cross-border lending by foreign banks; a contraction in local lending by foreign banks' affiliates in emerging markets; and a contraction in lending supply by domestic banks as well, as a result of the funding shock to their balance sheet induced by the decline in interbank, cross-border lending. Our paper contributes to this emerging literature by presenting evidence for a cross-border transmission by foreign banks in a large cross-country setting, as well as by incorporating information on discouraged firms in the empirical proxy for credit constraint.

The paper proceeds as follows. Section 2 presents the data. Section 3 describes the empirical methodology and the identification strategy. Section 4 presents the main empirical results. Section 5 presents key robustness tests. Section 6 discusses the results. Section 7 concludes with the main findings of the paper.

2 Data

The data for our analysis come from three main sources. The core firm level data come from the 2005 and the 2008 waves of the Business Environment and Enterprise Performance Survey (BEEPS), administered jointly by the World Bank and the European Bank for Reconstruction and Development. The 2008 survey was carried out between March 10th and April 20th 2008 among 11,998 firms in 29 central and eastern Europe and the former Soviet Union. 12,280 firms were initially targeted, suggesting a response rate of almost 98%. We complement this data with analogical information on 11,399 firms operating in the same countries and localities, derived from the 2005 version of the survey. We focus on a sample of 16 countries for which foreign bank ownership is sufficiently relevant over the period in question. The final sample thus consists of 10,701 firms, observed either in 2005 or in 2008, in the following 16 countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia,

Montenegro, Poland, Romania, Serbia, Slovakia, and Slovenia.

The survey contains a variety of firm-level information, like ownership structure, sector of operation, industry structure, export activities, use of external auditing services, subsidies received from central and local governments, etc. Respondent firms come from 6 different sectors: construction; manufacturing (11 sub-sectors); transport; wholesale and retail; IT; and hotels and restaurants. The number of firms covered is roughly proportional to the number of firms in the country, ranging from 260 in Albania to 1,592 in Poland. The survey tried to achieve representativeness in terms of the size of firms it surveyed: between three quarters and nine tenths of the firms surveyed are "small" (less than 20 workers) and only around 5% of the firms surveyed are "large" (more than 100 workers).[8] The survey also aimed to achieve representativeness in terms of private vs. public firms, firms with access to foreign product markets, firms which receive government subsidies, etc. Table 1 provides the summary statistics on the number of firms and their size, ownership, and market characteristics by country.[9] Appendix 1 explains the construction of all firm-level (as well as industry- and country-level) variables in the data.[10]

For the purpose of estimating the transmission of bank balance sheet conditions (including the financial crisis) to firms, we focus on the information on credit constraints faced by the firms in the past fiscal year. Question K16 asks: "Did the establishment apply for any loans or lines of credit in fiscal year 2007?"[11] For firms that answered "No" to K16, Question K17 subsequently asks: "What was the main reason the establishment did not apply for any line of credit or loan in fiscal year 2007?". For firms that answered "Yes" to K16, Question K18a subsequently asks: "In fiscal year 2007, did this establishment apply for any new loans or new credit lines that were rejected?". Firms that answered "No need for a loan" to K17 were classified as firms that do not desire bank credit. Firms that answered "Yes" to K18a or "Interest rates are not favorable", "Collateral requirements

[8] See http://www.ebrd.com/country/sector/econo/surveys/beeps.htm for further detailed reports on the representativeness of the survey.

[9] While foreign ownership is an important determinant of the firm's need for external credit, this information is only available in the 2005 survey and not in the 2008.

[10] While it is also important to control for firm foreign ownership (see Antras, Desai, and Foley (2009)), this information is only available in the 2008 BEEPS.

[11] Fiscal year 2007 refers to the calender year 2007. However, for tax purposes, in the countries in the sample firms can choose to extend it to March 31, 2008, which is precisely why the Survey was administered in March-April 2008. Given that signs of a credit crunch started emerging right after August 9, 2007 (see ECB (2010)), the data give us at least two and at most three quarters of credit crunch effects potentially experienced by firms.

are too high", "Size of loan and maturity are insufficient", or "Did not think it would be approved" to K17 were classified as constrained. This strategy of grouping firms that were turned down and firms that were discouraged from applying is also employed in Cox and Jappelli (1993) and in Duca and Rosenthal (1993), who find that rejected and discouraged borrowers are almost identical on observables, and is fairly standard in studies that rely on detailed questionnaires. Also, it is crucial given our empirical strategy to separate the firms that did not apply for credit because they didn't need it from those that did not apply because they were discouraged. Table 2 presents a summary by country of the shares of firms in need of bank loans and of constrained firms. As the data suggest, while fewer firms needed credit in fiscal year 2007 than in fiscal year 2004 (60% vs. 70%), a larger portion of the firms that needed credit were constrained (37% vs. 34%).

In addition to the information described above, BEEPS contains information on the locality (city/town/village) where each firm is incorporated. A total of 1,978 localities are present in the data, for an average of 5.4 firms per locality. We next set to determine which banks are physically present (i.e., have at least one branch) in each locality. First, pursuing a trade-off between representativeness and manageability, we narrowed our focus to the banks that comprise at least 80% of the banking sector assets in each country. This gives us a range of between 4 banks in Estonia and 9 banks in Bulgaria, and arguably results in the exclusion of a number of small banks. Given this criterion, we determined that the localities in the sample are served by a total of 155 banks. Out of those, 28 are domestic banks, and 127 are branches or subsidiaries of 23 foreign banks. There is considerable variation in foreign bank penetration in the sample: in 2008, foreign ownership of banking sector assets ranges from 22.8% in Slovenia to 98.9% in Estonia. Finally, we searched the web sites of the 155 banks in the sample in order to determine in which city/town each bank was present, and how many branches each bank had in each locality in which it was present. In this way we could determine not just mere geographical presence, but also each bank's market share at the unit of observation of the locality.[12]

Armed with this bank branching network, we can next construct a locality-specific index of

[12] In those cases where the firm is incorporated in a very small locality (for example, a village) where no bank is present, we used the branching network of the closest town with non-zero bank presence as a branching network for this locality.

bank health by averaging information on all banks present, and then match this index to all firms operating in that particular locality.[13] To that end, we used Bankscope to extract balance sheet information on the parent banks of the 155 banks in the sample. We collected data from 2005 to 2008 in order to evaluate how the condition of the banks' balance sheets is associated with a potential change in credit supply. We chose our potential explanatory variables in the context of the main issues surrounding the financial crisis of 2007-2008. The bursting of the housing bubble forced banks to write down several hundred billion dollars in bad loans caused by mortgage delinquencies. At the same time, the stock market capitalization of the major banks declined by more than twice that amount. The total loss in financial assets globally is estimated in the trillions of dollars. Central banks around the world pumped hundreds of billions of dollars in short-term liquidity, alongside reducing discount rates at an unprecedented speed, in order to prop up illiquid and likely insolvent banks (Brunnermeier (2009)).

Hence, we focused primarily on banks' capital ratios (Tier 1), equity, and gains/losses on financial assets. When a bank is foreign-owned, we focused on the financial position of the parent bank in order to study, for example, how the investment allocation of UniCredit Group into MBSs and the loss of capital associated with this allocation affects business lending by international branches and subsidiaries of UniCredit. Table 3 summarizes the main variables of interest which were used in the final empirical tests. There are apparent cross-country differences - for example, in 2008 Latvian banks had a somewhat low average Tier 1 capital ratio (6.52), close to the 4% regulatory

[13] The firm-bank matching at the locality level, which is central to the empirical analysis in the paper, helps explain why we have included only 16 countries from the original BEEPS survey. For one, we would like to capture at least partially the cross-border transmission of bank balance sheet conditions, which is why we exclude a number of countries in the firm-level dataset for which foreign bank presence is low (we set an arbitrary threshold of 20%). Subsequently, we exclude countries like Azerbaijan (7.5% foreign ownership), Belarus (19.7% foreign ownership), Kazakhstan (5.4% foreign ownership), Russia (17.2% foreign ownership), Tajikistan (6.6% foreign ownership), Turkmenistan (1.1% foreign ownership), and Uzbekistan (4.4% foreign ownership).

We also exclude Ukraine, which with 39.4% foreign ownership is in theory a good candidate. However, there are 175 banks operating in Ukraine, meaning that the data collection effort on the bank branching network in Ukraine would be more extensive than for all of the other 16 countries in the sample. In addition, the banking sector in Ukraine is very competitive, and while in the rest of the sample 80% of the assets in each country are held by at most 9 banks, in Ukraine the top 9 banks control only 49.8% of the market. In order to get to our representative 80% of total assets, we would need to collect data on the branching network of at least 20 banks, which would result in a very noisy measure of locality-specific bank health.

The resulting sample of 16 countries represents a good compromise between feasibility and coverage. Nevertheless, some information on bank lending is lost by not including large countries like Russia, and some information on the cross-border dimension of bank lending is lost by exluding large countries with a substantial foreign bank presence, like Ukraine.

requirement, owing to the relative undercapitalization of their parent foreign banks, while Polish banks had an average Tier 1 capital ratio of 9.39, mostly due to the fact that the largest bank in Poland was the well-capitalized domestic bank PKO Bank Polski. Also, the banks present in Macedonia incurred almost no losses on financial assets in 2007-08, while in 2008 the parents of the banks present in the Czech Republic had an average ratio of gains on financial assets to total assets of -0.40%. In general, banks were making on average gains on financial assets in 2005 and losses on financial assets in 2008.

Appendix 2 illustrates the degree of foreign bank penetration in each country in the sample. Clearly, a group of 23 western European and U.S. banks controls the vast majority of assets in the region. These are Erste Group, Hypo Group, Raiffeisen, and Volksbank (Austria), Dexia and KBC (Belgium), Danske Bank (Denmark), Nordea Bank (Finland), Societe Generale (France), Bayerische Landesbank and Commerzbank (Germany), Alpha Bank, EFG Eurobank, Emporiki Bank, National Bank of Greece, and Piraeus Bank (Greece), AIB (Ireland), Intesa Sanpaolo and UniCredit Group (Italy), ING Bank (Netherlands), Swedbank and Skandinaviska Enskilda Bank (Sweden), and Citibank (U.S.). There is also substantial regional variation in the degree of penetration: for example, the Greek banks operate mostly in south-eastern Europe, the Scandinavian banks in the Baltic countries, and the Austrian banks in central Europe. In addition, there is one domestic "global" bank, the Hungarian OTP, as well as cross-border penetration by, for example, Parex Group - Latvia and Snoras Bank - Lithuania.

3 Empirical methodology and identification

3.1 Transmission of bank financial conditions: Main empirical model

We want to estimate the transmission of balance sheet conditions from banks to businesses. We hypothesize that 1) banks transmit their parents' conditions locally, and 2) the supply of credit is more sensitive to parent balance sheet conditions for foreign-owned banks. For example, if bank-firm relationships are particularly strong and important, banks may be reluctant to reduce credit to their long-time domestic customers and shift more of the shock to overseas markets in response

to a negative shock (Peek and Rosengren (1997)).

We first use the 2008 cross-section data on bank balance sheets, firm characteristics, and access to credit to check for a supply effect by estimating the following basic model:

$$Y_{ijkl} = \beta_1 \cdot X_{ijkl} + \beta_2 \cdot \text{Finance}_{jk} + \beta_3 \cdot D_k + \beta_4 \cdot D_l + \varepsilon_{ijkl} \quad (1)$$

where Y_{ijkl} is a dummy variable equal to 1 if firm i in city j in country k in industry l is credit constrained in fiscal year 2007; X_{ijkl} is a matrix of firm characteristics; Finance_{jk} is the index of average bank balance sheet conditions in city j in country k; D_k is a matrix of country dummies; D_l is a matrix of industry dummies; and ε_{ijkl} is an idiosyncratic error term. The firm-level co-variates control for observable firm-level heterogeneity. The two sets of dummy variables control for any unobserved market and industry variation. Essentially, they eliminate the contamination of the estimates by sectoral and macroeconomic circumstances, like growth opportunities, common to all firms in the same industry, or taxes, common to all firms in a particular country.

Next, we pool the 2005 and 2008 samples in order to be able to conduct a proper pre-post analysis using the full sample of firms that were observed either in 2007/2008 (the beginning of the financial crisis) or in 2004/2005 (the peak of the credit cycle). We estimate two different models on the pooled data. First, we estimate the model

$$Y_{ijklt} = \beta_1 \cdot X_{ijklt} + \beta_2 \cdot \text{Post}_t \cdot \text{Finance}_{jkt} + \beta_3 \cdot \text{Post}_t + \beta_4 \cdot \text{Finance}_{jkt} + \beta_5 \cdot D_k + \beta_6 \cdot D_l + \varepsilon_{ijklt} \quad (2)$$

In this model, we are able to capture the transmission of bank balance sheet conditions after the crisis started relative to the transmission of identical bank balance sheet conditions before the crisis started. We do not include year dummies, as the level effect over time is captured by the variable Post, a dummy equal to 1 if the year is 2008.[14]

[14] BEEPS 2005 uses a SIC 1-digit classification, while BEEPS 2008 uses a SIC 2-digit classification dominated by manufacturing. In order to match the industrial classification across the 2005 and the 2008 survey, we end up with the following industries: manufacturing; construction; retail and wholesale; real estate, renting, and business services; and others.

Because the above model pools the data for all localities, including those present only in 2005 or only in 2008, we also estimate a model that allows us to compare variations in credit access over time of "affected" vs. "non-affected" localities. This approach captures the special case of negative shocks to bank balance sheets. In particular, we estimate the standard difference-in-difference model

$$Y_{ijklt} = \beta_1 \cdot X_{ijklt} + \beta_2 \cdot \text{Non-Affected}_{jkt} \cdot \text{Post}_t + \beta_3 \cdot \text{Post}_t + \beta_4 \cdot \text{Non-Affected}_{jkt} + \beta_5 \cdot D_k + \beta_6 \cdot D_l + \varepsilon_{ijklt} \tag{3}$$

where Affected is a dummy variable equal to 1 if the respective finance variable decreased by at least 1 standard deviation between 2005 and 2008. Consequently, Non-Affected is a dummy variable equal to 1 if the respective finance variable decreased by less than 1 standard deviation between 2005 and 2008.

The main parameter of interest in all three models is β_2, which captures the transmission of bank balance sheet conditions in the early stage of the financial crisis (Model 1), the transmission of bank balance sheet conditions in 2007/08 relative to 2004/05 (Model 2), and the effect of a change in the balance sheet conditions (Model 3) of the banks in each locality on credit access by firms in that locality. As higher values of $\text{Finance}_{jk(t)}$ are associated with superior balance sheet conditions, we expect the sign of β_2 to be negative in all models: financial health increases the credit supply while financial distress induces a deterioration of credit conditions. We construct an index of locality-specific bank balance sheet conditions index by aggregating balance sheet information from Bankscope after determining which banks were present in that locality, and the original ownership of each bank in that locality. The underlying assumption in the absence of a direct match of a loan, a rejection, or a discouragement to a particular bank is that the credit outcome was most likely the result of interaction with banks in the firms' locality of incorporation. We use three different weighting criteria in constructing the index, namely, 1) giving equal weight to each bank in that particular locality, 2) weighting each bank's financial position by the number of branches it has in the locality, and 3) weighting each bank's financial position by the relative share of its subsidiary's

assets.

Here is an example to clarify the above procedure. There are 4 banks in Estonia that hold close to 100% of the banking assets in the country: Swedbank, SEB, Sampo Pank, and Nordea. They are subsidiaries of Swedbank - Sweden, SEB - Sweden, Danske Pank - Denmark, and Nordea - Finland. In 2008, the 4 parent banks had Tier 1 capital ratios of 8.4, 8.4, 6.9, and 12, respectively. Consider the city Lihula in which only Swedbank has branches. We assign Lihula a Tier 1 capital ratio of 8.4, and then we match this index of locality-specific bank balance sheet conditions with all firms present in Lihula. Consider alternatively the city of Kuressaare, in which Swedbank, SEB, and Nordea are present. They have 2, 1, and 1 branches in that city, respectively. Consequently, in the main analysis, where we assign equal probability of each firm in that city doing business with each bank present in that city, we assign a Tier 1 capital ratio of $9.6 = \frac{1}{3} \cdot 8.4 + \frac{1}{3} \cdot 8.4 + \frac{1}{3} \cdot 12$, which is then matched to all firms located in Kuresaare. In the exercises where we weigh the probability of each firm doing business with each bank present in Kuresaare by the number of that bank's branches in that locality, we assign a Tier 1 capital ratio of $9.3 = \frac{1}{2} \cdot 8.4 + \frac{1}{4} \cdot 8.4 + \frac{1}{4} \cdot 12$. When weighting by subsidiaries' assets, we get a value of 8.4 for Lihula and 8.7 for Kuressaare.

This procedure gives us considerable variation of our main financial variables of interest within each country, due to the fact that not all banks present in a country are present in each city, and not to the same extent, if they are. For example, in the 2008 sample of firms, there are $1,354$ localities in the 16 countries in the sample, characterized by 276 unique values of locality-specific Tier 1 capital when data on all banks in a locality are weighted equally, by 759 unique values of locality-specific Tier 1 capital when data on all banks are branch-weighted, and by 419 unique values of locality-specific Tier 1 capital when data on all banks are asset-weighted. Consequently, there is little reason to worry that the country fixed effects in the regressions capture the same variation as locality-specific financial conditions.

Second, in order to address question 2), we separate the balance sheet conditions of foreign and domestic banks in each locality. In practice, we calculate two measures of bank financial health/distress, one for all foreign-owned banks in a particular locality, and one for all domestic banks in that same locality. Empirical models (1)-(3) are thus modified to incorporate two rather

than one measure of bank balance sheet conditions.

While in our specifications so far we are capable of estimating the transmission of bank financial conditions net of industry-wide and country-wide economic developments that are common to all firms in the respective industry (country), they don't allow us to test whether bank financial conditions differentially affect firms, and our estimates are prone to contamination by location-specific unobservables. Regarding the first point, it is generally predicted that riskier firms and firms with fewer tangible assets are more likely to be shut out of credit markets as a result of a negative shock (see, for example, Berger, Ofek, and Swary (1996), Beck, Demirgüç-Kunt, and Maksimovic (2005), and Brown, Jappelli, and Pagano (2009)). Regarding the second one, macroeconomic circumstances like unemployment usually vary at the city level, and so our specification so far will be contaminated by this variation. To address both points, we employ one final specification on the 2008 cross-section:

$$Y_{ijkl} = \beta_1 \cdot X_{ijkl} + \beta_2 \cdot \text{Finance}_{jk} \cdot Z_l + \beta_3 \cdot D_l + \beta_4 \cdot D_{jk} + \varepsilon_{ijkl} \tag{4}$$

Now the location dummies in D_{jk} absorb the effect of locality-specific unobservables. The interaction term containing the industry-level benchmark for asset tangibility in Z_l allows us to measure whether the potential credit supply effect is indeed strongest for those firms which theory predicts are most vulnerable to credit market developments (firms with risky profit prospects, and firms with little collaterizeable assets, for instance).

Finally, we need to emphasize that throughout the paper, it is implicitly assumed that the transmission of bank balance sheet conditions is localized and directed to firms headquartered in the locality in which the bank has operations. All of our empirical specifications presume that firms borrow from, or are rejected or discouraged by, banks located near their address of incorporation, which is identical to the approach in, for example, Gormley (2009). In general this is expected to hold as banks tend to derive market power ex ante from geographical proximity (e.g., Degryse and Ongena (2005)). Lending support to that conjecture, empirical work regarding lending relationships in different countries has demonstrated that the average distance between SMEs and their banks is

usually very small. For example, Petersen and Rajan (2002) find that the median distance between a firm and its main bank over the 1973-1993 period was only four miles; in Degryse and Ongena's (2005) sample, the median distance between a firm and it's main bank is 2.25 kilometers (1.6 miles); and in Agarwal and Hauswald's (2010) sample, the median distance between a firm and it's main bank is 0.55 miles.[15]

3.2 Isolating demand shocks

It is a common challenge of studies that analyze the association between bank balance sheets and lending to isolate supply shocks in a satisfactory fashion. In particular, it is likely that not only does loan demand decline (increase) for all firms in periods when bank capital declines (increases), but also the composition of firms that demand credit during busts (booms) changes. The solutions to this problem vary in the literature. For example, Peek and Rosengren (1997) bypass this issue by claiming that the identification problem is rather weak in the case of the international transmission of shocks to balance sheets into a recession-free environment. However, the financial crisis of 2007-2008 was followed by one of the deepest global recessions in post-war history, and this recession was already being predicted as soon as the extent of the sub-prime mortgage meltdown became apparent in late summer 2007. Hence, as we observe the firms in our sample in late 2007 and early 2008, it is conceivable that they were already behaving in a way consistent with a global recession environment. Jimenez, Ongena, Peydro, and Saurina (2011) and Puri, Rocholl, and Steffen (2011) incorporate data on loan applications to account for the weakening of the firm balance sheet channel. However, this strategy does not account for the changing composition across business lenders of firms that demand bank credit as these studies do not observe firms which select themselves out of the loan application process due to 1) weak own demand for loans, or to 2) being discouraged by the deteriorating lending environment. Failure to account for this changing composition will result in a bias in the estimation of the true extent of the transmission of bank financial conditions.

As we explained in Section 2, we eliminate the contamination of the estimates induced by 2) by incorporating data on discouraged firms in the measure of credit constraint. As for 1), we eliminate

[15] Arguably, the IT revolution and phone banking have recently diminished the role of geographic distance in bank-firm relationship.

the effect of the balance sheet channel by incorporating observable information on firms which did not apply for bank credit in fiscal year 2007 because they did not need it (see Section 2 for the exact definition). We apply Heckman's (1979) selection procedure to eliminate the bias arising from the left-truncation of the sample in that sense. Thus, credit constraint is only observable when a firm actually applies for a loan, and the firm only does so if it needs one, or if it is not discouraged. Let the dummy variable Q equal 1 if the firm desires positive bank credit and 0 otherwise. The value of Q is in turn determined by the latent variable:

$$q = \zeta \cdot Z_{ijkl} + \varepsilon_{ijkl} \tag{5}$$

where Z_{ijkl} contains firm and location variables that may effect the firm's fixed costs and convenience associated with using bank credit. The variable $Q = 1$ if $q > 0$ and $Q = 0$ otherwise. The error ε_{ijkl} is normally distributed with mean 0 and variance σ^2. Models (1)-(4) are then updated by adding the term $\sigma \frac{\phi(q)}{\Phi(q)}$ to the RHS, where $\frac{\phi(q)}{\Phi(q)}$ is the inverse of Mills' ratio (Heckman (1979)). Identification rests on the exclusion restriction which requires that q has been estimated on a set of variables that is larger by at least one variable then the set of variables in models (1)-(4), respectively.

4 Empirical results

4.1 Bank credit application

Before estimating our empirical models, we first consider the bank credit application tests that we use for our Heckman selection correction. Table 4 presents the results from the first stage probit regression. The probability of positive demand for bank credit is generally higher for firms in localities dominated by banks with weaker balance sheets. When balance sheet conditions are measured in terms of equity (column (2)), Tier 1 capital (column (4)), and gains on financial assets (column (7)), the effect is also significant in the statistical sense. Not accounting for this selection would thus bias the estimates of the transmission of balance sheet conditions towards zero.

In terms of the firm-level co-variates, the demand for bank credit increases in the size of the

firm. One potential explanation is that small firms face higher application costs (Brown, Ongena, Popov, and Yesin (2011)). Also, in a beginning-of-a-recession environment it might be that small firms are better equipped to finance investment with cash flows than - potentially - more highly leveraged large firms. In addition, some of the size effects may be picked by ownership and structural characteristics, as sole proprietorships and public companies have a higher demand for loans. The demand for bank credit is higher for exporters potentially due to their faster expansion, and for audited firms, which might simply imply that firms choose to be audited (i.e., they are willing to pay for transparency) when they plan to apply for bank credit.[16] It may also be the case that audited firms have access to financial statement lending which may be a cheaper lending technology.

In terms of the exclusion restriction, the variables "Competition" and "Subsidized" are included in this demand model, but excluded from the rest of the exercises. The rationale for using these particular variables as instruments for demand is the following. Firms in more competitive environments will likely have a higher demand for external credit due to lower profit margins, but it is unlikely that credit decisions will be correlated with product market competition. Analogically, having applied for state subsidies is likely a signal for external financial need. These considerations make both variables good firm demand shifters.[17] Both variables are very positively correlated with the demand for loans, the effect is statistically significant at the 1% level, and the overall F-statistics from a first-stage regression of loan demand on the two variables (unreported) is 49.01.

4.2 Transmission of bank balance sheet conditions

4.2.1 Nonparametric difference-in-differences estimates

Table 5 gives a simple non-parametric illustration of our empirical strategy. We separate the data across geographic and financial dimensions, for the special case of negative shocks to bank balance

[16] The results are broadly consistent with Ongena and Popov (2011) who apply a double selection technique to the BEEPS 2005 sample.

[17] We cannot ensure, however, that the exclusion restriction is not violated. On the one hand, unlike size, ownership, whether the firm exports or not, and whether the firm is audited or not (RHS variables in the credit supply equation) are more readily observed by the bank than whether the firm receives subsidies and how many competitors it has. On the other hand, firms in more competitive environments could be more efficient, and if a firm is backed by government subsidies, it can be viewed as less risky. If banks had this information, the validity of the instrument could be put into question. While the two variables appear to be uncorrelated in a statistical sense with the probability of a firm being constrained - all else equal - we need to acknowledge this caveat.

sheets. Specifically, we average the data on credit constraints, across all localities in the dataset, for the 2005 vs. the 2008 samples, and also for affected vs. non-affected localities. In determining which localities are affected, we use Tier 1 capital and define "affected" as localities where the average Tier 1 capital ratio of banks present in that locality decreased by at least one standard deviation between 2005 and 2008.[18] The table implies that credit constraints vary over time, given different bank balance sheet conditions. In particular, average rejection rates for non-affected localities didn't change much between 2005 and 2008: they went from 32.9% to 34.3%, and this increase is not statistically significant. In comparison, in affected localities rejection rates went up to 40.2% in 2008, from 34.2% in 2005, with this increase being significant at the 1% level. Looking at the same development from another angle, while rejection rates were similar for all banks in 2005, in 2008 they were much higher in localities where banks experienced a substantial decline in core capital in the meantime. This result is the first piece of evidence that banks (both foreign and domestic) reacted to their respective financial troubles early in the 2007-08 financial crisis by shrinking their loan portfolios.

4.2.2 Transmission of bank balance sheet conditions: Cross-section results

We start the discussion of the results from our parametric tests by reporting in Table 6 the estimates of the effect of bank balance sheet conditions on access to credit for all firms present in BEEPS 2008. We report the results of the model in equation (1) alongside the results from the Heckman selection-corrected version in order to contrast the two approaches. The three main financial conditions of interest are: the ratio of equity to total assets; Tier 1 capital ratio; and the ratio of gains on financial assets to total assets.

We first report the results from the model in which in calculating locality-specific measure of bank balance sheet conditions, each bank is given equal weight in each locality where the bank is present (Panel A). As expected, all else equal, small firms and sole proprietorships are more credit constrained, potentially indicating lower ability to tap alternative capital markets; audited firms are less constrained, implying gains from the reduction of informational opacity; and firms that export

[18] The results are qualitatively unchanged when we use a two standard deviation decline instead.

part of their production are less constrained, potentially signalling the willingness of banks to lend to firms with higher growth prospects. The variables of interest have a generally insignificant impact on the probability of firms being constrained in the credit market when selection is accounted for, with the sign of Tier 1 capital going in the expected direction.

When we apply our preferred weighting criterion in Panel B, namely, weighting the probability of the firm doing business with each particular bank by the number of branches the bank has in that locality, we find a large, negative, and significant impact of a bank Tier 1 capital ratio on rejection rates. The magnitude of the effect is also economically meaningful: for example, a 2-standard deviation increase in the average Tier 1 capital ratio for banks in a particular locality decreases the probability of identical firms in this locality being credit constrained by about 8.5% (column (4)). Gains on financial assets seem to be associated with higher constraints (column (5)).

Panel C, where we construct each financial variable by weighting parent bank health by subsidiaries' assets, confirms this result: higher Tier 1 capital is associated with lower credit constraints (columns (4)), while gains on financial assets are associated with higher constraints (columns (5) and (6)). This implies that banks tend to contract their balance sheets in response to capital losses, but expand them in response to asset losses. In all panels, the sign of the inverse of Mills' ratio is generally positive, but insignificant.

Finally, recall that by looking at fiscal year 2007, we are capturing only the initial stages of the crisis up to March 31, 2008. In addition to that, our results are contaminated by months of pre-crisis experience before August 2007. In that sense, if there is bias in our estimates, it only goes against finding any transmission of crisis-related bank conditions. The large and statistically significant effect of low Tier 1 capital, for example, on rejection rates could thus only be a lower bound of the true effect.

4.2.3 Transmission of bank balance sheet conditions over time

We now turn to the transmission of bank balance sheet conditions to firms that are present either in the 2008 or in the 2005 BEEPS, employing the Heckman selection-corrected version of model (2). This allows us to account for the changing composition of firms that select themselves out of

the application process, going from the peak to the trough of the credit cycle. In other words, the information on whether firms do not apply for credit because they don't need it, or because they are discouraged, and how that changes over time, is used to eliminate the potential contamination of our estimates by the correlation between credit needs and bank balance sheet conditions. In addition, we can compare the effect of an identical bank balance sheet condition in 2008 relative to 2005.

These results are reported in Table 7, Panel A.[19] In this specification, we find conflicting evidence on the effect of equity capital on credit constraints (columns (1) and (2)). Similar to Table 6, we again find that higher Tier 1 capital is associated with lower credit constraints when we weight each bank's presence in a locality equally (column (4)) or by number of branches (column (5)). The interpretation of the coefficient on the branch-weighted Tier 1 capital is that for the sample average Tier 1 capital, for example, an identical firm had a 6% higher chance of being constrained in fiscal year 2007 than in fiscal year 2004. Importantly, we confirm that not accounting for selection introduces downward bias. The sign of the inverse of Mills' ratio is generally negative, and this time significantly so, implying that firms which did not apply for a loan would have faced a higher probability of being rejected. Finally, this time we find that gains (losses) on financial assets are associated with lower (higher) credit constraints (Columns (8) and (9)), implying that over the credit cycle, firms' access to credit was higher if they were borrowing from banks whose financial assets were appreciating rather than depreciating in value.

In panel B of Table 9, we look at the special case of negative shocks to bank balance sheets (Model (3)). We only look at localities for which at least 1 firm is present both in 2005 and in 2008. Now instead of *levels*, we look at *changes* in bank balance sheet conditions over time. We define affected localities as ones in which the financial variable of interest declined by at least one standard deviation between 2005 and 2008.[20]

In this specification, we find that changes in equity capital and in Tier 1 capital are transmitted to the corporate sector through business lending. For example, consider our measure of average Tier

[19] In all tables to follow, only coefficients of interest are reported for brevity.

[20] This procedure is robust to taking a two-standard deviation decline instead, and to using the top quartile change vs. the bottom quartile change (results available upon request).

1 capital constructed by weighting information on each bank present in a locality by subsidiaries' assets (column (6)). We find, for example, that in localities where Tier 1 capital declined by at least one standard deviation between 2005 and 2008, the probability of a firm being credit constrained increased by 10.2% more than for an identical firm in a locality where whose banks' equity capital increased or declined by less.

We use these estimates to assess the overall change in lending due to the change in banks' balance sheet conditions in the beginning of the 2007-08 financial crisis. For example, at the onset of the crisis around 64.8% of the firms in localities present in both the 2005 and the 2008 survey had a positive demand for bank credit in 2007/08. In 82.8% of these localities, the parent banks experienced at least one standard deviation decrease in Tier 1 capital between 2005 and 2008, and our difference-in-differences estimates imply a 10.2% increase in the probability of a firm being credit constrained (all else equal) associated with deteriorating balance sheet conditions of parent banks. This implies that 5.4% of the overall population of firms were credit constrained (in terms of new lending) above and beyond what would have been the case if Tier 1 capital at parent banks had declined by less than one standard deviation.

4.2.4 Transmission of bank balance sheet conditions: Foreign vs. domestic banks

The evidence so far raises the question whether the elasticity of credit supply to bank balance sheet conditions is different for foreign and for domestic banks? We have so far only investigated the effect of bank balance sheet conditions on access to finance for the average bank in a locality, regardless of its ownership. Now we explicitly test for the variation in the transmission of bank balance sheets conditions between foreign-owned and domestic-owned banks. We do so by calculating two measures of balance sheet conditions for each locality: one constructed by averaging the respective average financial condition for all foreign banks in a locality, and one by averaging financial conditions for all domestic banks in that same locality.

Before we report the estimates, recall that our empirical strategy relies on gauging the intra-country cross-locality variation in access to finance. Therefore, in this specification we are not comparing changes in credit supply in a foreign bank-dominated country, like Estonia, to changes

in credit supply in a domestic bank-dominated country, like Slovenia. We are instead comparing changes in credit supply *within the same country* across foreign bank-dominated and domestic bank-dominated localities, as well as between foreign banks and domestic banks within the same locality.

Table 8 reports the estimates from models (1)-(3), after splitting the bank balance sheet condition variable(s) into a foreign component and a domestic component. In the 2008 cross-sectional tests, the sensitivity of credit supply to bank balance sheet conditions turns out to vary between foreign and domestic banks. For example, firms are considerably less credit constrained if the foreign banks in their locality of operation have more equity capital (column (1)). At the same time, bank credit supply seems to respond to changes in the Tier 1 capital of both foreign banks (column (4)) and of domestic banks (column (5)).

Turning to the transmission of bank balance sheet conditions over time, the results are somewhat ambiguous in the case of bank capital. For example, firms doing business with foreign banks which experienced a decline in Tier 1 capital between 2005 and 2008 were more constrained in 2008 (column (5)), while they were less constrained in localities where domestic banks went through this kind of experience (column (4)). At the same time, the direction of the effect is reversed in the case of equity capital. However, in the case of gains or losses on financial assets, the estimates consistently point to the fact that firms were more credit constrained in localities where the foreign banks experience losses on financial assets, but less constrained if domestic banks experienced them. The combined evidence is thus weakly suggestive of the fact that domestic banks facing similar shocks were less likely to abandon their customers than foreign banks whose principal customer base is abroad (Peek and Rosengren (1997)).

4.2.5 Transmission of bank balance sheet conditions and firm characteristics

Next, we ask which firms are most sensitive to the transmission of bank balance sheet conditions. There are clear arguments in the literature on which firms and industries should be most affected by a decline in credit. Firm risk and the tangibility of the firm's assets, for example, are expected to play an important role in explaining differences in credit availability across firms. High-risk firms

tend to be most affected by changes in credit conditions, especially when foreign bank lending is involved (Berger, Klapper, and Udell (2001)). Regarding asset tangibility, Berger, Ofek, and Swary (1996) show that firms with less tangible assets are more likely to lose access to credit when banks reprice risk. The rationale is that lenders rely more on collateral when making lending decision rather than investing in costly screening technologies, and this problem will tend to be exacerbated in an environment where risk is suddenly priced higher.

We proceed by collecting data on mature U.S. firms and using it to construct industry benchmarks for riskiness and asset tangibility. The rationale for doing so goes back to Rajan and Zingales (1998) who argued that the actual corporate structure of small firms is a function of financial constraints, while the corporate structure of large mature firms is more representative of the cross-industry variations in the scale of projects, gestation period, the ratio of tangible vs. intangible assets, R&D investment, etc. In addition, doing so for large U.S. firms ensures that what is taken as a "natural" industry feature is not contaminated by shallow financial markets. The idea is that large listed U.S. firms are not constrained in their choice of a corporate structure, so their financing decisions reflect the industry's natural demand for funds.

We start by taking all Compustat firms between 1990 and 2000. We first exclude all firms that are young in the sense that they have gone public only recently (in the last 10 years) to make sure that we are not capturing the excessive appetite for funds exhibited during the early life of a public firm. For each firm, we sum across all years its ratio of research and development expenses over sales. We take the median industry value of that ratio and this value constitutes our industry benchmark for "R&D intensity". This is both a measure of risk and of asset tangibility: firms with a lot of R&D investment will simultaneously have riskier returns due to more uncertain profits, and less collaterizeable assets. Second, we sum across all years each firm's ratio of total physical capital used in production over the number of employees. The industry median value of that variable constitutes our industry benchmark for "Capital intensity", which again captures partially risk and partially asset tangibility.

Table 9 reports the estimates of equation (4) where each measure of bank balance sheet conditions has been interacted with the industry benchmark for "R&D intensity" and for "Capital

intensity". A negative coefficient on the interaction term in the first case and a positive coefficient in the second case would imply that the transmission of identical changes in the banks' balance sheets is larger for firms with fewer collateralizeable assets to pledge. We only focus on financial conditions as measured by Tier 1 capital ratios, as this is the one measure that is most consistently significant in the analysis so far. Importantly, this specification gives us interaction at the city and industry level, and thus we can include city dummies in the regression. The direct effect of local bank conditions is now fully absorbed by the city dummies, along with any unobservable variation in macroeconomic conditions at the location level. The effect on credit constraints of the sector-wide variation in growth opportunities is absorbed by the industry dummies, as before.

The results confirm the intuition: the transmission of bank balance sheet conditions to the corporate sector is stronger for firms which have riskier growth prospects, or do not have enough assets to pledge as collateral. Numerically, the same branch-weighted Tier 1 capital ratio is associated with a 6% higher probability of loan rejection for firms in industries with the highest R&D intensity than for firms in industries with the lowest R&D intensity; and with a 31.2% higher probability of loan rejection for firms in industries with the lowest per-worker capital than for firms in industries with the highest per-worker capital.[21] We are only capturing bank behavior with respect to new loans, so this evidence is insufficient to alleviate concerns for a Japanese-style evergreening in the early stages of the 2007-08 crisis. However, the evidence does suggest that in the special case of negative balance sheet shocks, banks did not respond to financial distress by extending more loans to high-risk high-return projects.

5 Endogeneity and robustness

Finally, in Table 10, we address various potential problems with our data and with our empirical methodology. Probably the most important of these is the issue of the endogeneity of foreign bank entry: for example, foreign banks may in particular enter countries which grow faster during good

[21] In unreported exercises, we performed a robustness check interacting the industry benchmarks with the Frisch-Waugh residuals derived from a regression of the finance variable on each industry benchmark. This procedure is aimed at hedging against a spurious interaction term (see Ozer-Balli and Sorenson (2010) for details), and it leaves our estimates qualitatively unchanged (results available upon request).

times but where demand deteriorates more during recessions because of the industrial or trade mix of the country's economy. On the face of it, given our within-country cross-locality identification strategy, we shouldn't worry about this as much as studies which use country-level foreign bank presence as explanatory variable (see, for example, Giannetti and Ongena (2009)): the dominant mode of entry for foreign banks in the region was through purchasing existing banks rather than through greenfielding, and so while the entry choice is endogenous, the variation of local presence is somewhat predetermined conditional on entry. Nevertheless, it is still entirely possible that the purchaser took into account the conditions of the target bank, including its customer base and geographic outreach. In this case, the composition of local presence by foreign banks will not be a randomly applied treatment.

In order to address this problem, we attempt to extract the endogenous element of entry using an instrumental variable (IV) procedure. To that end, we need instrumental variables which are correlated with the entry choice but not with local variations in the customer base. The set of instruments that we use includes: 1) geographical distance to bank headquarters; 2) local protection of creditors' rights; 3) whether the country is a member of the euro area; and 4) whether the country is a member of the EU. The rationale behind this choice is that banks prefer to enter and extend loans in markets that are more institutionally similar (geographic proximity, common currency, common legal framework), and where their investments are better protected. This procedure is reminiscent of Jayaratne and Strahan (1996) who use the removal of barriers to bank entry in the U.S. as an instrument to show that improvements in the quality of bank lending are causally related to economic performance. As column (1) indicates, our results are only strengthened by this IV procedure.

The next problem relates to the possibility that year-end 2008 data do an inferior job of capturing bank balance sheet conditions at year-end 2007/start of 2008. Year-end 2007 data are clearly more contemporaneous to our sample period, however, our choice of using year-end 2008 data throughout the paper is motivated by the fact that accounting performance data arguably lag real performance. For example, Citibank looked in relatively good financial health in year-end 2007, but only because much of their financials were not marked to market. Nevertheless, we perform

a robustness check in which all locality-specific bank balance sheet conditions are calculated using year-end 2007 data from Bankscope. As indicated by column (2), while the statistical effect of Tier 1 capital on bank lending decreases somewhat relative to column (4) in Table 7, Panel C, it is nevertheless still statistically significant, implying that 2007 and 2008 data give a somewhat similar picture of the phenomenon we are attempting to capture.

Another problem might be the fact that throughout the paper, we have been using consolidated data to calculate locality-specific measures of bank balance sheet conditions. This is consistent with the purpose of the paper, namely, to partially capture the effect of parent-bank conditions on lending abroad.[22] However, parent banks in our sample are almost exclusively present through subsidiaries, and not through branches, and it is tempting to argue that parent health should matter very little next to subsidiary health given that subsidiaries tend to be separately capitalized. The cross-border internal capital markets in the region have been shown to be very active (De Haas and van Lelyveld (2011)), and the Vienna Initiative from early 2009[23] is a clear indication that governments and regulators in host countries were worried about a capital outflow regardless of local subsidiary health. We nevertheless take this concern to the data. In column (3), we include in the regression a measure of local bank conditions which is calculated using year-end 2008 data on the local subsidiaries. On its own, the effect of local subsidiary balance sheet strength turns out to be uncorrelated with bank lending, while parent bank balance sheet conditions continue to command a significant and large effect.

Another concern is that accounting data may capture poorly - even with the appropriate lag - the bank's actual financial situation, and so market indicators of bank stress, like CDS spreads, would be a better indicator. In addition, because these indicators have a higher frequency, they could capture better the actual bank stress at the time of the survey. We proceed to collect data on

[22] We note that our data, unlike the U.S. data used in Ceterolli and Goldberg (2009), do not permit us to directly observe the workings of the internal capital markets of the foreign banks in our sample so we cannot identify the precise mechanism through which the spillover effect operates. In this regard our approach is similar to recent studies of cross border spillover effects within the U.S. (Berrospide, Black, and Keeton 2011) and internationally (Ceterolli and Goldberg 2010).

[23] The Vienna Initiative was launched in January 2009 by the IMF, EBRD, EIB, the World Bank, the EU, ECB, home and host country regulators and the largest bank groups present in the region of central and eastern Europe to "[...] prevent a large-scale and uncoordinated withdrawal of cross-border bank groups from the region." See EBRD (2010) for details

CDS spreads for all parent banks for 2008:Q1 (the last quarter before the survey was administered). Unfortunately, the data do not exist for some of the banks in the sample (notably, all Greek banks, as well as Swedbank). This results in a somewhat reduced sample. Nevertheless, we confirm our main result: firms in localities dominated by banks whose CDS spreads were higher in the beginning of 2008 faced higher credit constraints (column (4)). Therefore, the transmission of financial distress we detected in our main tests seems to be robust to using market instead of accounting data.

Also potentially problematic are two natural objections to our procedure of calculating an average index of local bank conditions and then matching it to all firms in that locality. The first is that many firms which can afford it could be doing business with banks outside of their locality of incorporation, in a hunt for better credit conditions. The second is that the more banks there are in this locality, the more poorly our measure of average bank balance sheet conditions will capture actual firm experience. We address the first concern by looking only at small young firms for which the cost of applying for credit far from their locality of incorporation is too high given the expected gain in loan terms (Degryse and Ongena (2005)) and which should therefore be more restricted in their geographic choice of a main bank (column (5)). We address the second by looking at the experience of the same set of firms, but only in localities where there are at most two banks (column (6)). Both procedures do not eliminate the significance of our results, so we conclude that they are not driven by mismeasuring true financial distress or by imposing non-existing bank relationships.

Finally, while our procedure is by its nature tailored to eliminate the effect of demand on the measured transmission of shocks, the firms in the data come from a relatively export-driven economic region. It is possible then that both firm demand for credit and banks' assessment of the market for firms' products may be heavily influenced by whether the firms export to the most crisis-affected countries. If they do, then any observed decline in lending may be due declining foreign demand for the output of the firms that do business with these banks. Credit demand and credit supply would then be driven by the same shock and our identification strategy would break down. While we have so far controlled for whether firms export, we have not controlled for where they export to. As this information is not available, we check whether our results are robust to excluding all exporting firms from the sample (column (7)). Our main result survives with

an undiminished magnitude, suggesting that the effects we document are not due to the demand channel contaminating the supply channel.

6 Discussion of results

It is important to reconcile our findings with, for example, Navaretti, Calzolari, Possolo, and Levi (2010) and Cetorelli and Goldberg (2011), who find that total outstanding loans by foreign affiliates in central and eastern Europe did not decrease in the early stages of the crisis. Given that these papers look at total loans outstanding, while we look at new bank credit, our evidence does not necessarily contradict these other results. The two sets of findings can be reconciled by the simple difference between stocks and flows: a decline in new loans does not necessarily imply a decline in total loans outstanding, if the unused portion of credit lines and overdraft facilities are utilized. The evidence suggests that this occurred in the early stages of the crisis in the U.S., as argued by Cohen-Cole, Duygan-Bump, Fillat, and Garriga (2008) in response to Chari, Christiano, and Kehoe (2008): while new bank credit declined dramatically after the collapse of Lehman Brothers, total credit outstanding remained almost flat as firms started drawing extensively on their existing credit lines.

Our results offer important insights into the role of foreign banks in emerging markets. In general, the effect of foreign banks on business lending in the literature is ambiguous. A large literature has found that foreign bank presence is associated with higher access to loans (Clarke, Cull, and Peria (2006)), higher firm-level sales (Giannetti and Ongena (2009)), and lower loan rates and higher firm leverage (Ongena and Popov (2011)). On the other hand, Berger, Klapper, and Udell (2001), Mian (2006), and Gormley (2009) show that foreign banks tend to finance only larger, established, and more profitable firms. Such evidence is mostly derived from experience during "good times". Our paper complements that picture by providing evidence that foreign-owned banks tend to adjust their loan portfolios following shocks to their parent's financial condition.

Managerial issues might be important here given the managerial challenges associated with cross border banking (e.g., Berger, DeYoung, Genay, and Udell (2000)). Managerial focus on solving

problems at the headquarters level in the home country could reduce the ability of the parent bank to monitor lending activities in its foreign facilities. Given the organizational frictions associated with lending a la Stein (2002), this reduced monitoring ability could have a disproportional effect on the contraction of credit by foreign banks. Perhaps our results on foreign bank behavior are also related to the more general finding in the literature that lending tends to be pro-cyclical (e.g., Borio, Furfine, and Lowe (2001), Dell'Ariccia, Igan, and Laeven (2008), Pannetta et al. (2009)). Our finding that riskier borrowers are more affected might even suggest a link to the institutional memory explanations of pro-cyclical lending behavior (e.g., Berger and Udell (2004)) where eroded lending expertise is more problematic at foreign banks.

Finally, we need to acknowledge one caveat. While balance sheet conditions of domestic banks reflect local market conditions, balance sheet conditions of foreign parent banks would be dominated by conditions elsewhere, suggesting that the average financial condition in a locality may depend on the extent to which local market conditions differ from the average of markets in which the foreign owned banks operate. Moreover, foreign banks have operations in lots of different locations and countries, so there is an issue about how their internal capital markets work to allocate resources across their web of banks. Whether a multinational bank allocates more resources to, or pulls back from, a particular location may depend on the opportunities in that location relative to its opportunities in its other far-flung operations. While it is next to impossible to account for such differential opportunities directly (for example, UniCredit has over 10,000 branches in 22 countries, and Citigroup operates in more than 100 countries), and while the consolidated data we use by construction capture the parent bank's overall financial conditions, it is fair to admit that our empirical models based on measures of parent bank condition may not fully capture this effect.

7 Conclusion

A substantial amount of financial services in emerging Europe are delivered by foreign banks, and evidence amounts of the benefits of foreign bank ownership when credit markets function properly. However, borrowers are not insulated from negative shocks to bank financial conditions, should

such arise. Since the early stages of the 2007-08 financial crisis, policy-makers have been concerned that banks might curtail lending to retail customers in response to declining bank capital and to mounting asset losses. Because of the dominant role western European banks hit by the crisis play in the region, it was feared that firms in central and eastern Europe would be particularly heavily hit, despite the fact that the negative shocks to their parents' balance sheets originated elsewhere.

In this paper, we use survey data on 10,701 SMEs in 16 emerging European countries to investigate empirically the transmission of financial conditions from banks to business customers before and during the financial crisis. The major benefit of the data is that we observe firms that were discouraged from applying for bank credit by unfavourable credit market conditions, in addition to firms that received a loan or were denied one. Several recent studies have documented a credit supply effect during both good and bad times. However, our paper is the first one to simultaneously capture the indirect cross-border dimensions of this phenomenon, as well as to eliminate the contamination of the lending channel by the selection bias resulting from changes in firms' demand for credit and by the failure to account for discouragement in proxying for credit constraints.

We find that different types of financial shocks - both positive and negative - at foreign as well as domestic banks are associated with a significant impact on business lending to firms in emerging Europe over the credit cycle. Our evidence shows that SMEs report higher credit constraints in localities dominated by branches or subsidiaries of banks which have low equity capital and low Tier 1 capital ratios, and which have recorded losses on financial assets. The evidence is particularly strong during the early stages of the 2007-08 financial crisis. Our results are robust to controlling for the endogeneity of foreign bank entry, to the choice of end-2007 vs. end-2008 data and of accounting vs. market data on financial conditions, to accounting for the possibility that weakening credit demand and weakening credit supply originate from the same shock, and to eliminating the bias resulting from the systematic self-selection of firms out of the application process. We also find that high-risk firms and firms with fewer tangible assets are relatively more sensitive to shocks to bank capital. Our evidence also implies that all else equal, firms in countries where major portions of the banking market were held by relatively undercapitalized foreign banks

were more credit constrained than identical firms in countries served by better capitalized foreign banks. Our paper thus presents evidence of the transmission of negative shocks to bank balance sheets in the relatively early stages of the 2007-2008 financial crisis, in a way unrelated to the demand for loans in local markets.

The global nature of the financial crisis has finally laid to rest the idea that the effect of large financial shocks can be confined locally. While the financial crisis only started in the third quarter of 2007, European banks continued tightening credit standards deep into 2010.[24] Thus, despite the coordinated actions of various national and supranational authorities to keep the global financial system operational once tensions emerged in interbank markets in August 2007, it is likely that the losses that the financial system endured have induced a much larger impact on the real sector than the one estimated in this paper. The true extent of the financial crisis and its effect on firm access to finance will only become clear when new, more comprehensive data become available.

[24] See ECB (2010) for details.

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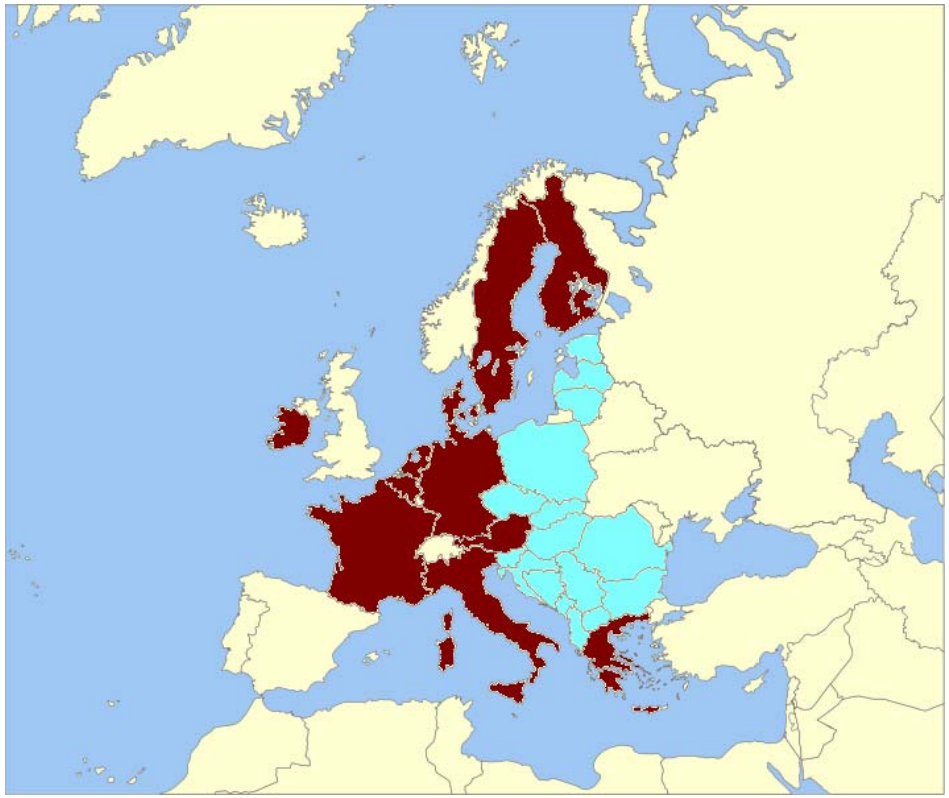
Figure 1. Home and host countries



The map shows the cross-border dimension of the underlying data. Countries in dark color (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Netherlands, and Sweden) are those in which the parents of the foreign-owned banks in the dataset are incorporated. Countries in light color (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia, and Slovenia) are those where the firms in the dataset are incorporated.

Table 1.
Summary statistics: Firm characteristics

Country	# firms	Small firm	Big firm	Public company	Private company	Sole proprietorship	Privatized	Exporter	Audited	Subsidized	Competition
Albania	260	0.90	0.03	0.01	0.19	0.74	0.06	0.31	0.74	0.04	0.74
Bosnia and Herzegovina	607	0.78	0.03	0.14	0.54	0.40	0.22	0.35	0.53	0.10	0.79
Bulgaria	609	0.84	0.03	0.05	0.38	0.51	0.12	0.24	0.42	0.06	0.62
Croatia	372	0.79	0.05	0.06	0.41	0.44	0.23	0.36	0.47	0.18	0.79
Czech Republic	670	0.79	0.04	0.04	0.48	0.41	0.08	0.35	0.43	0.16	0.82
Estonia	557	0.79	0.03	0.13	0.55	0.27	0.11	0.34	0.80	0.14	0.77
Hungary	992	0.80	0.04	0.01	0.32	0.63	0.12	0.36	0.74	0.22	0.88
Latvia	529	0.73	0.04	0.01	0.56	0.36	0.13	0.31	0.68	0.12	0.79
Lithuania	544	0.77	0.02	0.02	0.68	0.24	0.16	0.37	0.40	0.15	0.78
Macedonia	611	0.81	0.03	0.05	0.48	0.32	0.16	0.39	0.54	0.04	0.84
Montenegro	151	0.86	0.01	0.04	0.25	0.71	0.12	0.15	0.48	0.04	0.69
Poland	1,592	0.83	0.02	0.05	0.12	0.78	0.09	0.26	0.37	0.13	0.84
Romania	1,247	0.73	0.04	0.04	0.73	0.17	0.13	0.20	0.37	0.09	0.71
Serbia	734	0.72	0.05	0.13	0.42	0.49	0.19	0.38	0.54	0.08	0.81
Slovakia	610	0.74	0.05	0.06	0.29	0.54	0.11	0.34	0.55	0.13	0.79
Slovenia	616	0.74	0.05	0.08	0.50	0.29	0.21	0.56	0.43	0.22	0.79
Total	10,701	0.79	0.03	0.05	0.42	0.46	0.12	0.32	0.51	0.13	0.79

Note: The table presents statistics on the number of firms and the share of firms by size, ownership, privatization history, access to foreign product markets, access to international auditing, subsidies from central and local governments, and degree of competition, by country. See Appendix 1 for exact definitions. Source: BEEPS (2008 and 2005).

Table 2.
Summary statistics: Credit demand and credit constraints

	BEEPS 2008		BEEPS 2005	
Country	Need loan	Constrained	Need loan	Constrained
Albania	0.29	0.47	0.68	0.32
Bosnia and Herzegovina	0.77	0.37	0.76	0.20
Bulgaria	0.58	0.52	0.65	0.37
Croatia	0.59	0.42	0.78	0.16
Czech Republic	0.53	0.32	0.56	0.43
Estonia	0.54	0.27	0.60	0.23
Hungary	0.41	0.31	0.78	0.29
Latvia	0.59	0.48	0.70	0.27
Lithuania	0.60	0.23	0.71	0.32
Macedonia	0.59	0.50	0.68	0.57
Montenegro	0.78	0.48	0.56	0.30
Poland	0.53	0.41	0.68	0.46
Romania	0.61	0.33	0.72	0.34
Serbia	0.77	0.38	0.77	0.41
Slovakia	0.53	0.40	0.62	0.24
Slovenia	0.64	0.15	0.72	0.11
Total	0.60	0.37	0.70	0.34

Note: The table presents statistics on the share of firms who declare bank loans desirable, and the share of firms out of those that need a loan that have been formally rejected or did not apply because they found access to finance too difficult, by country. The data are for the fiscal year 2007 (until March 31, 2008) and for until March 31, 2005. See Appendix 1 for exact definitions. Source: BEEPS (2008 and 2005).

Table 3.
Bank ownership and balance sheet data

	2005	2008	2005	2008	2005	2008	2005	2008
Country	% foreign owned bank assets		Equity/assets		Tier 1 capital ratio		Gain on financial assets	
Albania	0.92	0.94	0.065	0.053	8.39	7.88	0.120	-0.333
Bosnia and Herzegovina	0.91	0.94	0.048	0.054	7.26	7.85	0.091	-0.370
Bulgaria	0.75	0.82	0.069	0.064	10.10	8.89	0.230	-0.200
Croatia	0.91	0.90	0.066	0.061	7.33	7.56	0.151	-0.126
Czech Republic	0.82	0.86	0.041	0.042	7.74	8.29	0.423	-0.401
Estonia	0.99	0.99	0.047	0.038	8.88	8.69	0.185	-0.095
Hungary	0.83	0.64	0.068	0.065	8.89	8.51	0.098	-0.306
Latvia	0.58	0.64	0.076	0.049	7.98	6.52	-0.048	-0.379
Lithuania	0.92	0.92	0.058	0.054	8.14	8.19	0.194	-0.158
Macedonia	0.51	0.86	0.076	0.071	10.37	8.60	0.319	-0.037
Montenegro	0.88	0.79	0.144	0.094	16.91	9.45	0.759	-0.127
Poland	0.74	0.76	0.082	0.081	10.32	9.39	0.076	-0.183
Romania	0.59	0.87	0.059	0.053	8.31	7.81	0.266	-0.217
Serbia	0.66	0.76	0.084	0.077	9.19	8.63	0.206	-0.173
Slovakia	0.97	0.99	0.058	0.055	7.93	8.21	0.079	-0.287
Slovenia	0.23	0.29	0.058	0.050	8.86	8.82	0.348	-0.509
Total	0.76	0.81	0.066	0.060	8.92	8.36	0.170	-0.241

Note: The table reports summary statistics on the share of the domestic banking system owned by branches and subsidiaries of foreign banks, of the average ratio of equity financing to total bank assets, of the average Tier 1 capital ratio, and of average gains on financial assets by the parent of the banks operating in each country, by country. The data are averaged for end-2005 and end-2008, respectively. 'Equity/assets' is a simple ratio, 'Tier 1 capital ratio' and 'Gains on financial assets' are ratios multiplied by 100. See Appendix 1 for exact definitions. Source: EBRD Transition Report (2008) and Bankscope (2005 and 2008).

Table 4.
Credit demand

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Finance = Equity/assets			Finance = Tier 1 capital ratio			Finance = Gains on fin assets		
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Finance	-0.027	-0.031	-0.007	-0.039	-0.030	-0.021	-0.312	-0.151	-0.178
	(0.018)	(0.018)*	(0.016)	(0.020)*	(0.021)	(0.017)	(0.100)***	(0.123)	(0.112)
Small firm	-0.123	-0.123	-0.122	-0.126	-0.126	-0.130	-0.120	-0.120	-0.121
	(0.043)***	(0.043)***	(0.044)***	(0.043)***	(0.043)***	(0.044)***	(0.044)***	(0.044)***	(0.044)***
Big firm	0.189	0.188	0.217	0.192	0.190	0.212	0.180	0.181	0.219
	(0.091)**	(0.091)**	(0.092)**	(0.091)**	(0.091)**	(0.092)**	(0.091)**	(0.091)**	(0.092)**
Public company	0.007	0.009	0.004	0.009	0.011	0.010	0.002	0.002	-0.002
	(0.069)	(0.069)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)
Sole proprietorship	0.148	0.151	0.130	0.150	0.153	0.133	0.144	0.143	0.127
	(0.036)***	(0.036)***	(0.036)***	(0.036)***	(0.036)***	(0.036)***	(0.036)***	(0.036)***	(0.036)***
Privatized	0.055	0.056	0.041	0.059	0.057	0.045	0.062	0.061	0.042
	(0.048)	(0.048)	(0.049)	(0.048)	(0.048)	(0.049)	(0.049)	(0.049)	(0.049)
Exporter	0.181	0.181	0.190	0.181	0.180	0.188	0.177	0.178	0.189
	(0.035)***	(0.035)***	(0.035)***	(0.035)***	(0.035)***	(0.035)***	(0.035)***	(0.035)***	(0.035)***
Audited	0.084	0.084	0.072	0.082	0.082	0.069	0.079	0.081	0.071
	(0.033)***	(0.033)**	(0.034)**	(0.033)***	(0.033)**	(0.034)**	(0.033)**	(0.033)**	(0.034)**
Competition	0.177	0.176	0.181	0.177	0.177	0.182	0.173	0.174	0.180
	(0.036)***	(0.036)***	(0.037)***	(0.036)***	(0.036)***	(0.037)***	(0.037)***	(0.037)***	(0.037)***
Subsidized	0.331	0.333	0.330	0.332	0.333	0.334	0.332	0.333	0.327
	(0.048)***	(0.048)***	(0.048)***	(0.048)***	(0.048)***	(0.048)***	(0.048)***	(0.048)***	(0.048)***
Fixed effects					Country Industry Year				
Observations	8,097	8,097	7,941	8,095	8,095	7,895	8,035	8,035	7,941
Pseudo R-squared	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Note: The dependent variable is a dummy variable equal to 1 if the firm desires bank credit. 'Finance' is one of the three balance sheet variables from Table 4. Each finance variable is locality-specific and is constructed by weighting equally (Columns labeled "Equally-weighted"), by number of branches (Columns labeled "Branch-weighted"), or by subsidiaries' assets (Columns labeled "Asset-weighted") the respective financial variable for each parent bank which has at least one branch or subsidiary in that locality. 'Small firm' is a dummy equal to 1 if the firm has fewer than 20 employees. 'Big firm'

is a dummy equal to 1 if the firm has more than 100 employees. 'Public company' is a dummy equal to 1 if the firm is a shareholder company, or its shares traded in the stock market. 'Sole proprietorship' is a dummy equal to 1 if the firms is a sole proprietorship. 'Privatized' is a dummy equal to 1 if the firm is a former state-owned company. 'Exporter' is a dummy equal to 1 if the firm exports to non-local markets. 'Audited' is a dummy equal to 1 if the firm employs external auditing services. 'Competition' is a dummy equal to 1 if the firm faces fairly, very, or extremely strong competition. 'Subsidized' is a dummy equal to 1 if the firm has received in the last 3 years subsidies from central or local government. Omitted category in firm size is 'Medium firm'. Omitted category in firm ownership is 'Private company'. The analysis is performed on all firms present either in the 2005 or in the 2008 survey. All regressions include country, industry, and year fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2005 and 2008) and Bankscope (2005 and 2008).

Table 5.
Affected vs. non-affected banks: Rejection rates pre- vs. post-

	2005	2008	Difference
Affected localities	0.342	0.402	-0.060***
Non-affected localities	0.329	0.343	-0.014
Difference	0.013	0.059**	-0.046***

Note: The table reports a difference-in-differences estimate from a Mann-Whitney two-sided test. 'Affected' are localities where the average Tier 1 capital ratio of the parents of all banks present decreased by at least 1 standard deviation between fiscal year 2004 and fiscal year 2007. The statistical significance of the difference-in-differences estimate can be found next to the difference, where *** indicates significance at the 1% level. Source: BEEPS (2005 and 2008) and Bankscope (2005 and 2008).

Table 6.
Transmission of bank balance sheet conditions (2008 sample)

Panel A. Equally-weighted bank data for each locality

	(1)	(2)	(3)	(4)	(5)	(6)
	Finance = Equity/assets		Finance = Tier 1 capital		Finance = Gains on fin assets	
Finance	0.043	0.035	-0.058	-0.068	0.395	0.365
	(0.031)	(0.031)	(0.054)	(0.055)	(0.270)	(0.376)
Small firm	0.364	0.399	0.362	0.391	0.361	0.388
	(0.072)***	(0.078)***	(0.072)***	(0.078)***	(0.072)***	(0.078)***
Big firm	0.044	0.003	0.051	0.020	0.028	-0.001
	(0.162)	(0.162)	(0.162)	(0.161)	(0.164)	(0.163)
Public company	0.418	0.437	0.419	0.432	0.414	0.428
	(0.105)***	(0.108)***	(0.105)***	(0.108)***	(0.105)***	(0.108)***
Sole proprietorship	0.155	0.141	0.155	0.143	0.151	0.140
	(0.069)**	(0.070)**	(0.069)**	(0.070)**	(0.069)**	(0.071)**
Privatized	0.026	0.015	0.020	0.013	0.028	0.019
	(0.081)	(0.082)	(0.081)	(0.083)	(0.082)	(0.083)
Exporter	-0.214	-0.239	-0.211	-0.230	-0.208	-0.226
	(0.063)***	(0.067)***	(0.063)***	(0.067)***	(0.063)***	(0.067)**
Audited	-0.232	-0.235	-0.229	-0.227	-0.234	-0.233
	(0.060)***	(0.062)***	(0.060)***	(0.062)***	(0.061)***	(0.063)***
Inverse Mills' ratio		0.093		0.071		0.070
		(0.080)		(0.079)		(0.079)
Fixed effects			Country			
			Industry			
Observations	2,502	2,470	2,501	2,469	2,471	2,439
Pseudo R-squared	0.07	0.07	0.07	0.07	0.07	0.07

Table 6.
Transmission of bank balance sheet conditions (2008 sample)

Panel B. Branch-weighted bank data for each locality

	(1)	(2)	(3)	(4)	(5)	(6)
	Finance = Equity/assets		Finance = Tier 1 capital		Finance = Gains on fin assets	
Finance	-0.021	-0.026	-0.162	-0.167	0.431	0.392
	(0.031)	(0.032)	(0.057)***	(0.057)***	(0.257)*	(0.258)
Small firm	0.361	0.396	0.361	0.394	0.361	0.390
	(0.072)***	(0.078)***	(0.072)***	(0.078)***	(0.072)***	(0.078)***
Big firm	0.043	0.002	0.057	0.018	0.028	-0.006
	(0.162)	(0.162)	(0.161)	(0.161)	(0.164)	(0.164)
Public company	0.420	0.437	0.418	0.435	0.416	0.429
	(0.105)***	(0.108)***	(0.105)***	(0.108)***	(0.105)***	(0.108)***
Sole proprietorship	0.158	0.144	0.159	0.145	0.153	0.141
	(0.069)**	(0.070)**	(0.069)**	(0.071)**	(0.069)**	(0.071)**
Privatized	0.022	0.013	0.023	0.014	0.029	0.021
	(0.081)	(0.082)	(0.081)	(0.083)	(0.082)	(0.083)
Exporter	-0.214	-0.238	-0.208	-0.231	-0.208	-0.228
	(0.063)***	(0.067)***	(0.063)***	(0.067)***	(0.063)***	(0.067)***
Audited	-0.232	-0.234	-0.227	-0.229	-0.234	-0.233
	(0.060)***	(0.062)***	(0.060)***	(0.062)***	(0.061)***	(0.063)***
Inverse Mills' ratio		0.091		0.089		0.073
		(0.080)		(0.080)		(0.081)
Fixed effects			Country			
			Industry			
Observations	2,502	2,470	2,501	2,469	2,471	2,439
Pseudo R-squared	0.07	0.07	0.07	0.07	0.07	0.07

Table 6.
Transmission of bank balance sheet conditions (2008 sample)

Panel C. Asset-weighted bank data for each locality

	(1)	(2)	(3)	(4)	(5)	(6)
	Finance = Equity/assets		Finance = Tier 1 capital		Finance = Gains on fin assets	
Finance	0.048	0.041	-0.094	-0.084	0.599	0.589
	(0.027)*	(0.027)	(0.045)**	(0.045)*	(0.274)**	(0.274)**
Small firm	0.367	0.400	0.361	0.402	0.368	0.413
	(0.071)***	(0.078)***	(0.072)***	(0.079)***	(0.071)***	(0.078)***
Big firm	0.054	0.012	0.057	0.011	0.049	-0.001
	(0.162)	(0.162)	(0.161)	(0.161)	(0.162)	(0.163)
Public company	0.412	0.431	0.415	0.436	0.414	0.438
	(0.104)***	(0.107)***	(0.105)***	(0.107)***	(0.104)***	(0.107)***
Sole proprietorship	0.130	0.117	0.140	0.124	0.134	0.118
	(0.069)*	(0.071)*	(0.070)**	(0.071)*	(0.069)*	(0.071)*
Privatized	0.019	0.010	0.020	0.010	0.022	0.017
	(0.081)	(0.082)	(0.081)	(0.083)	(0.081)	(0.083)
Exporter	-0.209	-0.236	-0.212	-0.242	-0.212	-0.245
	(0.063)***	(0.067)***	(0.063)***	(0.067)***	(0.063)***	(0.067)***
Audited	-0.237	-0.238	-0.232	-0.234	-0.237	-0.239
	(0.060)***	(0.062)***	(0.061)***	(0.062)***	(0.060)***	(0.062)***
Inverse Mills' ratio		0.091		0.103		0.109
		(0.081)		(0.079)		(0.079)
Fixed effects			Country			
			Industry			
Observations	2,495	2,463	2,473	2,441	2,495	2,441
Pseudo R-squared	0.07	0.07	0.07	0.07	0.07	0.07

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Finance' is one of the three balance sheet variables from Table 4. Each finance variable is locality-specific and is constructed by weighting equally (Panel A), by number of branches (Panel B), or by subsidiaries assets (Panel C) the respective financial variable for each parent bank which has at least one branch or subsidiary in that locality. 'Small firm' is a dummy equal to 1 if the firm has fewer than 20 employees. 'Big firm' is a dummy equal to 1 if the firm has more than 100 employees. 'Public company' is a dummy equal to 1 if the firm is a shareholder company, or its shares traded in the stock market. 'Sole proprietorship' is a dummy equal to 1 if the firms is a sole proprietorship. 'Privatized' is a dummy equal to 1 if the firm is a former state-owned company. 'Exporter' is a dummy equal to 1 if the firm exports to non-local markets. 'Audited' is a dummy equal to 1 if the firm employs external auditing services. 'Inverse Mills' ratio' is the inverse of Mills' ratio from the probit model in Table 4 for each respective financial variable. Omitted category in firm size is 'Medium firm'. Omitted category in firm ownership is 'Private company'. Omitted variables from the probit equation in Table 4 are 'Competition' and 'Subsidized'. The analysis is performed on all firms present in the 2008 survey. All regressions include country and industry fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2008) and Bankscope (2008).

Table 7.
Transmission of bank balance sheet conditions: 2005 and 2008 samples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. Difference-in-differences 1									
	Finance = Equity/assets			Finance = Tier 1 capital ratio			Finance = Gains on fin assets		
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Post × Finance	0.075	-0.042	0.011	-0.088	-0.203	-0.070	-0.301	-0.514	-0.562
	(0.033)**	(0.027)*	(0.022)	(0.051)*	(0.043)***	(0.032)**	(0.342)	(0.322)*	(0.354)*
Finance	-0.073	-0.013	-0.033	-0.005	0.044	-0.039	0.316	0.495	0.782
	(0.030)**	(0.028)	(0.026)	(0.028)	(0.028)	(0.024)*	(0.281)	(0.263)*	(0.316)**
Post	-0.354	0.374	0.063	0.864	1.857	0.726	0.180	0.205	0.296
	(0.216)	(0.181)**	(0.144)	(0.444)**	(0.371)***	(0.257)***	(0.102)	(0.095)**	(0.089)***
Inverse Mills' ratio	-0.143	-0.151	-0.151	-0.138	-0.137	-0.133	-0.160	-0.163	-0.150
	(0.056)***	(0.056)***	(0.056)***	(0.055)***	(0.055)***	(0.055)***	(0.058)***	(0.057)***	(0.060)**
Fixed effects					Country Industry				
Observations	5,182	5,182	5,089	5,181	5,181	5,060	5,149	5,149	5,089
Pseudo R-squared	0.08	0.08	0.08	0.08	0.09	0.09	0.08	0.08	0.09

Panel B. Difference-in-differences 2

	Finance = Equity/assets			Finance = Tier 1 capital ratio			Finance = Gains on fin assets		
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Post × Non-Affected	0.049	-0.024	-0.431	-0.053	-0.122	-0.297	0.244	0.155	-0.036
	(0.091)	(0.092)	(0.110)***	(0.090)	(0.096)	(0.118)**	(0.273)	(0.316)	(0.114)
Non-Affected	-0.055	0.048	0.068	0.162	0.044	-0.276	-0.472	-0.744	-0.038
	(0.114)	(0.072)	(0.089)	(0.092)*	(0.087)	(0.163)*	(0.156)***	(0.190)***	(0.100)
Post	0.104	0.143	0.479	0.161	0.209	0.381	0.116	0.121	0.154
	(0.074)	(0.079)	(0.104)***	(0.072)**	(0.081)***	(0.110)***	(0.061)*	(0.060)**	(0.063)**
Inverse Mills' ratio	-0.203	-0.203	-0.188	-0.188	-0.197	-0.187	-0.204	-0.204	-0.187
	(0.057)***	(0.060)***	(0.057)***	(0.058)***	(0.057)***	(0.058)***	(0.059)***	(0.059)***	(0.056)***
Fixed effects					Country Industry				
Observations	4,289	4,289	4,189	4,288	4,288	4,179	4,273	4,273	4,189
Pseudo R-squared	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Finance' is one of the three balance sheet variables from Table 4. Each finance variable is locality-specific and is constructed by weighting equally (Columns labeled "Equally-weighted"), by number of branches (Columns labeled "Branch-weighted"), or by subsidiaries' assets (Columns labeled "Asset-weighted") the respective financial variable for each parent bank which has at least one branch or subsidiary in that locality. 'Post' is a dummy variable equal to 1 if the observation is in 2008, and to 0 if it is in 2005. 'Non-Affected' is a dummy variable equal to 1 if the respective finance variable declined by less than 1 standard deviation between 2005 and 2008. 'Inverse Mills' ratio' is the inverse of Mills' ratio from the probit model in Table 5 for each respective financial variable. The regressions also include the rest of the independent variables from Table 6 (unreported for brevity). Omitted variables from the probit equation in Table 4 are 'Competition' and 'Subsidized'. The analysis is performed on all firms present either in the 2005 or in the 2008 survey (Panel A), and on all firms present in localities which appeared both in the 2005 and the 2008 survey (Panel B). All regressions include country and industry fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2005 and 2008) and Bankscope (2005 and 2008).

Table 8.
Transmission of bank balance sheet conditions: Foreign-owned vs. domestic banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. 2008 sample									
	Finance = Equity/assets			Finance = Tier 1 capital ratio			Finance = Gains on fin assets		
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Finance foreign	-0.042	0.052	0.055	-0.040	-0.051	0.019	0.976	0.485	0.588
	(0.025)*	(0.054)	(0.052)	(0.016)**	(0.059)	(0.050)	(0.397)**	(0.378)	(0.421)
Finance domestic	-0.006	-0.025	0.075	-0.002	-0.081	0.056	-0.177	0.569	-0.234
	(0.013)	(0.027)	(0.042)*	(0.014)	(0.034)**	(0.058)	(1.405)	(1.286)	(0.955)
Observations	1,898	1,898	1,898	1,898	1,898	1,898	1,898	1,898	1,898
Pseudo R-squared	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Panel B. 2005 and 2008 samples, difference-in-differences									
	Finance = Equity/assets			Finance = Tier 1 capital ratio			Finance = Gains on fin assets		
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Post × Finance foreign	-0.003	-0.026	0.188	-0.023	-0.148	0.032	-0.167	-0.738	-1.231
	(0.034)	(0.048)	(0.060)***	(0.021)	(0.047)***	(0.046)	(0.657)	(0.413)*	(0.365)***
Post × Finance domestic	0.026	0.004	-0.115	0.030	-0.001	-0.002	3.312	2.756	1.963
	(0.018)	(0.017)	(0.031)***	(0.015)**	(0.013)	(0.018)	(1.399)**	(0.917)***	(0.662)***
Finance foreign	-0.038	0.122	-0.122	-0.019	0.120	0.037	0.620	0.850	1.319
	(0.026)	(0.038)***	(0.052)**	(0.016)	(0.026)***	(0.030)	(0.554)	(0.336)**	(0.345)***
Finance domestic	-0.026	-0.031	0.059	-0.027	-0.003	-0.020	-0.598	0.617	0.195
	(0.014)	(0.019)*	(0.030)*	(0.012)**	(0.014)	(0.015)	(0.515)	(0.284)***	(0.297)
Post	0.146	0.324	0.381	0.206	1.332	-0.091	0.250	0.497	0.505
	(0.065)**	(0.263)	(0.408)	(0.066)***	(0.396)***	(0.404)	(0.058)***	(0.100)***	(0.098)***
Observations	4,294	4,294	3,886	4,294	4,294	3,886	4,294	4,294	3,886
Pseudo R-squared	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Finance foreign (domestic)' is one of the three balance sheet variables from Table 4, calculated for the foreign-owned (domestic-owned) banks in each locality. Each finance variable is locality-specific and is constructed by weighting equally (Columns labeled "Equally-weighted"), by number of branches (Columns labeled "Branch-weighted"), or by subsidiaries' assets (Columns labeled "Asset-weighted") the respective financial variable for each parent bank which has at least one branch or subsidiary in that locality.

‘Post’ is a dummy variable equal to 1 if the observation is in 2008, and to 0 if it is in 2005. The regressions also include the rest of the independent variables from Table 6, including the inverse of Mills' ratio, as well as all double interaction terms between Post, Non-Affected, and Foreign (unreported for brevity). Omitted cvariables from the probit equation in Table 4 are ‘Competition’ and ‘Subsidized’. The analysis is performed on all firms present in the 2008 survey (Panel A) and on all firms present either in the 2005 or the 2008 survey (Panel B). All regressions include country and industry fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2005 and 2008) and Bankscope (2005 and 2008).

Table 9.
Transmission of bank balance sheet conditions: Differential effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Equally-weighted	Branch-weighted	Asset-weighted	Equally-weighted	Branch-weighted	Asset-weighted
Tier 1 capital × R&D intensity	-0.104	-0.122	-0.087			
	(0.055)**	(0.040)***	(0.023)***			
Tier 1 capital × Capital intensity				0.013	0.013	0.009
				(0.005)**	(0.004)***	(0.002)***
Fixed effects			Locality			
			Industry			
Observations	1,683	1,683	1,669	1,683	1,683	1,669
Pseudo R-squared	0.13	0.13	0.13	0.13	0.13	0.13

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Tier 1 capital' is the ratio of Tier 1 capital to total assets. It is locality-specific and is constructed by weighting equally (Columns labeled "Equally-weighted"), by number of branches (Columns labeled "Branch-weighted"), or by subsidiaries' assets (Columns labeled "Asset-weighted") the Tier 1 capital ratio for each parent bank which has at least one branch or subsidiary in that locality. 'R&D intensity' is the industry median ratio of research and development expenses to sales for mature Compustat firms over the period 1990-2000. 'Capital intensity' is the industry median capital usage per worker for mature Compustat firms over the period 1990-2000. The regressions also include the rest of the independent variables from Table 6, including the inverse of Mills' ratio (unreported for brevity). Omitted categories from the probit equation in Table 4 are 'Competition' and 'Subsidized'. The analysis is performed on all firms present in the 2008 survey. All regressions include locality and industry fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2008) and Bankscope (2008).

Table 10.
Transmission of bank balance sheet conditions: Endogeneity and robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2SLS	2007 financial data	Subsidiaries' health	CDS spreads	Small firms only	<3 banks and small firms only	Non-exporting firms only
Tier 1 capital	-0.695	-0.028	-0.119		-0.083	-0.938	-0.095
	(0.040)***	(0.016)*	(0.056)**		(0.049)*	(0.404)**	(0.056)*
Tier 1 capital (subsidiaries)			0.037				
			(0.052)				
CDS spreads				0.022			
				(0.011)**			
Fixed effects				Country			
				Industry			
Observations	2,473	2,145	2,385	2,057	1,739	45	1,298
Pseudo R-squared	0.06	0.06	0.07	0.07	0.05	0.27	0.07

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Tier 1 capital' is the ratio of Tier 1 capital to total assets. It is locality-specific and is constructed by weighting by subsidiaries' assets the Tier 1 capital ratio for each parent bank which has at least one branch or subsidiary in that locality. 'Tier 1 capital (subsidiaries)' is locality-specific and is constructed by weighting by subsidiaries' assets the Tier 1 capital ratio for each bank present in that locality. In column (1), bank distress is instrumented using average distance to bank headquarters, an index of host-country creditor protection, a dummy equal to 1 if the country is in the EU, and a dummy equal to 1 if the country is in the euro zone. In column (2), the bank financial condition is constructed using data for 2007. In column (4), the bank financial condition is constructed by weighting by subsidiaries' branches the average CDS spread for 2008:Q1 for each parent bank which has at least one branch or subsidiary in that locality. In column (5), the sample is restricted to small firms younger than 12 years. In column (6), the sample is restricted to small firms younger than 12 years in localities with a maximum of 2 banks present. In column (7), the sample is restricted to firms in non-exporting industries only. The regressions also include the rest of the independent variables from Table 7, including the inverse of Mills' ratio (unreported for brevity). The analysis is performed on firms present in the 2008 survey. All regressions include country and industry fixed effects. White (1980) robust standard errors are reported in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. See Appendix 1 for exact definitions. Source: BEEPS (2008), Bankscope (2008), and Thomson Financial.

Appendix 1. Variables – definitions and sources

Variable Name	Definition	Source
	Firm characteristics	
Small firm	Dummy=1 if firm has fewer than 20 employees	BEEPS 2005 & 2008
Medium firm	Dummy=1 if the firm has between 20 and 100 employees	BEEPS 2005 & 2008
Big firm	Dummy=1 if firm has more than 100 employees	BEEPS 2005 & 2008
Public company	Dummy=1 if firm is a shareholder company / shares traded in the stock market	BEEPS 2005 & 2008
Private company	Dummy=1 if firm is a shareholder company / shares traded privately if at all	BEEPS 2005 & 2008
Sole proprietorship	Dummy=1 if firm is a sole proprietorship	BEEPS 2005 & 2008
Privatized	Dummy=1 if the firm went from state to private ownership in the past	BEEPS 2005 & 2008
Subsidized	Dummy=1 if the firm has received state subsidized in the past year	BEEPS 2005 & 2008
Exporter	Dummy=1 if firm's production is at least partially exported	BEEPS 2005 & 2008
Competition	Dummy=1 if pressure from competitors is "fairly" or "very" severe	BEEPS 2005 & 2008
Audited	Dummy=1 if the firm has its financial accounts externally audited	BEEPS 2005 & 2008
	Credit demand and credit access	
Need loan	Dummy=1 if the firm doesn't need a loan because it has sufficient capital	BEEPS 2005 & 2008
Constrained	Dummy=1 if the firm was refused a loan or didn't apply for one because of adverse loan conditions	BEEPS 2005 & 2008
	Industry benchmarks	
R&D intensity	Median proportion of the ratio of research and development expenses to sales for mature Compustat firms over the period 1990-2000	Compustat
Capital intensity	Median proportion of capital usage per worker for mature Compustat firms over the period 1990-2000	Compustat
	Bank-level variables	

% foreign owned bank assets	Share of banking sector assets owned by branches or subsidiaries of foreign banks	EBRD Transition report 2008
Equity/assets	Ratio of total equity to total assets	Bankscope 2005 & 2008
Tier 1 capital	Ratio of Tier 1 capital to total risk-weighted assets	Bankscope 2005 & 2008
Gain on financial assets	Gain on financial assets held by the bank	Bankscope 2005 & 2008
CDS spreads	Spreads on credit default swap for parent bank in 2008:Q1	Thomson Financial
Distance to headquarters	Geographical distance to parent bank's headquarters	
	Country variables	
Creditor protection	An index of host-country protection of creditors' rights	WB Doing Business Database
EU	Dummy=1 if the country is a member of the EU	
Euro	Dummy=1 if the country is a member of the euro area	

Appendix 2. Domestic and parent banks in the sample

Country	Bank	Parent bank and country of incorporation
Albania	Alpha Bank	Alpha Bank – Greece
	Raiffeisen	Raiffeisen – Austira
	Banka Kombetare Trektare	domestic
	Tirana Bank	Pireus Bank – Greece
	Intessa San Paolo Bank Albania	Intesa Sanpaolo – Italy
	National Bank of Greece	National Bank of Greece - Greece
	Emporiki	Emporiki Bank – Greece
	Banka Credins	domestic
Bulgaria	Alpha Bank	Alpha Bank – Greece
	Unicredit Bulbank	UniCredit Group – Italy
	DSK	OTP – Hungary
	First Investment Bank	domestic
	PostBank	EFG Eurobank – Greece
	Expressbank	Societe Generale – France
	United Bulgarian Bank	National Bank of Greece - Greece
	Reiffeisen	Raiffeisen – Austira
	Piraeus	Piraeus Bank – Greece
Bosnia and Herzegovina	Raiffeisen Bank Bosna i Hercegovina	Raiffeisen – Austira
	UniCredit Bank	UniCredit Group – Italy
	Hypo Alpe-Adria-Bank Mostar	Hypo Group - Austria
	Intesa Sanpaolo Banka Bosna i Hercegovina	Intesa Sanpaolo – Italy
	NLB Tuzlanska Banka	KBC - Belgium
	Volksbank Sarajevo	Volksbank - Austria
Croatia	Zagrebaska Bank	UniCredit Group - Italy
	Privredna Bank Zagreb	Intesa Sanpaolo - Italy
	Erste & Steiermarkische Bank	Erste Group - Austria
	Raiffeisen Bank	Raiffeisen - Austria
	Societe Generale - Splitska Banka	Societe Generale - France
	Hypo Alde Adria Bank	Hypo Group - Austria
	OTP Banka Hrvatska	OTP - Hungary
	Slavonska Banka	domestic
	Hrvatska Postanska Banka	domestic
Czech Republic		
	Ceska Sporitelna	Erste Group - Austria
	CSOB	KBC - Belgium
	Komercni Banka	Societe Generale - France
	UniCredit Bank CR	UniCredit Group - Italy
	Citibank	Citibank - US
	Ceskomoravska zarucni a rozvojova banka	domestic
	GE Money Bank	GE Money - US
	Hypotecni Banka	KBC - Belgium
	Raiffeisenbank	Raiffeisen - Austira
Estonia	Swedbank Estonia	Swedbank - Sweden
	SEB	Skandinavska Enskilda Banken - Sweden
	Sampo Bank	Danske Bank - Denmark
	Nordea	Nordea Bank - Finland
Hungary	OTP Bank	domestic
	K&H Commercial and Credit Bank	KBC - Belgium

	MKB Bank	Bayerische Landesbank - Germany
	CIB Bank	Intesa Sanpaolo – Italy
	Raiffeisen Bank	Raiffeisen - Austira
	Erste Bank Hungary	Erste Group - Austria
	KDB Bank	KDB Seoul - Korea
	UniCredit Bank Hungary	UniCredit Group - Italy
Latvia	Parex	domestic
	Hansabank	Swedbank - Sweden
	Latvijas Krajbanka	Snoras Bank - Lithuania
	SMP Bank	domestic
	Rietumu Banka	domestic
	Trasta Komercbanka	domestic
Lithuania	SEB	Skandinavska Enskilda Banken - Sweden
	Sampo Bank	Danske Bank - Denmark
	Nordea	Nordea Bank - Finland
	Snoras Bank	domestic
	Ukio Bankas	domestic
	Hansabankas	Swedbank - Sweden
	Parex Bankas	Parex Group - Latvia
Macedonia	Alpha Bank	Alpha Bank - Greece
	Stopanska Banka	National Bank of Greece - Greece
	Komercijalna Banka	domestic
	NLB Tutunska Banka	NLB - Slovenia
	Ohridska Banka	Societe Generale - France
	Pro Credit Bank	Pro Credit Group
Montenegro	AtlasMont Bank	domestic
	Crnogorska Komercijalna Banka	OTP - Hungary
	Hypo-Alpe-Adria Bank	Hypo Group - Austria
	Komercijalna Banka ad Budva	domestic
	NLB Montenegro Banka	KBC - Belgium
	Prva Banka Crne Gore	domestic
	Invest Banka Montenegro	domestic
	Podgoricka Banka SG	Societe Generale - France
	Opportunity Bank	domestic
Poland	PKO Bank	domestic
	Bank Pekao	UniCredit Group - Italy
	Bank BPH	UniCredit Group - Italy
	Bank Zachodni WBK	AIB - Ireland
	ING Bank Slaski	ING Bank - Netherlands
	Bank Pocztowy	domestic
	Kredyt Bank	KBC - Belgium
	mBank	Commerzbank - Germany
	Getin Bank	domestic
Romania	BCR	Erste Group - Austria
	BRD Group Societe General	Societe Generale - France
	Volksbank Romania	Volksbank - Austria
	Raiffeisen Bank	Raiffeisen - Austira
	Alpha Bank Romania	Alpha Bank - Greece
	UniCredit Tiriac Bank	UniCredit Group - Italy
	Banca Transilvania	domestic
	Bancpost	EFG Eurobank - Greece

	CEC Bank	domestic
Serbia	Banca Intesa	Intesa Sanpaolo - Italy
	Komercijalna Banka	domestic
	Raiffeisen Banka	Raiffeisen - Austria
	Eurobank RFG	EFG Eurobank - Greece
	Hypo Alde-Adria-Bank	Hypo Group - Austria
	UniCredit Bank	UniCredit Group - Italy
	Vojvodanska Banka	National Bank of Greece - Greece
	Aik Banka Nis	domestic
	Societe Generale Banka	Societe Generale - France
Slovakia	Vseobecna Uverova banka	Intesa Sanpaolo – Italy
	Slovenska Sporitelna	Erste Group - Austria
	Tatra Banka	Raiffeisen - Austira
	OTP Banka Slovensko	OTP - Hungary
	Dexia Banka Slovensko	Dexia - Belgium
	UniCredit Bank Slovakia	UniCredit Group - Italy
	Volksbank Slovensko	Volksbank - Austria
	CSOB Slovakia	KBC - Belgium
Slovenia	Nova Ljubljanska Banka	KBC - Belgium
	Nova Kreditna Banka Maribor	domestic
	Abanka	domestic
	SKB	Societe Generale - France
	UniCredit	UniCredit Group - Italy
	Banka Koper	Intesa Sanpaolo – Italy
	Banka Celje	domestic
	Reiffeisen Krekova banka	Raiffeisen - Austira

Appendix 3. Bank data coverage

Country	Ratio assets of the banks in the data set to total assets of the country's banking sector
Albania	0.982
Bosnia	0.842
Bulgaria	0.857
Croatia	0.887
Czech Republic	0.913
Estonia	0.956
Hungary	0.948
Latvia	0.851
Lithuania	0.896
Macedonia	0.877
Montenegro	0.862
Poland	0.859
Romania	0.904
Serbia	0.782
Slovakia	0.925
Slovenia	0.862

Source: Bankscope (2008).