"When the Cat's Away the Mice Will Play": Does Regulation At Home Affect Bank Risk-Taking Abroad?*

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Abstract

This paper provides the first empirical evidence that bank regulation and supervision is associated with cross-border spillover effects through the lending activities of large multinational banks. We analyze business lending by 155 banks to 9,617 firms in 1,976 different localities across 16 countries. We find that higher barriers to entry, tighter restrictions on bank activities, and higher minimum capital requirements in domestic markets are associated with lower bank lending standards abroad. The effects are stronger when banks are less efficiently supervised at home, and are observed to exist independently from the impact of host-country regulation.

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1 Introduction

In this paper, we analyze the effect of bank regulation in domestic (i.e., home-country) markets on multinational banks' lending standards in foreign (i.e., host-country) markets. We focus on the cross-border impact of barriers to entry, of regulatory restrictions on bank activities, and of capital stringency. Moreover, we examine whether the impact of home-country regulation on host-country lending standards depends on home-country supervision.

We are motivated by three empirical observations. For one, the available evidence suggests that bank risk-taking responds to changes in domestic regulation (Barth, Caprio, and Levine, 2004; Laeven and Levine, 2009) and in domestic supervision (Buch and DeLong, 2008). Many academics and policy-makers have blamed the recent financial crisis on poor regulation and supervision, resulting in excessive bank risk-taking prior to the crisis.[1] Second, financial institutions tend to shift poorly monitored risk exposures to taxpayers in markets where safety net benefits are greater (Kane, 2000; Carbo, Kane, and Rodriguez-Fernandez, 2009). Third, international retail and syndicated bank lending reflects conditions in parent banks both during good times (De Haas and van Lelyveld, 2010) and during times of crisis (Popov and Udell, 2010; Cetorelli and Goldberg, 2011; De Haas and van Horen, 2011).

Do these observations imply that stricter home-country regulation induces banks to develop a more conservative business model which they then export into the foreign markets they enter? Or do multinational banks embark on a deliberate strategy of risk-taking abroad to make up for the inability to take on risk in their home-country market? In other words, does strict regulation and comprehensive supervision eliminate risk, or does it simply re-allocate it across markets through the actions of multinational banks? In this paper, we address these questions by taking advantage of a unique dataset of bank-firm lending relationships in a large cross-section of host countries whose local markets are dominated by subsidiaries of foreign banks. These data allow us to investigate whether business lending in local host-country markets is affected by how restrictive regulation (i.e., the *rules* that constrain bank condition, behavior, and activities) and by how efficient supervision

[1] For example, in a speech to the American Economic Association in January 2010, Ben Bernanke, Chairman of the US Federal Reserve, claimed that "Stronger regulation and supervision aimed at problems with underwriting practices and lenders' risk management would have been a more effective and surgical approach to constraining the housing bubble [...]."

(i.e., the regulatory *monitoring* of bank condition, behavior, and activities) is in the parent banks' home country. Crucially, we analyze the impact of home-country regulation and supervision on the riskiness of host-country lending. We also test whether home-country regulation and supervision interact in determining host-country lending standards. This empirical strategy allows us to make inferences about the cross-border effects of domestic bank regulation and supervision.

Our experimental setting is that of foreign-owned banks in central and eastern Europe and it provides an ideal laboratory to study the cross-border spillover of national regulation and supervision from home countries in western Europe. The corporate landscape in emerging Europe is dominated by small and medium enterprises (SMEs), with up to 99% of all firms being classified as such companies. With less developed capital markets and rudimentary corporate bond financing, banks are by far the main provider of external funds. In addition, foreign ownership in the banking sector has grown dramatically in the recent decade, and by 2008 foreign banks controlled around 80% of the assets in the region's banking industry. Finally, in each of the countries in our sample we observe firm access to credit in local markets dominated by banks with parents coming from at least two different countries, allowing us to tease out the variation in lending standards associated with variations in the home-country regulatory environment.

Our empirical strategy proceeds as follows. First, we identify firms who sought access to credit and whether they were denied credit. This latter category includes firms whose loan application was turned down by a bank, as well as on firms which were discouraged from applying for loans by adverse credit conditions, for the fiscal years 2004 and 2007. While we cannot observe which bank granted/refused a loan application from a particular firms, we can observe the precise locality in which each firm operates. We proceed to hand-collect information on which banks are present in each locality, as well as on the number of branches each bank has there. This allows us to match firms and banks based on geographic proximity. In order to study the cross-border spill-over of bank regulation and supervision, we focus on host-country localities that are dominated by subsidiaries of foreign banks. Then, we combine the data on firm access to finance in local markets with data on regulatory stringency and supervisory efficiency in the parent banks' primary domestic markets. The final sample consists of $9,617$ firms in $1,976$ localities across 16 countries served by a total

of 155 banks. The data thus provide us with an empirical set-up where we can compare how access to finance varies by the firm's ex ante riskiness and opacity and by the degree of regulatory stringency and supervisory efficiency faced by the parent bank in its home country, after having netted out the effect of host-country regulation and supervision. As an illustration, consider the Czech Republic. Its banking sector is dominated by three banks, which are subsidiaries of Erste Group (Austria), KBC (Belgium), and Societe Generale (France). We observe access to finance by 598 firms in 95 local Czech markets. Our empirical strategy then rests on comparing access to finance by firms in a local market dominated by a subsidiary of KBC to access to finance by firms in a local market dominated by Erste Group and relating variations in this access to differences between the regulatory environments in Belgium and in Austria. We further identify the supply effect by appropriately accounting for demand based on detailed firm-level data.

We face two main challenges in our analysis. The first challenge is that the banks' entry decisions are not made randomly, i.e., banks tend to strategically choose their foreign markets of operation on the basis of proximity and the perceived opportunities for example. For example, South-Eastern Europe has a large presence of Greek banks, while the Baltic countries are dominated by Scandinavian banks. A cross-country study of lending behavior ignoring this entry decision-making would suffer from a standard omitted variables' problem. Our within-country cross-locality empirical set-up is the first step to circumventing this problem. Comparing localities allows us to net out the effect of host country omitted variables with host country fixed effects. To mitigate the even deeper concern that foreign banks made their entry choices based on the characteristics of the individual local markets they were trying to get access to, we employ an instrumental variables' approach where we use geographic proximity and institutional similarity to extract the endogenous component of foreign bank entry.

A second challenge is that using loan rejection rates to define risk-taking may be prone to a selection bias as applicant firms may be a systematically truncated sub-sample of all firms. For example, some firms do not apply because they do not need credit, while others do not apply because they are discouraged. If, for example, financially stronger firms account for a larger share of all firms in local markets dominated by banks from tightly regulated markets, we would overestimate the

effect of home-country regulation on host-country risk-taking. By observing data on non-applicant firms we are able to address this question in a standard two-step selection framework (see Popov and Udell, 2010, and Ongena and Popov, 2011, for recent applications).

Our key findings are as follows. First, lower barriers to entry in domestic markets (proxied by a regulatory environment that is more permissive of bank competition) results in lower lending standards by cross-border banks in local host-country markets (proxied by more lending to ex ante risky firms). Second, higher restrictions on non-core bank activities (like bank involvement in securities markets, insurance, and real estate, ownership of non-financial firms, etc.) also result in lower lending standards by cross-border banks in local host-country markets. Third, these laxer lending standards occur in these scenarios, as well as when minimum capital standards are higher, especially when home-country supervision is inefficient.

Uncovering the exact mechanisms through which these effects are realized is beyond the scope of this paper. Nevertheless, one potential hypothesis explaining our results is that home-country regulation which reduces banks' profitability in their primary domestic market, either by lowering their charter value or by restricting them from engaging in certain activities, leads banks to loosen their lending standards abroad. This result could be viewed as qualifying the findings widely reported in the literature that foreign banks "cherry pick" the borrowers that they lend to in host countries (e.g., Berger, Klapper, and Udell, 2001; Gormley, 2010; Mian, 2006; see Degryse, Havrylchyk, Jurzyk, and Kozak, 2009, for a recent survey). Our findings suggest that this phenomenon may depend on the nature of home-country regulation. Importantly, our findings hold when conditioning on a large set of observable firm-level characteristics, the effects are not subsumed in the degree of host-country bank regulation and supervision, and they survive controlling for firm selection into the application process.

The paper proceeds as follows. Section 2 formulates the research hypotheses and presents the data. Section 3 describes the empirical methodology and the identification strategy. Section 4 presents the main results on the link between home-country regulation and supervision and host-country lending standards. Section 5 discusses how our results relate to the extant literature, and Section 6 concludes.

2 Hypotheses and Data

2.1 Hypotheses

There are three hypotheses that describe the relationship between home-country bank regulation and supervision and host-country bank lending standards. First, the foreign banks in our data are almost exclusively present in foreign markets through subsidiaries rather than through branches. As subsidiaries are separately capitalized and subject to host-country regulation and supervision by default, the first hypothesis is:

(H1) The strength of home-country regulation and supervision is uncorrelated with host-country bank lending standards.

Second, stricter regulation may reduce the bank's incentives to engage in risk-taking in its primary domestic market. For example, capital regulations should reduce the risk-taking incentives of owners by forcing them to place more personal wealth at risk (Kim and Santomero, 1994). Regulators can also impose restrictions on various non-core bank activities in an attempt to contain bank risk. They could also restrict competition if they fear that competition may erode the charter value of existing banks and encourage them to pursue riskier policies in an attempt to maintain profit levels (Keeley, 1990). Such restrictive regulation may lead banks to develop a more conservative business model, which they later export when they enter foreign markets. Also, they may be induced to act abroad "as if at home" by various mechanisms, like a reputational one. This type of behavior would in general be consistent with the empirical literature that has found that foreign-owned banks operating in emerging markets are more prudent than domestic banks (e.g., Crystal, Dages, and Goldberg, 2002).

Alternatively, stricter home country regulation and supervision may induce multinational banks to embark on a deliberate strategy of risk-taking abroad to "make up" for the inability to engage in risk-taking in their home-country market. For example, international banks may have an incentive to relegate their riskier activities to their foreign subsidiaries (i.e., the bank's "periphery") to which they limit their exposure (Powell and Majnoni, 2007). In that sense, risky behavior abroad could reflect a "search for yield" (Rajan, 2006; Goldberg, 2009). Another possibility is that stricter regulation leads to more risky behavior both in domestic and in foreign markets. For example, capital

regulation might lower lending standards if owners compensate for the loss of utility from more stringent capital requirements by selecting a riskier investment portfolio (Koehn and Santomero, 1980; Buser, Chen, and Kane, 1981). Restrictions on various bank activities could reduce the utility of owning a bank, intensifying the risk-taking incentives of the owners relative to the managers (see Laeven and Levine, 2009, for a discussion). Also, less competition among banks could result in higher interest rates being charged on business loans, leading to a higher borrower credit risk as a result of moral hazard (Boyd and De Nicolo, 2005).

The second hypothesis then is:

(Ha1) The strength of home-country regulation and supervision is positively correlated with host-country bank lending standards.

(Ha2) The strength of home-country regulation and supervision is negatively correlated with host-country bank lending standards.

2.2 Data

In this section, we discuss the various data sources from which the dataset used in this paper is constructed.

2.2.1 Cross-border banks' branches in emerging Europe

We wish to determine how home-country regulation and supervision affects host-country lending standards. To that end, we start by building a new database of the geographical presence of cross-border banks in local host-country markets. We choose a sample of 16 emerging European markets where foreign bank presence is particularly relevant and for which we also have firm-level data. Next, we determine the set of banks that operate in each host country and that together hold at least 80% of the banking sector assets in this country. We do so in order to make the matching of banks and firms more manageable by excluding banks with an insignificant national presence. This gives us a range of between 4 banks in Estonia and 9 banks in Bulgaria. Given this criterion, we determine that the localities in the sample were 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, for example, foreign ownership of banking sector assets ranges from 22.8% in Slovenia to 98.9% in Estonia. Finally, we perform an extensive internet search to determine which of these banks were present in which locality in the sample, and how many branches each had in each locality in which it was present.[2] We compile this information for a total of $1,976$ localities. This exercise allows us to determine not just which bank is present in which local market, but also its market share at the unit of observation of the locality (city / town / village). While we also collect data on domestic banks in the process, in the empirical exercises we focus on those localities that are *dominated by foreign banks*. In practice, this means localities in which branches and subsidiaries of foreign banks account for: 1) at least 50% of all bank branches, 2) at least 50% of all banks present, or 3) at least 50% of total assets of all present banks. Depending on which of the three criteria is used, we end up with a bank branching map of at least $1,726$ localities.

Appendix 1 illustrates the degree of foreign bank penetration in each country in the sample. Clearly, a group of 23 west 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.

Appendix 2 lists the coverage in terms of total banking assets in each country. It ranges from 78.2% in Serbia to 98.2% in Albania, with an average sample coverage of 88.8%. Figure 1 presents a map of home countries (where the parent banks are domiciled) and of host countries (where the

[2] The matching was made possible after an extensive research of the web pages of all banks involved. In quite a few cases, information was only available in the respective national language.

local firms and the branches and subsidiaries of foreign banks operate). The map illustrates our country selection strategy. In terms of host countries, the only markets in emerging Europe that we have excluded are ones where foreign bank presence is limited,[3] or ones where it is diluted by the presence of many other banks (like Russia or Ukraine). In terms of home countries, some markets where large cross-border banks are domiciled, like Spain, Switzerland, and the UK, are excluded because the presence of banks such as Santander, UBS, and HSBC in the region is very limited. Finally, only ING and Citigroup are present in the sample countries through branches of the parent bank rather than through subsidiaries.[4]

2.2.2 Bank regulation and supervision

We analyze bank regulatory and supervisory tools which have been highlighted by theory to affect bank behavior and which vary sufficiently across the home countries in the sample. In particular, we employ four indices, three pertaining to regulation and one to supervision.

Barriers to entry is an index which comes from Abiad, Detragiache, and Tressel (2008). It is a composite index of regulatory restrictions associated with entry barriers and privatization. The value of the first restriction is determined from the answer to the following questions: To what extent does the government allow foreign banks to enter into a domestic market? Does the government allow the entry of new domestic banks? Are there restrictions on branching? Does the government allow banks to engage in a wide rage of activities? The value of the second restriction is determined from the answer to the following question: To which degree do state-owned banks dominate the domestic market? The resulting composite index measures the degree to which regulation restricts competition, in particular by foreign and private banks.

Capital stringency is an index of regulatory constraints on bank capital, and it comes from Barth, Caprio, and Levine (2008). Capital stringency does not measure statutory capital requirements, instead it measures the regulatory approach to assessing and verifying the degree of capital at risk in a bank. The index is constructed from the following nine questions. (1) Is the minimum

[3] For example, we exclude Azerbaijan (7.5% foreign ownership), Belarus (19.7%), Kazakhstan (5.4%), Russia (17.2%), Tajikistan (6.6%), Turkmenistan (1.1%), and Uzbekistan (4.4%).

[4] The national regulator's incentives to intervene in a mutinational bank may differ depending on the bank's foreign representation (Calzolari and Loranth, 2011).

capital asset ratio requirement risk weighted in line with the Basle guidelines? (2) Does the minimum ratio vary as a function of market risk? (3) Are unrealized values of loan losses deducted from capital? (4) Are unrealized losses in securities portfolios deducted? (5) Are unrealized foreign exchange losses deducted? (6) What fraction of revaluation gains is allowed as part of capital? (7) Are the sources of funds classified as capital verified by the regulatory or supervisory authorities? (8) Can the initial disbursement and subsequent injections of capital be executed with assets other than cash or government securities? (9) Can the initial disbursement of capital be executed with borrowed funds?

Restrictions on bank activities measures regulatory impediments to banks engaging in the securities market (e.g., underwriting, brokering, dealing, and all aspects of the mutual fund industry), insurance (e.g., underwriting and selling), real estate (e.g., real estate investment, development, and management), and ownership of nonfinancial firms. The index comes from Barth, Caprio, and Levine (2008).

Finally, *Prudential supervision* captures the degree to which an active agency is involved in the supervision of the banking sector and (with the possible exception of the first questions) is based on more than a mere counting of existing mechanical regulatory rules. Four questions underlie this index: (1) Has a country adopted a capital adequacy ratio based on the Basle standard? (2) Is the banking supervisory agency independent from (bank) executives' influence? (3) Does the banking supervisory agency conduct supervision through on-site and off-site examinations? (4) Does the country's banking supervisory agency cover all financial institutions without exception? The index comes from comes from Abiad, Detragiache, and Tressel (2008).

The three regulatory indices are scaled so that higher values indicate a more restrictive regulatory environment. The supervisory index is scaled so that higher values indicate a greater degree of government intervention.

2.2.3 Bank business lending, bank lending standards, and firm-level characteristics

The data on bank lending and lending standards, as well as on firm-level characteristics come from the 2005 and the 2008 version of the Business Environment and Enterprise Performance Survey

(BEEPS). We use two waves of the survey conducted in the Spring of 2005 and in the Spring of 2008 containing 13,409 respondent firms from 27 countries in central and eastern Europe and the former Soviet Union. As explained earlier, we narrow that initial sample down to the countries (as well as localities within these countries) where there is a sizeable foreign bank penetration. The final sample thus consists of 9,617 firms, observed either in 2005 or in 2008, in 1,976 localities across 16 countries.

The main purpose of the survey is to obtain information from firms about their experience with financial and legal constraints, as well as government corruption. In addition, however, BEEPS also includes questions about firm 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 258 in Albania to 1,431 in Poland. Detailed analysis suggests that the survey achieves representativeness in terms of the size of firms it surveyed.[5] 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). The survey also achieves 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 other characteristics by country.[6]

For the purpose of measuring bank business lending, we use the information on the firm's most recent experience when applying for credit. Our strategy follows Cox and Jappelli (1993) in that we group firms that were turned down and firms that were discouraged from applying, and it is standard in studies that rely on detailed questionnaires. Formally, Question K16 asks: "Has the establishment applied for any loans or lines of credit?" For firms that answered "No" to K16, Question K17 subsequently asks: "What was the main reason the establishment has not applied for any line of credit or loan?". For firms that answered "Yes" to K16, Question K18a

[5] See http://www.ebrd.com/country/sector/econo/surveys/beeps.htm.

[6] See Appendix 3 for all variable definitions, as well as data sources.

subsequently asks: "Has this establishment applied 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 are too high", "Size of loan and maturity are insufficient", or "Did not think it would be approved" to K17 were classified as constrained.[7] Figure 2 summarizes this data across the 2005 and the 2008 BEEPS.

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. The literature has also suggested grouping together firms that were turned down with firms that were discouraged from applying because they are observationally equivalent. Moreover, discouragement is frequently an actual rejection that follows a conversation with the loan officer and does not appear in bank records (see Duca and Rosenthal (1993)).

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, fewer firms needed credit in fiscal year 2007 than prior to 2005 (60% vs. 70%), but more firms were credit constrained (37% vs. 34%). However, this picture is slightly misleading as the question in the 2008 survey asks about the firm's experience in the fiscal year 2007, while the question in the 2005 survey asks about the firm's experience with the latest loan.

Our main firm-level variable used to tease out bank lending standards is opacity. It is a dummy which equals 1 if the firm does not have its financial accounts verified by an external auditor, and to 0 if it does. This variable directly captures an important dimension of opacity in the sense that having an audit materially affects the informativeness of the financial statements. Audited statements, for example, allow banks to underwrite loans primarily based on financial statement ratios and covenants associcated with those ratios (Berger and Udell, 2006). This dummy also captures an important dimension of ex ante risk because unaudited statements (i.e., financial statements that have not been verified by an external auditor) have a much higher risk of material misstatment (e.g., Blackwell, Noland, and Winters, 1998; Allee and Yohn, 2009).

[7] Using data on central and east European firms, Brown et al. (2011) show that the share of firms discouraged from applying is up to twice as large than the share of firms which applied and had their loan application rejected.

There is considerable variation across countries in this variable. For example, 80% of the SMEs in Estonia use external auditors to verify their accounts, while only 37% of the firms in Romania and Poland do. On average in the sample, about half of the firms are opaque.

3 Empirical methodology and identification

Our goal is to evaluate how home-country regulation and supervision affects host-country bank lending standards. Given the data we have assembled, the immediate approach would be to map regulation into loan rejection and the firm risk associated with granted loans. However, this strategy would fail to account for the changing composition across business lenders of firms that demand bank credit, or in other words, for the fact that the sample of firms that apply for credit is not a random sample of the population of firms.

It is now customary to address this problem by incorporating information on non-applicant firms in a standard 2-step Heckman procedure. The idea is that credit constraints are only observable when a firm has a strictly positive demand for bank credit. 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:

$$q = \zeta \cdot Z_{ijklt} + \varepsilon_{ijklt}$$

where Z_{ijklt} 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. The second stage regression can now be 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) derived from the first step. 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 than the set of variables in the second stage.

Thus, in the second stage regression in which we determine the effect of domestic regulation and supervision on lending standards in foreign markets, we estimate the following equation:

$$
\begin{aligned}
Constrained_{ijklt} = \; & \beta_1 \cdot X_{ijklt} + \beta_2 \cdot Regulation_{jkt} \cdot Opaque_{ijklt} + \beta_3 \cdot Regulation_{jkt} \\
& + \beta_4 \cdot Opaque_{ijklt} + \beta_5 \cdot D_{klt} + \beta_6 \sigma \tfrac{\phi(q)}{\Phi(q)} + \varepsilon_{ijklt}
\end{aligned} \tag{1}
$$

where $Constrained_{ijklt}$ is a dummy variable equal to 1 if firm i in locality j in country k in industry l in year t is credit constrained; X_{ijklt} is a matrix of firm characteristics; $Regulation_{jkt}$ is a measure of home-country bank regulation pertaining to the banks whose branches and subsidiaries are active in locality j in country k; $Opaque_{ijklt}$ is a dummy variable equal to 1 if firm i in locality j in country k in industry l in year t does not have its accounts audited by an external auditor; D_{klt} is a matrix of country, industry, and time dummies; and ε_{ijklt} is an idiosyncratic error term. The firm-level co-variates control for observable firm-level heterogeneity. The three sets of dummy variables control for any unobserved market, industry, and business cycle variation. Essentially, they eliminate the contamination of the estimates by time-invariant sectoral characteristics, like growth opportunities; by time-invariant macroeconomic factors, like host-country regulation or taxes; and by time-varying developments common to all sample countries, like the business and/or the credit cycle. Finally, the equation is estimated using a probit model.[8]

The main parameter of interest in the model is β_2, which measures the effect of home-country regulation and supervision on host-country lending standards defined as lending to informationally opaque firms. We construct the home-country bank regulation index by aggregating data on home-country regulation and supervision after determining which banks are present in each locality in each host country, as well as the parent bank of each bank in each locality in each host country. The underlying assumption in the absence of a direct match between each loan and the lending bank and between each rejection and the rejecting bank is that if firms were granted/denied credit, then it 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, giving equal weight to each bank in that particular locality, weighting each bank's home-country regulation and supervision by the number of branches it has in the locality, or weighting it by bank assets.

[8] In practice, the command "heckprob" is used in Stata.

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 Bank - Denmark, and Nordea - Finland. In 2008, our index of prudential supervision from Abiad, Detragiache, and Tressel (2008) takes on the value of 2 in Sweden, 3 in Denmark, and 1 in Finland.

Consider the city Lihula in which only Swedbank has branches. We assign the prudential supervision index a value of 2 in Lihula, and then we match this index of home-country bank supervision to all firms incorporated in that city.

Consider alternatively the city of Kuresaare, 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 the prudential supervision index a value of $\frac{5}{3} = \frac{1}{3} \cdot 2 + \frac{1}{3} \cdot 2 + \frac{1}{3} \cdot 1$, which is then matched to all firms located in Kuresaare. And 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 the prudential supervision index a value of $\frac{7}{4} = \frac{1}{2} \cdot 2 + \frac{1}{4} \cdot 2 + \frac{1}{4} \cdot 1$. When weighting by bank assets, the same number is 1.9.

This procedure gives us considerable variation in 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 locality, and if they are, their market presence varies by locality.[9] For example, in the 2008 sample of firms, there are $1,344$ localities in the 16 countries in the sample, characterized by 69 unique values of the index of locality-specific home-country regulation when data on all banks in a locality are weighted equally, by 361 unique values of locality-specific home-country regulation when data on all banks is branch-weighted, and by 196 unique values of locality-specific home-country regulation when data on all banks is asset-weighted. Consequently, there is little reason to worry that the country fixed effects in the regressions capture the same variation as locality-specific regulation and supervisory strength. Importantly, identification is achieved not by comparing bank lending behavior and risk-taking across countries, but across localities within countries, where the country effect is absorbed out by country dummies. In the empirical exercises, we focus on the branch-weighted data, but in

[9] See Table 3 for country-level aggregates.

robustness exercises we report estimates from the other two approaches.

Finally, we need to emphasize that throughout the paper, it is implicitly assumed that the effect of bank financial distress is localized and realized predominately by firms headquartered in the locality in which the bank has operations. All our empirical specifications presume that firms borrow from banks located near their address of incorporation, which is identical to the approach in, for example, Gormley (2010). 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 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.

4 Empirical results

4.1 First-stage regressions

Table 4 presents the results from the first-stage probit regression. The probability of positive demand for bank credit is generally lower for firms in localities dominated by foreign banks from countries with higher barriers to entry, and in two cases, this effect is also statistically significant at least at the 10% level. For example, in a localities at the 75th percentile of (branch-weighted) home-country barriers to entry, a typical firm exhibits, *ceteris paribus*, a 5.4% lower probability that it would have a positive demand for bank credit than were it incorporated in a locality at the 25th percentile of (branch-weighted) home-country barriers to entry.[10] This implies that along some regulatory dimension, localities may differ systematically in the firms' demand for loans. This could be because the industrial composition in localities dominated by banks domiciled in countries with higher barriers to entry is skewed towards sectors that for technological reasons do not need much external finance. Alternatively, banks from countries with tighter regulation

[10] All percentage differences that are reported are based on the marginal effects at the sample means.

may have endogeneously chosen to enter through branching networks that serve bank-dependent firms. Not accounting for such selection mechanism would thus bias the estimates of the effect of regulation on bank lending and risk-taking towards zero.

In terms of firm-level co-variates, the demand for bank credit increases in the size of the firm. One potential explanation is that because of economies of scale in loan size small firms face proportionately higher loan application costs (Brown, Ongena, Popov, and Yesin, 2011). Also, in the beginning of a recession it might be that small firms are better equipped to finance investment with cash flows than more highly leveraged large firms. In addition, some of the size effects may be picked up by ownership and structural characteristics, as sole proprietorships have a higher demand for loans. The probability of desiring credit may be higher for exporters due to their faster expansion, and is lower for non-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.[11] It may also be the case that audited firms have access to financial statement lending which may be a cheaper lending technology (Berger and Udell, 2006). Finally, innovative firms tend to have a higher demand for credit.

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. Analogously, having applied for state subsidies is likely a signal for external financial need. These considerations make both variables good firm demand shifters. Both variables are very positively correlated with the demand for loans, and the effect is statistically significant at the 1% level. For different weighting schemes, the F-statistics from a first-stage regression of loan demand on the two variables (unreported) is between 13 and 14, depending on different weightings of home-country regulation and supervision, which satisfies the relevance condition.

Finally, due to information limitations in the data we use at most $7,651$ firms in these regressions

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

rather than the $9,617$ reported in Table 1. This is because from Table 4 onwards, we focus on firms in localities dominated by foreign banks. We thus lose information on $1,023$ firms when we weigh the regulatory and supervisory variables by banks present, 653 firms when we weigh the regulatory and supervisory variables by the number of branches of each bank present, and 417 firms when we weigh the regulatory and supervisory variables by the relative assets of each bank present.[12] The remaining part of the reduction is accounted for by the firms which are incorporated in localities for which no data on bank presence are available.

4.2 Home-country regulation and supervision and bank lending standards abroad

We start the main part of our empirical analysis with the estimation of Model (1) in which we study how the stringency of home-country regulation and the efficiency of home-country supervision is mapped into host-country bank-lending standards as measured by our variable for opacity and ex ante risk - our "opaque" variable that indicates that a firm's financial statements are not audited. In Table 5, we present a series of regressions in which we examine the direct and interactive associations among home-country regulation, host-country lending, and firm opacity. Specifically, after conditioning on country-, industry-, time-, and firm-level traits, we include the interaction term of each of the locality-specific home-country regulations with firm-level information opacity. In particular, we include all firm-level co-variates from Table 4, with the exception of "Competition" and "Subsidized" whose omission from the regressions is meant to satisfy the exclusion restriction.

The estimates of the regression coefficients on the non-excluded firm-level variables imply that small firms, sole proprietorships, non-innovative firms, and non-exporting firms tend to be more constrained in credit markets. Regarding our main proxy for informational opacity and ex ante risk, non-audited firms also tend to be more credit constrained. These results are broadly in line with findings in the literature on SME lending that foreign banks cherry-pick (e.g., Berger, Klapper, and Udell, 2001; Mian, 2006; Gormley, 2010), as well as on the literature of how credit constraints vary with firm characteristics (e.g., Beck, Demirguc-Kunt, and Maksimovic, 2005).

Turning to the estimates of β_2, we first consider the composite index of *barriers to entry*. This

[12] This implies that 1,023 firms reside in localities where at least 50% of the banks present are domestic-owned, 653 in localities where at least 50% of the bank branches belong to domestic-owned banks, and 417 in localities where at least 50% of the bank assets are held by domestic-owned banks.

variable enters negatively in columns (1) and (5)but is only significant in column (5) (at the 10% level). This finding indicates that the direct effect of a less competition-friendly type of home-country regulation is to increase bank lending abroad. Crucially, the interaction term between regulation and firm opacity enters positively and significantly in both regressions, indicating that competition-reducing regulation results in higher lending standards abroad, implied by less lending to informationally opaque firms. In terms of the economic significance, the effect of regulation on lending depends crucially on the firm's information opacity. For instance, column (5) implies that an informationally transparent firm (i.e., *Opaque=0*) has a 6.4% lower probability of having its loan application rejected if it is dealing with banks at the 75th percentile of the sample home-country regulatory stringency relative to an identical firm in the same country dealing with banks at the 25th percentile of the sample home-country regulatory stringency. However, an informationally opaque firm (i.e., *Opaque=1*) has the exact same probability of having its loan application rejected if it is dealing with banks at the 75th percentile of the sample home-country regulatory stringency relative to an identical firm in the same country dealing with banks at the 25th percentile of the sample home-country regulatory stringency. The combined evidence implies that multinational banks which for regulatory reasons face less competition at home, tend to extend more loans abroad, but this lower volume of lending is not associated with lower lending standards.

The association between home-country *restrictions on bank activities* and host-country lending also turns out to depend crucially on the informational opacity of the banks' corporate clients abroad. Columns (2) and (5) indicate that higher home-country restrictions on bank activities result in higher rejection rates abroad, although this effect is not statistically significant. However, the interaction term between restrictions and firm opacity enters negatively and significantly in both regressions, indicating that the type of home-country regulation that reduces the scope of bank activities in domestic markets results in lower lending standards abroad, implied by relatively more lending to informationally opaque firms. Once again, the economic significance depends crucially on the firm's transparency. Given that the direct effect of *restrictions on bank activities* is statistically indistinguishable from zero, column (5) implies that an informationally transparent firm has the same chance of receiving a business loan regardless of the bank's home country regulation, but an

informationally opaque firm has a 6.9% lower probability of having its loan application rejected if it is dealing with banks at the 75th percentile of the sample home-country regulatory stringency relative to an identical firm in the same country dealing with banks at the 25th percentile of the sample home-country regulatory stringency. The evidence thus suggests that restrictions on bank activities at home lead to lower lending standards abroad. To the degree that opaque firms are ex ante risky, this effect may be interpreted in the sense that banks look abroad for the risk they cannot take on at home.

In contrast, home-country *capital stringency* and *prudential supervision* have neither a significant level effects on lending, nor a significant nonlinear effect that depend on the firm's degree of informational opacity (columns (3) and (5) and columns (4) and (5), respectively).

Finally, in column (6) we repeat the horse-race from column (5), but this time we also include the selection term from the first stage regression reported in Table 4. The significant effect of *regulatory stringency* and *restrictions on bank activities* survives this correction for firm self-selection. The sign of the inverse of Mills' ratio is positive, implying that unobservable factors that increase the demand for credit also increase the probability of being constrained in credit markets. However, the estimate is not statistically significant

To conclude, our estimates suggest that aspects of home-country regulation associated with higher barriers to competition are mapped into higher lending standards by cross-border banks in foreign markets. Conversely, aspects of home-country regulation associated with strict restrictions on bank activities lead to lower lending standards abroad.

4.3 Home-country regulation and supervision and bank lending standards abroad: Robustness

In the previous sub-section, we had calculated a locality-specific index of home-country regulation and supervision by weighting each bank's home-country regulation and supervision by the number of branches it has in a certain locality. Given that we do not have a direct match between a bank and a firm, we needed a criterion which would tell us, which bank in its locality of incorporation each firm most likely does business with. The underlying assumption is that firms have a higher probability

of doing business with banks that have a wider penetration in a certain locality. However, other criteria are also possible. For example, firms may have an equal chance of doing business with any bank in a particular locality, or they may have a higher probability of having a credit relation with the bank that has the largest asset base. We need to check if our results are robust to such alternative criteria.

In Table 6 we investigate this possibility. Panel A reports estimates from regressions where each locality-specific index of regulation and supervision is calculated by weighting equally each bank's index of home-country regulation and supervision. Panel B reports estimates from regressions where each bank's home country regulation and supervision is weighted by the bank's assets. The results are broadly consistent with what we already estimated in Table 5. Namely, the direct effect of barriers to entry is to increase bank lending abroad, but such regulation results in higher lending standards abroad, implied by less lending to informationally opaque firms (columns (1), (5), and (6) of Panel A and Panel B). Conversely, when significant, higher home-country restrictions on bank activities result in higher rejection rates abroad, although this effect is not statistically significant, but this particular type of home-country regulation maps into lower lending standards abroad, implied by relatively more lending to informationally opaque firms (columns (2) and (6) of Panel B). In the latter case, we estimate that when self-selection is accounted for (column (6) of Panel B), an informationally opaque firm has a 10.3% lower probability of having its loan application rejected if it is dealing with banks at the 75th percentile of the sample home-country barriers to entry relative to an identical firm in the same country dealing with banks at the 25th percentile of the sample home-country barriers to entry. We conclude that to the degree that firm opacity is associated with ex ante risk, home-country regulation that is more conducive to competition, yet more restrictive of certain bank activities, is associated with significant cross-border spillovers in terms of risk-taking by multinational banks. Finally, in both cases the sign of the inverse of Mills' ratio is positive and significant, implying that unobservable factors that increase the demand for credit also increase the probability of being constrained in credit markets.

4.4 Interaction between supervision and regulation

In our tests so far, we found an effect of various types of regulation on lending standards, but no significant effect of supervision. However, the effect of strict regulation may itself vary with the strength of the bank supervisor. For example, restrictions on bank activities may be relatively more desirable in environments where the public sector lacks the ability to monitor banks because of inefficient official supervision. Similarly, capital regulations may be especially important in countries with a regulatory environment that does not spur private monitoring (see Barth, Caprio, and Levine, 2004, for an exposition of these arguments). Alternatively, powerful supervisors may have an incentive to undertake socially sub-optimal actions. This situation may arise if there are agency problems between taxpayers and bank supervisors, for example when supervisors are self-interested and there is uncertainty about their ability to monitor banks, as in Boot and Thakor (1993). If this is the case, then strict regulation will limit the instability consequences of powerful and efficient supervision.

To test these hypotheses, Table 7 examines whether the effect on bank lending standards abroad of regulating banks more strictly in home markets depends on the degree of home-country supervision. In particular, we perform our previous tests on two groups of localities, those dominated by foreign banks in the top half of the sample distribution of home-country supervision, and those in the bottom half of this distribution. As before, lending standards abroad are proxied by the probability of lending to informationally opaque firms in host markets. We report the estimates for all three criteria of weighting relevant home-country data in constructing host-country locality-specific indices, namely by bank branches (columns (1) and (2)), equally (columns (3) and (4)), and by bank assets (columns (5) and (6)). Only results from the horse-race regressions with a correction for self-selection (the analogue of column (6) in Tables 5 and 6) are reported.

The evidence points to important complementarities between regulation and supervision, but not for all types of regulation. For example, the effect of barriers to entry in domestic markets on lending standards abroad does not seem to vary with the degree of home-country supervision; for various criteria for data-weighting, this effect goes in the same direction both when banks are less (columns (1), (3), and (5)) and more (columns (4) and (6)) efficiently supervised at home. However,

the decline in host-country lending standards induced by stricter restrictions on bank activities in home markets, tends to be magnified by inefficient home-country supervision, although this result is significant in only one case (column (1)). This finding lends support to theories that yield complementarities between regulation and supervision: if regulation is less efficient in restraining banks in home markets when supervision is weak, banks may export a business model based on lower lending standards in their host markets too.

Finally, a higher degree of capital stringency results in lower lending standards abroad too. This result is very consistent across all criteria for constructing locality-specific regulatory data, and it is significant in one case (column (5)). In the case when bank assets are used to construct locality-specific measures of home-country capital requirements (column (5)), stricter home-country capital requirements are associated with more lending abroad, and relatively more so when the corporate clients are informationally opaque. In all, an informationally opaque firm has a 58.6% lower probability of having its loan application rejected if it is dealing with banks at the 75th percentile of the sample home-country minimum capital requirements relative to an identical firm in the same country dealing with banks at the 25th percentile of the sample home-country minimum capital requirements, if the home country is also in the bottom half of the sample distribution of home-country supervisory efficiency. This suggests that higher minimum capital requirements at home also tend to result in lower lending standards abroad as long as they are coupled with inadequate home-country supervision.

4.5 Endogeneity of foreign bank entry

Finally, in Table 8, we address the issue of the endogeneity of foreign bank entry. For example, foreign banks may in particular enter countries which are populated by fast-growing but high-risk firms. 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 has been through purchasing existing banks rather than through greenfielding, and so while the entry choice is endogenous, the variation in 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 extent of local presence by foreign banks will not be a randomly applied treatment.

In order to mitigate this problem, we attempt to extract the endogenous element of entry using an instrumental variable (IV) procedure. To that end, we need instruments which are correlated with the entry choice but not with local variations in the customer base. The set of instruments that we use for our proxies for bank health includes: 1) geographical distance to bank headquarters; 2) local protection of creditors' rights; and 3) whether the host 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 easier to monitor (in the sense of geographic proximity), more institutionally similar (in the sense of a 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.

We find that barriers to entry have a much weaker effect on lending standards abroad (column (1)). Columns (2) and (3) confirm the previous results, namely that higher restrictions on bank activities and higher minimum capital requirements in home markets tend to map into lower lending standards in host-country markets. Finally, in this case more efficient home-country supervision is associated with more lending abroad, both in levels and in interaction with firm opacity (column (2)).

5 Discussion of results

There is a large literature on the role of government in regulating economic activity (Pigou, 1938; Stigler, 1971). One of the prime targets of such regulation are commercial banks because their risk-taking behavior has important implications for financial and economic fragility (Bernanke, 1983; Calomiris and Mason, 1997, 2003a,b). To that end, various domestic regulatory and supervisory agencies have been charged with the task to monitor and assess bank risk. The construction of data-

bases containing indices of regulatory stringency and supervisory structure has enabled researchers to look into how the actions of these agencies have affected various banking developments. For example, Barth, Caprio, and Levine (2004) show that restrictions on bank activities affect negatively bank development, while capital regulations enhance bank stability. Laeven and Levine (2009) show that capital requirements and capital stringency reduce risk-taking by banks, and also that this effect depends crucially on the bank's ownership structure.

Our evidence suggests that to different degrees, these results extend across borders. For example, we find that the type of regulation that restricts competition and promotes state ownership of banks results in *more loans* being extended to *predominantly ex ante safe* corporate clients in foreign markets (Table 5, columns (1), (5), and (6)). This suggests that bank deregulation at home may give banks incentives to lower lending standards and engage in more risk-taking in foreign markets. This evidence relates to theories of the beneficial effect of competition in enhancing prudent risk-taking behavior, as well as to theories relating government incentives to the social desirability of economic outcomes (see Shleifer and Vishny, 1998, for an extensive treatment of both types of theories). In particular, our evidence seems to lend support to the argument in Keeley (1990) that banks with monopolistic power possess greater charter value, resulting in higher profits at home and lower incentives to engage in risk-taking in foreign markets.

We also find that higher restrictions on bank activities in home countries lead cross-border banks to extend more loans to opaque corporate clients in host-country markets (Table 5, columns (2), (5), and (6)). To the extent that informational opacity is associated with higher ex ante risk, this result suggests an increase in risk-taking abroad following higher restrictions on bank activities at home. This is consistent with theories implying that fewer regulatory restrictions increase the charter value of banks and therefore augment incentives for more prudent behavior (see Barth, Caprio, and Levine, 2004). This result is also consistent with prior empirical evidence indicating that restricting bank activities has negative repercussions. For example, Barth, Caprio, and Levine (2001) find that such restrictions are associated with a higher probability of a major banking crisis and lower banking-sector efficiency. However, prior evidence has only documented the domestic dimension of this effect. Our results suggest that restrictions on bank activities domestically may

lead to lower lending standards and higher risk-taking abroad - potentially to compensate for the inability to perfectly diversify in home markets.

Our results also suggest that higher capital stringency in home countries leads cross-border banks to extend more loans to informationally opaque firms in foreign markets, but only when banks are inefficiently supervised at home (Table 7, column (5)). Such behavior may imply that these banks may be making up abroad for the inability to engage in high risk-high return lending at home. Barth, Caprio, and Levine (2004) and Laeven and Levine (2009) both show that capital requirements decrease bank riskiness and the share of non-performing loans. Our results imply that lending in foreign markets may be a mirror image of domestic behavior.

In general, our results also offer insights into the role of foreign banks in emerging markets. Overall, 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 (2010) show that foreign banks tend to finance only larger, established, and more profitable firms, and Peek and Rosengren (1997) and Popov and Udell (2010) show that foreign banks shrink their portfolios abroad in response to domestic shocks. Our paper adds to this line of research by providing evidence that foreign banks tend to modify their loan portfolio in response to changes to bank regulation in home-country markets.

Managerial issues might also be important here given the 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 credit availability. 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.

6 Conclusion

In this paper, we conduct the first empirical assessment of theories that relate lending and risk-taking by cross-border banks in foreign markets to domestic bank regulation and supervision. Theory yields inconclusive predictions: strict domestic regulation may incentivize banks to engage in less (act "as if at home") or in more (make up for the lack of risk-taking domestically) risk-taking abroad. We assess these questions by first mapping the scope of the operations of large cross-border banks in $1,976$ localities in 16 countries in emerging Europe, and then study how the loan granting process involving $9,617$ small and medium corporate clients with varying risk profiles relates to the degree of regulation and supervision in the banks' home countries. By employing a cross-locality within-country empirical strategy, we can identify the effect of home-country regulation that is independent of the effect of host-country regulation. We also explicitly address the problem with the endogeneity of foreign bank entry. Finally, by using data on local borrowers to define ex ante risk we address the problem that standard bank-level measures of riskiness, like the Z-score (e.g., Laeven and Levine, 2009), only imperfectly capture the foreign component of the lending standards, as well as risk-taking behavior, of large multinational banks.

Our key findings are twofold. First, lower barriers to entry in home markets, as well as home-country regulation associated with higher restrictions on bank activities, result in laxer lending standards by cross-border banks in foreign markets. Second, lower home-country barriers to entry, higher home-country restrictions on bank activities, and higher home-country minimum capital requirements are associated with even lower lending standards abroad if coupled with inefficient home-country supervision. These findings hold when conditioning on a large set of observable firm-level characteristics and when accounting for firm selection into the credit application process, and the effects are not subsumed in the degree of host-country bank regulation and supervision.

Our results imply that home-country regulation which restricts banks from risk-taking in their primary domestic market, either through reducing their charter value or through restricting them from engaging in certain risky activities, may lead banks to look for risk abroad by lowering their lending standards when dealing with corporate customers. This result relates to the literature on foreign banks "cherry picking" the borrowers that they lend to in host countries. In particular,

what kind of corporate clients foreign banks pursue seems to depend crucially on home-country regulation and supervision. Determining the exact mechanism through which the effects we observe are realized, is beyond the scope of this paper. Our findings nevertheless suggest that domestic bank regulation and supervision have important spillover effects through the activities of cross-border banks. While the current policy debate in the EU is focused on implementing a stricter regulatory framework, our paper cautions that restrictive regulation may not eliminate risk, but simply re-allocate it across markets through the actions of multinational banks.

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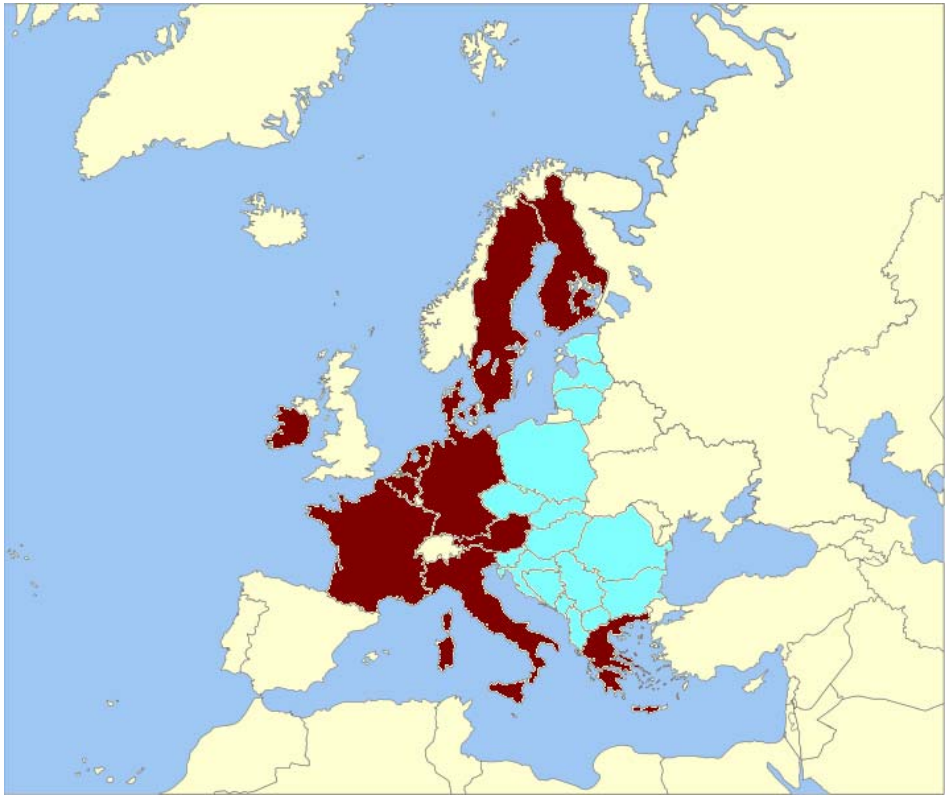
Figure 1. Origin and target countries in the data



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 parent banks in the dataset are incorporated (home countries). 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 (host countries).

Table 1. Summary statistics: Firm characteristics

Country	# Firms	Opaque	Small firm	Big firm	Public company	Sole pro-prietorship	Privatized	Non-exporter	Firm age	Innovative	Competition	Subsidized
Albania	259	0.26	0.90	0.03	0.00	0.74	0.06	0.69	12.81	0.38	0.74	0.04
Bosnia and Herzegovina	561	0.47	0.78	0.03	0.14	0.40	0.22	0.65	21.37	0.54	0.79	0.10
Bulgaria	581	0.58	0.84	0.03	0.05	0.51	0.12	0.76	17.48	0.38	0.62	0.06
Croatia	340	0.53	0.79	0.05	0.07	0.44	0.23	0.63	25.19	0.49	0.79	0.18
Czech Republic	598	0.56	0.79	0.04	0.04	0.41	0.08	0.65	14.84	0.37	0.82	0.16
Estonia	501	0.20	0.79	0.03	0.13	0.27	0.11	0.66	16.13	0.48	0.77	0.14
Hungary	901	0.26	0.80	0.04	0.00	0.63	0.12	0.64	16.88	0.33	0.88	0.22
Latvia	455	0.31	0.72	0.04	0.01	0.36	0.12	0.69	15.79	0.51	0.78	0.11
Lithuania	484	0.60	0.77	0.02	0.02	0.24	0.16	0.63	15.58	0.60	0.78	0.15
Macedonia	566	0.46	0.81	0.03	0.05	0.32	0.16	0.61	18.48	0.52	0.84	0.04
Montenegro	135	0.52	0.86	0.01	0.04	0.71	0.12	0.85	12.83	0.52	0.69	0.04
Poland	1,431	0.63	0.83	0.02	0.05	0.78	0.09	0.74	20.02	0.42	0.84	0.13
Romania	1,142	0.63	0.73	0.04	0.04	0.17	0.13	0.80	16.02	0.39	0.71	0.09
Serbia	670	0.46	0.72	0.05	0.13	0.49	0.18	0.62	24.73	0.52	0.82	0.08
Slovakia	497	0.45	0.74	0.05	0.06	0.54	0.11	0.66	15.89	0.44	0.79	0.13
Slovenia	496	0.57	0.74	0.05	0.08	0.29	0.21	0.44	24.43	0.48	0.79	0.22
Total	9,617	0.49	0.78	0.04	0.06	0.46	0.13	0.68	18.38	0.45	0.79	0.12

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. 'Opaque' is a dummy equal to 1 if the firm does not employ external auditing services. 'Small firm' is a dummy equal to 1 if the firm has from 2 to 49 employees. 'Big firm' is a dummy equal to 1 if the firm has more than 250 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. 'Non-exporter' is a dummy equal to 1 if the does not have access to foreign markets. 'Firm age' is the firm's age in years. 'Innovative' is a dummy equal to 1 if the firm has introduced a new product line in the past 3 years. 'Private company' is a dummy equal to 1 if the firm started as a private company. '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 subsidies during the last 3 years from central or local government. Omitted category in firm size is 'Medium firm'. Omitted category in firm ownership is 'Private company'. See Appendix 1 for exact definitions and data sources.

Table 2. Summary statistics: Credit demand and access

	2005		2008	
Country	Need loan	Constrained	Need loan	Constrained
Albania	0.68	0.32	0.29	0.47
Bosnia and Herzegovina	0.76	0.20	0.77	0.37
Bulgaria	0.65	0.37	0.58	0.52
Croatia	0.78	0.16	0.58	0.43
Czech Republic	0.56	0.42	0.53	0.32
Estonia	0.60	0.23	0.54	0.27
Hungary	0.78	0.29	0.41	0.31
Latvia	0.70	0.29	0.59	0.47
Lithuania	0.71	0.32	0.60	0.23
Macedonia	0.68	0.57	0.59	0.50
Montenegro	0.56	0.30	0.78	0.48
Poland	0.68	0.46	0.53	0.41
Romania	0.72	0.34	0.61	0.33
Serbia	0.77	0.41	0.77	0.38
Slovakia	0.62	0.22	0.53	0.4
Slovenia	0.72	0.11	0.64	0.15
Total	0.70	0.34	0.60	0.37

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 the end of fiscal year 2004 (until March 31, 2005). See Appendix 1 for exact definitions and data sources.

Table 3. Bank regulation and supervision

Panel A. Home countries

Country	Barriers to entry	Restrictions on bank activities	Capital stringency	Prudential supervision
Austria	1.5	5	5	2.5
Belgium	0	9	4	2.5
Denmark	0	8	2	3
Finland	2	7	4	1
France	0	6	2	3
Germany	2	5	1	3
Greece	2.5	9	3	2
Ireland	0	8	1	3
Italy	0.5	10	4	2
Netherlands	0	6	3	2.75
Sweden	0	9	3	2
United States	0	12	4	3
Total	0.7	7.8	3	2.4

Panel B. Host countries

Country	Barriers to entry	Restrictions on bank activities	Capital stringency	Prudential supervision
Albania	1.910	7.474	3.977	2.117
Bosnia and Herzegovina	0.947	7.181	4.547	2.439
Bulgaria	1.784	8.350	3.328	2.171
Croatia	0.852	8.185	4.120	2.189
Czech Republic	0.611	6.780	3.804	2.621
Estonia	0.332	8.486	2.984	2.016
Hungary	1.033	7.345	4.062	2.288
Latvia	0.478	4.535	1.512	2.000
Lithuania	0.156	7.390	2.536	2.159
Macedonia	1.625	7.825	2.561	2.368
Montenegro	1.017	5.440	2.267	2.984
Poland	0.349	8.753	2.848	2.464
Romania	1.210	6.668	3.693	2.483
Serbia	1.146	8.341	3.802	2.204
Slovakia	0.920	7.141	4.534	2.418
Slovenia	0.198	8.190	3.649	2.621
Total	0.879	7.543	3.418	2.346

Note: The table reports summary statistics on average strength of over 2002-2005 of bank supervision and regulation, by home (Panel A) and host (Panel B) country. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks over 2002-2005, taken from Abiad et al. (2008). 'Restrictions on bank activities' is an index of regulatory restrictions on the activities of banks over 2002-2005, taken from Barth et al. (2008). 'Capital stringency' is an index of regulatory oversight of bank capital over 2002-2005, taken from Barth et al. (2008). 'Prudential supervision' is an index of the scope and efficiency of home-country supervision over 2002-2005, taken from Abiad et al. (2008). In Panel B, the three variables are locality-specific and are constructed by weighting by number of branches the respective home-country variable for each parent bank which has at least one branch or subsidiary in that locality. See Appendix 1 for exact definitions and data sources.

Table 4. Probability of positive demand for credit

	(1)	(2)	(3)
	Branch-weighted	Equally-weighted	Asset-weighted
Regulatory and supervisory variables			
Barriers to entry	-0.182	-0.195	-0.124
	(0.095)**	(0.111)*	(0.082)
Restrictions on bank activities	-0.026	-0.027	-0.045
	(0.035)	(0.042)	(0.035)
Capital stringency	0.015	0.026	0.070
	(0.067)	(0.083)	(0.058)
Prudential supervision	-0.142	-0.102	-0.113
	(0.131)	(0.143)	(0.132)
Firm-level variables			
Opaque	-0.096	-0.094	-0.069
	(0.037)***	(0.035)***	(0.034)**
Small firm	-0.148	-0.130	-0.153
	(0.056)***	(0.053)**	(0.053)**
Big firm	0.145	0.156	0.172
	(0.091)*	(0.094)*	(0.089)**
Public company	-0.017	0.033	0.016
	(0.070)	(0.070)	(0.069)
Sole proprietorship	0.192	0.175	0.148
	(0.045)***	(0.044)***	(0.043)***
Privatized	0.102	0.147	0.107
	(0.056)*	(0.056)***	(0.054)**
Non-exporter	-0.179	-0.147	-0.164
	(0.049)***	(0.048)***	(0.048)***
Firm age	-0.036	-0.069	-0.068
	(0.111)	(0.107)	(0.103)
Innovative	0.205	0.203	0.201
	(0.044)***	(0.043)***	(0.042)***
Firm-level variables excluded from second stage			
Competition	0.138	0.143	0.164
	(0.036)***	(0.036)***	(0.035)***
Subsidized	0.320	0.327	0.325
	(0.062)***	(0.060)***	(0.058)***
Country fixed effects		Yes	
Industry fixed effects		Yes	
Time fixed effects		Yes	
Number of observations	7,040	7,379	7,651
Pseudo R-squared	0.05	0.05	0.05

Note: The dependent variable is a dummy variable equal to 1 if the firm desires bank credit. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks. 'Restrictions on bank activities' is an index of home-country regulatory restrictions on the activities of banks. 'Capital stringency' is an index of home-country regulatory oversight of bank capital. 'Prudential supervision' is an index of the scope and efficiency of home-country supervision. The four variables are locality-specific and are constructed by weighting by number of branches (Column (1)), equally (Column (2)), or by assets (Column (3)) the respective variable for each parent bank which has at least one branch or subsidiary in that locality. 'Opaque' is a dummy equal to 1 if the firm does not employ external auditing services. 'Small firm' is a dummy equal to 1 if the firm has from 2 to 49 employees. 'Big firm' is a dummy equal to 1 if the firm has more than 250 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. 'Non-Exporter' is a dummy equal to 1 if the firm does not export to foreign markets. 'Firm age' is the firm's age in years. 'Innovative' is a dummy equal to 1 if the firm has introduced a new product line

in the past 3 years. ‘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’. Only localities where branches and subsidiaries of foreign banks account for more than 50% of the local market are included. All regressions include country, industry, and year fixed effects. White (1980) robust standard errors, clustered at the locality level, 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 and data sources.

Table 5. Home country bank regulation and supervision, and host-country lending standards

	(1)	(2)	(3)	(4)	(5)	(6)
Regulatory and supervisory variables						
Barriers to entry × Opaque	0.228				0.232	0.193
	(0.070)***				(0.080)***	(0.085)**
Restrictions on bank activities × Opaque		-0.099			-0.086	-0.076
		(0.036)***			(0.037)**	(0.032)**
Capital stringency × Opaque			-0.040		-0.057	-0.045
			(0.050)		(0.054)	(0.052)
Prudential supervision × Opaque				-0.131	-0.051	-0.062
				(0.151)	(0.149)	(0.129)
Barriers to entry	-0.163				-0.230	-0.207
	(0.107)				(0.133)*	(0.127)*
Restrictions on bank activities		0.044			0.024	0.023
		(0.040)			(0.049)	(0.042)
Capital stringency			0.120		0.169	0.143
			(0.091)		(0.098)*	(0.095)
Prudential supervision				0.154	0.134	0.137
				(0.157)	(0.182)	(0.160)
Firm-level variables						
Opaque	0.095	0.625	1.058	0.463	1.060	0.951
	(0.092)	(0.352)*	(0.270)***	(0.180)**	(0.377)***	(0.334)***
Small firm	0.523	0.513	0.511	0.508	0.520	0.445
	(0.054)***	(0.054)***	(0.053)***	(0.053)***	(0.053)***	(0.072)***
Big firm	-0.012	-0.028	-0.023	-0.031	-0.020	-0.025
	(0.114)	(0.113)	(0.113)	(0.113)	(0.112)	(0.102)
Public company	0.341	0.337	0.329	0.337	0.320	0.272
	(0.105)***	(0.106)***	(0.106)***	(0.105)***	(0.106)***	(0.099)***
Sole proprietorship	0.126	0.120	0.130	0.121	0.130	0.110
	(0.054)**	(0.054)**	(0.054)**	(0.055)**	(0.054)**	(0.045)**

Privatized	-0.072	-0.077	-0.078	-0.076	-0.080	-0.066
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.059)
Non-exporter	0.284	0.281	0.280	0.282	0.282	0.240
	(0.049)***	(0.049)***	(0.049)***	(0.049)***	(0.049)***	(0.048)***
Firm age	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Innovative	-0.191	-0.189	-0.191	-0.192	-0.192	-0.165
	(0.037)***	(0.037)***	(0.037)***	(0.037)***	(0.037)***	(0.036)***
Inverse Mills' ratio						0.880
						(0.618)
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Number of observations	4,537	4,537	4,537	4,537	4,537	4,519
Pseudo R-squared	0.10	0.10	0.10	0.10	0.10	0.10

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks. 'Restrictions on bank activities' is an index of home-country regulatory restrictions on the activities of banks. 'Capital stringency' is an index of home-country regulatory oversight of bank capital. 'Prudential supervision' is an index of the scope and efficiency of home-country supervision. The four variables are locality-specific and are constructed by weighting by the number of branches the respective variable for each parent bank which has at least one branch or subsidiary in that locality. 'Opaque' is a dummy equal to 1 if the firm does not employ external auditing services. 'Small firm' is a dummy equal to 1 if the firm has from 2 to 49 employees. 'Big firm' is a dummy equal to 1 if the firm has more than 250 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. 'Non-exporter' is a dummy equal to 1 if the firm does not export to foreign markets. 'Firm age' is the firm's age in years. 'Innovative' is a dummy equal to 1 if the firm has introduced a new product line in the past 3 years. '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 categories from the probit equation in Table 4 are 'Competition' and 'Subsidized'. Only localities where branches and subsidiaries of foreign banks account for more than 50% of the local market are included. All regressions include country, industry, and year fixed effects. White (1980) robust standard errors, clustered at the locality level, 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 and data sources.

Table 6. Home country bank regulation and supervision, and host-country lending standards: Robustness

Panel A. Equally-weighted regulation and supervision data

	(1)	(2)	(3)	(4)	(5)	(6)
Barriers to entry × Opaque	0.260				0.260	0.213
	(0.074)***				(0.082)***	(0.077)***
Restrictions on bank activities × Opaque		-0.003			0.021	0.013
		(0.054)			(0.053)	(0.045)
Capital stringency × Opaque			-0.002		-0.032	-0.012
			(0.063)		(0.064)	(0.056)
Prudential supervision × Opaque				-0.149	0.040	-0.015
				(0.165)	(0.176)	(0.151)
Barriers to entry	-0.115				-0.240	-0.207
	(0.111)				(0.138)*	(0.120)*
Restrictions on bank activities		-0.077			-0.083	-0.063
		(0.049)			(0.060)	(0.052)
Capital stringency			-0.043		0.053	0.063
			(0.103)		(0.108)	(0.092)
Prudential supervision				0.363	0.151	0.181
				(0.160)**	(0.184)	(0.158)
Opaque	0.059	0.665	0.342	0.323	-0.080	0.019
	(0.096)	(0.389)*	(0.412)	(0.224)	(0.674)	(0.573)
Inverse Mills' ratio						0.994
						(0.417)**
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Firm-level covariates			Yes			
Number of observations	4,749	4,749	4,749	4,749	4,749	4,727
Pseudo R-squared	0.10	0.10	0.10	0.10	0.10	0.10

Panel B. Asset-weighted regulation and supervision data

	(1)	(2)	(3)	(4)	(5)	(6)
Barriers to entry × Opaque	0.304				0.256	0.201
	(0.062)***				(0.080)***	(0.079)***
Restrictions on bank activities × Opaque		-0.146			-0.099	-0.092
		(0.046)***			(0.064)	(0.053)*
Capital stringency × Opaque			-0.082		-0.122	-0.094
			(0.070)		(0.077)	(0.066)
Prudential supervision × Opaque				0.067	-0.136	-0.167
				(0.147)	(0.178)	(0.148)
Barriers to entry	-0.214				-0.128	-0.104
	(0.105)**				(0.129)	(0.122)
Restrictions on bank activities		0.079			0.082	0.072
		(0.041)*			(0.055)	(0.046)
Capital stringency			-0.046		-0.025	-0.008
			(0.080)		(0.090)	(0.076)
Prudential supervision				0.072	0.209	0.209
				(0.147)	(0.183)	(0.155)
Opaque	0.109	0.154	1.507	0.597	1.687	1.577
	(0.068)	(0.340)	(0.379)***	(0.248)**	(0.853)**	(0.701)**
Inverse Mills' ratio						1.023
						(0.606)*
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Firm-level covariates			Yes			
Number of observations	4,923	4,923	4,923	4,923	4,923	4,900
Pseudo R-squared	0.10	0.10	0.10	0.10	0.10	0.10

Note: The dependent variable is a dummy variable equal to 1 if the firm is credit constrained. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks. 'Restrictions on bank activities' is an index of home-country regulatory restrictions on the activities of banks. 'Capital stringency' is an index of home-country regulatory oversight of bank capital. 'Prudential supervision' is an index of the scope and

efficiency of home-country supervision. The four variables are locality-specific and are constructed by weighting equally (Panel A) or by assets (Panel B) the respective variable for each parent bank which has at least one branch or subsidiary in that locality. ‘Opaque’ is a dummy equal to 1 if the firm does not employ external auditing services. All other covariates from Table 6 are also included in the regressions. Omitted categories from the probit equation in Table 4 are ‘Competition’ and ‘Subsidized’. Only localities where branches and subsidiaries of foreign banks account for more than 50% of the local market are included. All regressions include country, industry, and year fixed effects, as well as the rest of the firm-level covariates from Table 5 (not reported for brevity). White (1980) robust standard errors, clustered at the locality level, 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 and data sources.

Table 7. Home country bank regulation and supervision, and host-country lending standards: Interaction between regulation and supervision

	(1)	(2)	(3)	(4)	(5)	(6)
	Branch-weighted		Equally-weighted		Asset-weighted	
	Low supervision	High supervision	Low supervision	High supervision	Low supervision	High supervision
Barriers to entry × Opaque	0.367	0.016	0.268	0.157	0.248	0.197
	(0.090)***	(0.083)	(0.100)***	(0.091)*	(0.083)***	(0.106)*
Restrictions on bank activities × Opaque	-0.093	-0.033	-0.051	0.114	-0.060	0.007
	(0.041)**	(0.060)	(0.066)	(0.076)	(0.061)	(0.058)
Capital stringency × Opaque	-0.111	0.031	-0.073	0.092	-0.219	0.043
	(0.077)	(0.063)	(0.090)	(0.065)	(0.092)**	(0.086)
Barriers to entry	-0.506	-0.023	-0.500	-0.016	-0.022	-0.177
	(0.170)***	(0.133)	(0.183)***	(0.148)	(0.190)	(0.160)
Restrictions on bank activities	-0.035	0.018	-0.111	0.081	0.157	-0.010
	(0.063)	(0.057)	(0.086)	(0.064)	(0.066)**	(0.062)
Capital stringency	0.109	0.115	-0.256	0.117	-0.301	0.032
	(0.143)	(0.100)	(0.150)*	(0.104)	(0.156)*	(0.105)
Opaque	0.975	0.321	0.594	-1.119	1.343	-0.046
	(0.248)***	(0.619)	(0.504)	(0.664)*	(0.548)**	(0.581)
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Firm-level covariates			Yes			
Number of observations	2,527	1,992	2,449	2,278	2,581	2,319
Pseudo R-squared	0.11	0.11	0.11	0.11	0.11	0.11

Note: The dependent variable is a dummy variable equal to 1 if the firm's credit application has been rejected. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks. 'Restrictions on bank activities' is an index of home-country regulatory restrictions on the activities of banks. 'Capital stringency' is an index of home-country regulatory oversight of bank capital. 'Prudential supervision' is an index of the scope and efficiency of home-country supervision. The four variables are locality-specific and are constructed by weighting by the number of branches (Columns labelled "Branch-weighted"), equally (Columns labelled "Equally-weighted"), or by assets (Columns labelled "Asset-weighted") the respective variable for each parent bank which has at least one branch or subsidiary in that locality. 'Opaque' is a dummy equal to 1 if the firm does not employ external auditing services. All other covariates from Table 6 are also included in the regressions. Only localities where branches and subsidiaries of foreign banks account for

more than 50% of the local market are included. All regressions include country, industry, and year fixed effects, as well as the rest of the firm-level covariates from Table 5 (not reported for brevity). White (1980) robust standard errors, clustered at the locality level, 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 and data sources.

Table 8. Home country bank regulation and supervision, and host-country lending standards: Accounting for the endogeneity of foreign bank entry

	(1)	(2)	(3)	(4)
Barriers to entry × Opaque	-0.017			
	(0.058)			
Restrictions on bank activities × Opaque		-0.212		
		(0.134)*		
Capital stringency × Opaque			-0.252	
			(0.119)**	
Prudential supervision × Opaque				-0.398
				(0.159)**
Barriers to entry	0.112			
	(0.101)			
Restrictions on bank activities		0.054		
		(0.087)		
Capital stringency			0.422	
			(0.393)	
Prudential supervision				-0.503
				(0.411)
Opaque	0.127	1.028	1.692	0.994
	(0.063)**	(0.366)***	(1.017)*	(0.420)**
Country fixed effects		Yes		
Industry fixed effects		Yes		
Time fixed effects		Yes		
Firm-level covariates		Yes		
Number of observations	4,519	4,519	4,519	4,519
Pseudo R-squared	0.11	0.04	0.07	0.06

Note: The dependent variable is a dummy variable equal to 1 if the firm's credit application has been rejected. 'Barriers to entry' is an index of the strength of regulatory restrictions of entry by private and/or foreign banks. 'Restrictions on bank activities' is an index of home-country regulatory restrictions on the activities of banks. 'Capital stringency' is an index of home-country regulatory oversight of bank capital. 'Prudential supervision' is an index of the scope and efficiency of home-country supervision. The four variables are locality-specific and are constructed by weighting by the number of branches the respective variable for each parent bank which has at least one branch or subsidiary in that locality. Each regulatory/supervision variable is instrumented using average distance to bank headquarters, an index of host-country creditor protection, and a dummy equal to 1 if the country is in the European Union. 'Opaque' is a dummy equal to 1 if the firm does not employ external auditing services. All other covariates from Table 6 are also included in the regressions. Omitted category in firm size is 'Medium firm'. Omitted category in firm ownership is 'Private company'. Omitted categories from the probit equation in Table 4 are 'Competition' and 'Subsidized'. Only localities where branches and subsidiaries of foreign banks account for more than 50% of the local market are included. All regressions include country, industry, and year fixed effects, as well as the rest of the firm-level covariates from Table 5 (not reported for brevity). White (1980) robust standard errors, clustered at the locality level, 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 and data sources.

Appendix 1. Domestic and parent banks in the sample

Country	Bank	Parent bank and country of incorporation
Albania	Alpha Bank	Alpha Bank – Greece
	Raiffeisen	Raiffeisen – Austria
	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 – Austria
	Piraeus	Piraeus Bank – Greece
Bosnia and Herzegovina	Raiffeisen Bank Bosna i Hercegovina	Raiffeisen – Austria
	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 - Austria
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 - Austria
	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 - Austria
	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 - Austria
	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 - Austria

Appendix 2. 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

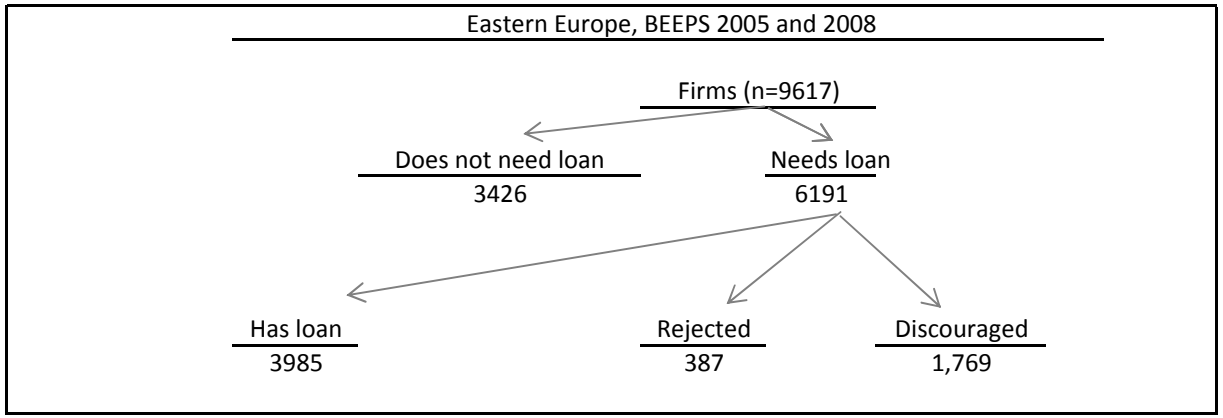
Source: Bankscope (2008).

Appendix 3. Variables – definitions and sources

Variable Name	Definition	Source
	Firm characteristics	
Opaque	Dummy=1 if the firm does not subject its financial accounts to external audit.	BEEPS 2005 & 2008
Small firm	Dummy=1 if firm has less 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
Non-exporter	Dummy=1 if no part of the firm's production is exported to foreign markets.	BEEPS 2005 & 2008
Competition	Dummy=1 if pressure from competitors is "fairly" or "very" severe.	BEEPS 2005 & 2008
Firm age	The number of years since the firm was officially incoroprated.	BEEPS 2005 & 2008
Innovative	Dummy=1 if the firm has introduced at least one new credit line in the past 3 years.	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's application for a bank loan was rejected.	BEEPS 2005 & 2008

	Bank-level variables	
Barriers to entry	Composite index of 2 types of regulatory restrictions: barriers to entry, and degree of involvement of private banks.	Abiad et al. (2008)
Restrictions on bank activities	Composite index of regulatory restrictions on security market activities, insurance activities, real estate activities, and nonfinancial firm owenrship by banks.	Barth et al. (2008)
Capital stringency	Composite index of regulatory oversight of bank capital, including minimum capital requirement adjusted for risk, deduction of loan losses, securities losses, and foreign exchange losses not realized, fraction of revaluation gains allowed, verification of sources of funds to be used as capital, regulation of initial disbursement or subsequent injections of capital.	Barth et al. (2008)
Prudential supervision	Composite index of 4 types of government intervention in prudential supervision: Basle-type capital adequacy ratio, independence from the executive, on-site and off-site supervision, coverage of all institutions.	Abiad et al. (2008)
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 host country is a member of the European Union.	

Figure 2. Responses to BEEPS questions on credit access



The figure summarizes the responses of firms to questinos on access to credit in the 2005 and the 2008 BEEPS surveys.