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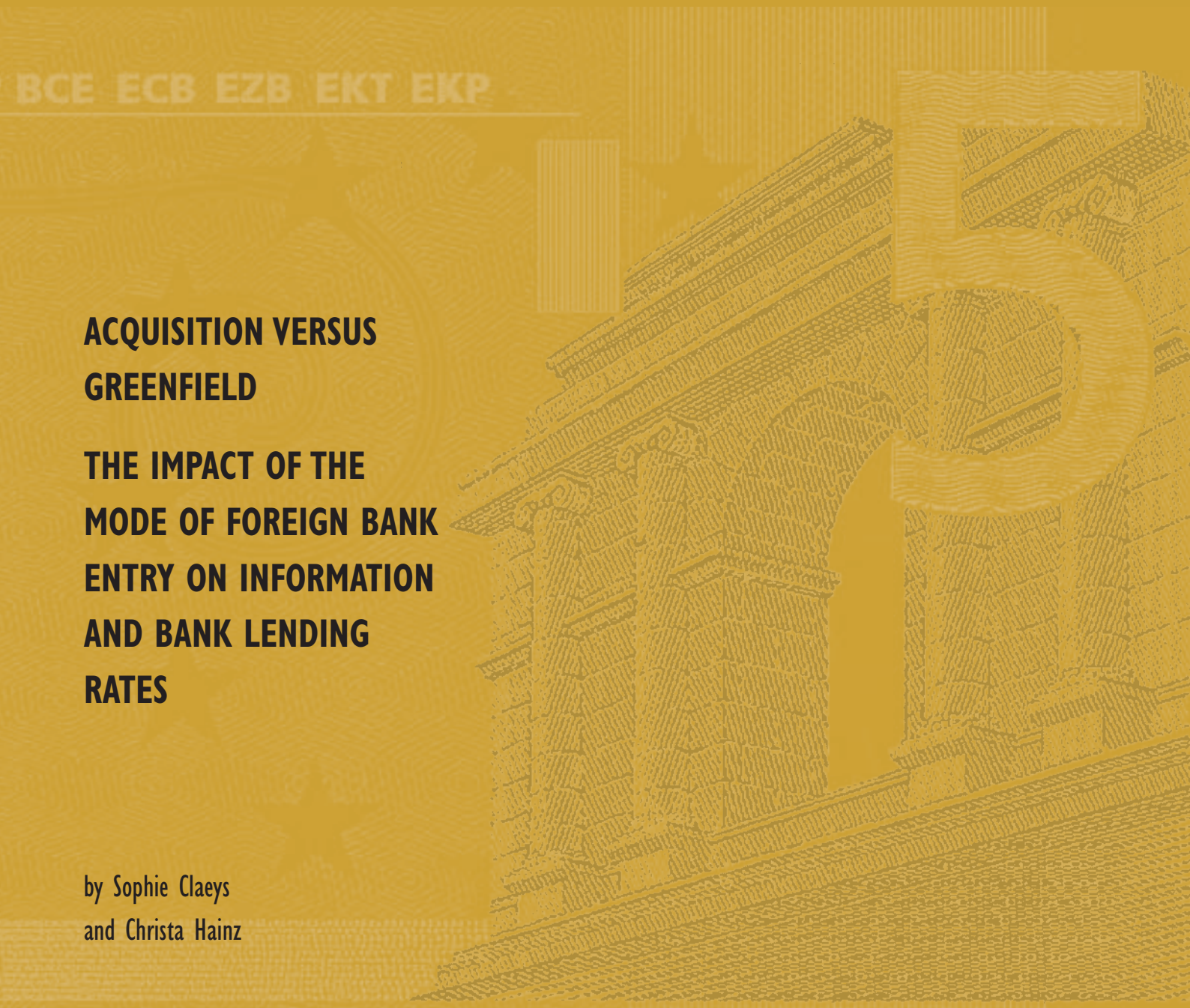

ACQUISITION VERSUS GREENFIELD

THE IMPACT OF THE MODE OF FOREIGN BANK ENTRY ON INFORMATION AND BANK LENDING RATES

by Sophie Claeys
and Christa Hainz

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Abstract

Policy makers often decide to liberalize foreign bank entry but at the same time restrict the mode of entry. We study how different entry modes affect the interest rate for loans in a model in which domestic banks possess private information about their incumbent clients but foreign banks have better screening skills. Our model predicts that competition is stronger if market entry occurs through a greenfield investment and therefore domestic banks' interest rates are lower. We find empirical support for our results for a sample of banks from 10 transition countries of Eastern Europe for the period 1995-2003.

Keywords: Banking, Foreign Entry, Mode of Entry, Interest Rate, Asymmetric Information

JEL-Classification: G21, D4, L31

Non-technical Summary

Empirical evidence shows that in emerging markets, foreign banks are more profitable and more efficient than domestic banks (Demirgüç-Kunt and Huizinga (2000), Bonin, Hasan and Wachtel (2005), Martinez Peria and Mody (2004)), while being less profitable in more developed countries (Claessens, Demirgüç-Kunt and Huizinga (2001)). These contrasting findings heat the debate as to what extent foreign bank entry benefits customers. Traditional industrial organization literature predicts that bank entry leads to more competition which should ultimately help borrowers. Indeed, foreign bank presence in emerging countries increases access to loans, especially for large and transparent firms (Mian (2006a), Giannetti and Ongena (2005), Clarke, Cull and Martinez Peria (2001)). Differences in information distribution (*soft* versus *hard* information) between domestic and foreign banks may however obstruct a likewise impact on lending to small and more opaque firms (Dell'Ariccia and Marquez (2004)). These firms are often captured by their domestic bank and barred from foreign lending. To date, the impact of the *mode* of foreign bank entry - foreign acquisition versus foreign *de novo* or greenfield investment - on the initial distribution of information and the consequent degree of competition and lending conditions remains largely ignored.

Governments all over the world have expressed their concerns about foreign banks' *cherry picking strategies* by keeping up (sometimes illegal) barriers to entry. Foreign banks are sometimes deprived of gaining majority stakes in private domestic banks. Vice versa, domestic policy makers have been reluctant to grant bank licenses that allow foreign investors to start a *de novo* bank. While foreign *de novo* banks are more profitable and efficient than foreign acquired banks (Martinez Peria and Mody (2004), Majnoni, Shankar and Vàrhegyi (2003)), it remains unclear whether the mode of entry impacts domestic bank lending conditions and competition as a whole alike. This is especially important for emerging markets where firms heavily depend on bank financing.

In this paper we try to fill this void. We provide a theoretical framework that outlines how the distribution of information between foreign and domestic banks may differ depending on the mode of entry. Consequently, this will influence the degree of competition and the average lending rate for borrowers. The predictions of the model are tested using data on entry modes of foreign banks in 10 Eastern European countries. Because Eastern Europe witnessed a dramatic increase in foreign bank entry over the past decade (foreign bank market shares increased from approximately 10 percent in 1995 to almost 70 percent in 2003), it provides a unique laboratory for analyzing the impact of the mode of foreign bank entry on bank interest rates.

The crucial difference between foreign and domestic banks is their aptitude to acquire information. Domestic banks possess information about their incumbent firms. Both the domestic and the foreign bank have the same degree of information about firms which have just entered the credit market. However, foreign banks have better screening skills

than the domestic bank. A foreign bank enters through a greenfield investment only if its advantage in screening new applicant firms compensates its disadvantage of having no information about incumbent firms. If a foreign bank enters via acquisition, it acquires a credit portfolio that contains information about the quality of incumbent firms. In addition, the acquired bank can generate information by screening applicants. The mode of entry thus determines the distribution of information between foreign and domestic banks, which affects the degree of competition. Therefore, the mode of entry generates a differential "competition effect". Since we subsequently empirically analyze the lending rate for borrowers, we take into account how a bank's portfolio composition with respect to new applicants and incumbent firms depends on the mode of entry. In contrast to new applicants, successful incumbent firms can signal their type. For these firms, competition drives down the interest rate. Thus, the higher the share of successful incumbent firms, the lower will be the average lending rate demanded by acquired banks. We refer to this effect as the "portfolio composition effect".

Our analysis provides three main results. First, domestic banks demand higher lending rates than foreign banks from new applicants. Since a foreign bank will enter only if it is better in generating information, it can undercut the domestic bank's lending rate. Second, competition is stronger when a foreign bank enters via a greenfield investment rather than by acquiring an existing bank. The stronger the information advantage of the foreign bank, the weaker the position of the domestic bank, and the higher will be the domestic bank's lending rate. A higher interest rate by the domestic bank gives the foreign bank scope to extract rents from borrowers. Thus, the competition effect is more pronounced in the case of entry through a greenfield investment. Third, the average lending rates of foreign and domestic banks depend on their portfolio composition. Incumbent firms - on which domestic and acquired banks have *soft* information - face a hold-up problem because they cannot signal their type. However, the higher the share of successful incumbent firms that are able to signal their type, the lower will be the average lending rate demanded by acquired banks.

We use bank balance sheets to derive lending rates for a panel of 200 banks in 10 Eastern European countries for the period 1995-2003. Using panel data estimation methods, we find empirical support for our results. Consistent with previous literature, we find that foreign bank presence negatively impacts bank interest rates. Foreign banks, on average, charge lower lending rates - between 1.33 and 1.48 percent less than their domestic counterparts. By including (non-linear) age dynamics into our regression equation, we find that although greenfield banks charge higher interest rates on average, they significantly reduce their interest rates over the years following entry. We further find indications of a differential competition effect. Depending on the mode of entry, domestic bank lending rates are lower when entry predominantly happened via a greenfield investment.

1 Introduction

Empirical evidence shows that in emerging markets, foreign banks are more profitable and more efficient than domestic banks (Demirgüç-Kunt and Huizinga (2000), Bonin, Hasan and Wachtel (2005), Martinez Peria and Mody (2004)), while being less profitable in more developed countries (Claessens, Demirgüç-Kunt and Huizinga (2001)). These contrasting findings heat the debate as to what extent foreign bank entry benefits customers. Traditional industrial organization literature predicts that bank entry leads to more competition which should ultimately help borrowers. Indeed, foreign bank presence in emerging countries increases access to loans, especially for large and transparent firms (Mian (2006a), Giannetti and Ongena (2005), Clarke, Cull and Martinez Peria (2001)). Differences in information distribution (*soft* versus *hard* information) between domestic and foreign banks may however obstruct a likewise impact on lending to small and more opaque firms (Dell'Ariccia and Marquez (2004)). These firms are often captured by their domestic bank and barred from foreign lending. To date, the impact of the *mode* of foreign bank entry - foreign acquisition versus foreign *de novo* or greenfield investment - on the initial distribution of information and the consequent degree of competition and lending conditions remains largely ignored.

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The remainder of this paper is organized as follows. In section 2, we review the related literature. A model of bank market entry is presented in section 3. We derive the credit contract offered in the case of a greenfield investment and in the case of acquisition. We discriminate between interest rates demanded from new applicants and incumbent firms. Based on the comparison of the interest rates under different entry mode regimes,

we derive testable hypotheses in Section 4. We investigate the empirical validity of the model for banks operating in 10 Eastern European countries. Section 5 concludes.

2 Literature

This paper is related to both the theoretical and empirical literature of foreign bank entry. The theoretical literature has highlighted the problems of asymmetric information in lending that new entrants face relative to incumbent banks, which makes credit markets not easily contestable. Dell'Ariccia, Friedman and Marquez (1999) show that when entrant banks are unable to distinguish between good and bad borrowers, foreign bank entry comes to a standstill. They develop a model in which two banks possess private information about the customers whom they financed in the past. When new firms enter the credit market, neither bank has information about their type. In a first step, Dell'Ariccia et al. (1999) demonstrate that the smaller of the two banks makes zero expected profit. This result is used to show that a new entrant would make an expected loss, because it faces a higher share of unprofitable firms switching from the incumbent bank to the new entrant which has less information.[1]

Dell'Ariccia and Marquez (2004) extend the model and assume that one of the lenders possesses an informational advantage. They study the case where the bank with less information capital has a cost advantage in extending credit. They show that spreads are higher in markets characterized by more severe information asymmetries. As a consequence, it is profitable to finance borrowers of lower profitability. If an uninformed lender with lower costs enters, the incumbent bank reacts and finds it more profitable to lend to firms in more opaque sectors. In contrast to Dell'Ariccia and Marquez (2004), we assume that all banks have identical cost structures. In addition, foreign banks differ from domestic banks because they are able to screen applicants. Thus, we model the advantage of foreign banks more explicitly.[2] Furthermore, we compare different modes of bank entry whereas Dell'Ariccia and Marquez (2004) restrict their analysis to bank entry through a greenfield investment.

Martinez Peria and Mody (2004) empirically analyze how foreign bank participation and market concentration affect bank spreads in a sample of five Latin American countries during the late 1990s. Their results suggest that foreign banks are able to charge lower spreads than domestic banks.[3] Furthermore, they find that acquired banks have relatively higher spreads than foreign *de novo* banks. The authors give two possible explanations of why greenfield banks charge lower spreads compared to the acquired banks. First, greenfield banks may be more concerned with gaining market share compared to foreign

[1] Gehrig (1998) obtains a similar result; namely that the incumbent monopolistic bank has an incentive to improve its screening technology in order to deter entry by foreign banks.

[2] In Sengupta (2005) the new entrant has lower costs and offers collateralized credit contracts to match the incumbent's information advantage.

[3] Equivalently, it is shown that restricting foreign bank entry increases the net interest margin (Levine, 2004).

acquired banks, which leads them to set prices more aggressively, benefiting domestic borrowers. Second, due to differences in initial informational conditions, both types of banks might not be able to charge the same spreads. More specifically, as is argued by Dell'Ariccia and Marquez (2004), *de novo* banks will have little information on domestic borrowers and will thus focus on more transparent (and thus more competitive) market segments.[4]

The empirical facts about bank market entry differ substantially between developing and industrialized countries. Eastern Europe is a region with one of the highest shares of foreign participation in the banking sector (Papi and Revoltella (2000)). In the new EU member states, the share of foreign banks in total banking sector assets amounted to about 55 percent in 2003. This was at a time when foreign banks were almost absent in the large EU-15 countries (ECB, 2005). This is surprising, because there are no formal restrictions on bank market entry. Interestingly, foreign-owned banks in developed countries are less profitable than domestic banks (IMF, 2000).[5] Rather the opposite situation is found in developing countries. Foreign ownership in these countries increased significantly during the last decade and a majority of assets is now owned by foreign banks. Furthermore, foreign banks have a higher profitability than domestic banks in developing markets (Claessens, Demirgüç-Kunt and Huizinga (2001)).

Some studies focus on the profitability and efficiency of foreign banks in Eastern Europe. Bonin, Hasan and Wachtel (2005) analyze whether privatization improves bank performance for the 10 largest banks in 6 transition countries of Eastern Europe. Their results indicate that foreign-owned banks are most efficient (see also Weill (2003)). Majnoni, Shankar and Vàrhegyi (2003) investigate how foreign ownership affects banks' cost and profit efficiency in Hungary. They find that greenfield banks are more profitable than acquired banks, because they offer a wider range of financial services. Using both bank and firm level data, Giannetti and Ongena (2005) study the impact of foreign bank entry in Eastern Europe on firms' access to credit. They find that firms benefit from the presence of foreign banks, especially large domestic firms. In contrast, De Haas and Naaborg (2005) document that foreign bank entry in Eastern Europe has not led to a persistent bias of credit supply towards large multinational corporations. Instead, increased competition and the improvement in lending technologies led to a gradual expansion towards the SME and retail markets. Naturally, foreign bank lending behavior will depend on the legal environment of the host country in which it operates. Haselmann, Pistor and Vig (2005) show that an improvement in the legal protection of creditors in Eastern Europe is positively related to banks' willingness to lend, especially for foreign banks.

[4] A similar argument is made by Stein (2002) who argues that banks with more hierarchical structures - here foreign banks - are more likely to rely on "hard information". A study on banks in 100 emerging economies confirms this difference in lending policies between domestic and foreign banks (Mian, 2006b).

[5] See also De Young and Nolle (1996) and Berger, De Young, Genay and Udell (2000) who find that foreign banks are less efficient than domestic banks in developed markets.

3 A Model of Bank Market Entry

3.1 Setup of the Model

We study the market entry decision of a bank in a one-period framework. We take the bank-firm relationships which have been established in the past as given. To capture these effects, we use a setup that is similar to that of Dell'Ariccia, Friedman and Marquez (1999). Before starting the analysis, we describe the characteristics of the borrowers and the banking sector.

Firms We distinguish between two groups of borrowers. First, there are incumbent firms that have established a bank relationship in the past. Second, there are new firms that have just entered the credit market. The total number of firms is normalized to 1; the share of incumbent firms μ, that of new firms is $(1-\mu)$. Among the incumbent firms that already established a bank relationship in the past are successful and old firms which represent a share of π and $(1-\pi)$. The "successful firms" possess a track record that enables them to signal their type. Among the "old firms" a share p will be profitable in the future and will be referred to as "good firms".[6] A share $(1-p)$ will fail, they are called "bad firms". Through the bank relationship, the incumbent bank has perfect information about the profitability of the old firms and knows which firm is good or bad. However, the outside bank cannot discriminate between good and bad old firms according to their type but knows that a fraction p of the old firms is good. Moreover, there are "new firms" that enter the credit market. No bank has information about the type of an individual new firm. It is common knowledge that there is a share of q good and a share of $(1-q)$ bad firms among the new firms. All firms that apply for credit to a certain bank for the first time are treated as new applicants unless they provide a track record.[7]

Successful, old and new firms can invest in new projects. However, only good firms will succeed and generate a payoff of X with certainty. Bad firms will always fail. In order to undertake the project, firms need to invest an amount I. Since they do not have own liquid funds, the investment has to be credit-financed. Figure 1 depicts a game tree that summarizes the composition of the firm population.

[Figure 1]

[6] The differentiation between old and new firms is independent of the activity of the firm on the product market. It only refers to the previous relationship with a bank.

[7] These include all the old firms that apply for credit to the outside bank and all the new firms that apply for credit. This assumption implies that the foreign bank does not distinguish between new firms and old firms - i.e. firms that already have a bank relationship - that apply for credit for the first time. The distinction between old and new firms is only important with respect to the information that is revealed to the bank through the bank relationship, irrespective of whether the old firm has already applied for credit in the past.

Banks We study different scenarios of entry into the banking sector. We assume that after bank market entry, there is Bertrand competition on the credit market between the domestic and the foreign bank.[8] The cost of raising funds is equal for both domestic and foreign banks and is normalized to 0. The domestic bank, which was the incumbent bank of the incumbent firms, has perfect information about this group of customers. This assumption can be interpreted as the domestic bank's access to soft information that it accumulated over the years by, for example, maintaining lending relationships. The extent to which a foreign bank possesses soft information depends on the mode of entry. A *de novo* bank does not have such soft information. Both foreign greenfield and foreign acquired banks do however observe - as does the domestic bank - hard information. Other than the domestic bank, the foreign bank is better able to process this hard information via a superior screening technology. For modelling purposes, we assume that the domestic bank does not possess any screening technology as a normalization according to which we measure how much better a foreign bank is able to evaluate credit proposals than the domestic bank. The foreign bank's screening technology generates a signal about the profitability of the firm, which is correct with probability s ($s > 0.5$). The foreign bank receives the profitability signal without incurring any additional costs. The idea behind this is that the foreign bank uses the screening technology it has built in the home market, in order to limit the losses in the market it has just entered. Incorporating screening costs needlessly burdens the calculations and does not change the results.

We do not explicitly study collateralization. However, successful firms could be considered as firms that provide collateral in order to signal their type. We further assume that no formal information sharing on borrowers' credit histories occurs.[9] Moreover, we assume that banks do not have any constraints in lending capacity.

Timing Before the credit market game starts, the incumbent bank learns the type of all old firms in its portfolio. There are two rounds in which the banks offer credit. First, all banks make offers to new applicants. Second, the incumbent bank makes offers to successful and good old firms. New firms apply to both banks in order to increase their chance to receive a loan. Finally, firms choose which bank to borrow from and invest. Provided that both banks offer a loan, firms choose the bank with the lower payoff. If both banks demand the same repayment, firms apply in proportion to their share in the population. Old firms stay with their incumbent bank if both the incumbent and the

[8] Although competition for primary deposits could play a role in the structure of the credit market (Besanko and Thakor (1987)), we neglect the market situation for deposits and focus on the credit market. In many transition economies, credit-granting banks are not competing for primary deposits. Often, former savings banks are still the most important collectors of deposits, which they transfer to the credit-granting banks through the money market (Dittus and Prowse (1996)).

[9] For the countries that we include in our empirical analysis, this is a valid assumption in the first years under consideration. These countries have only recently adopted some form of formal (public or private) credit information registry (see Djankov, McLiesh and Schleifer (2005)). We discuss the role of information sharing in the Appendix and control for the incorporation of credit registries in the empirical analysis.

outside bank demand the same repayment. Finally, the payoffs realize and firms repay if they are successful.

There is no equilibrium in pure strategies for the repayment terms. The reason is that a marginal change in the repayments can lead to a discontinuous change in the bank's profits. This is due to the fact that we focus on asymmetric information between banks. If we incorporate, for example, switching costs, we would be able to derive an equilibrium in pure strategies (for an example see Boukaert and Degryse (2006)). Since we want to restrict our attention to the question on how different entry modes influence the expected repayment through differences in the distribution of information and differences in screening skills, we do not incorporate switching costs in our analysis.

The lending rate that we derive in the empirical part is the average rate offered to new applicants and incumbent customers. In the theoretical analysis, we first analyze the terms of the credit contract offered to new applicants. Next, we investigate the lending behavior of banks vis-a-vis the incumbent customers. We show that bank loan portfolios depend on the mode of entry. We refer to this effect as the "portfolio composition effect". The composition of the loan portfolio subsequently determines how sensitive bank repayments are to the "competition effect". In each step of the analysis, we first discuss entry via a greenfield investment, followed by entry via acquisition and finally compare the two modes of entry.

3.2 Credit Contract Offered to New Applicants

3.2.1 Market Entry through Greenfield Investment

We first derive the credit contract offered by the domestic bank. The domestic bank has perfect information about all old firms. Therefore, it will only lend to the good old firms and deny credit to bad old firms since this would imply making an expected loss. Suppose the domestic bank serves all the new firms that apply for credit. Since it has no screening skills, the minimal repayment that the domestic bank requires, $\underline{R_D}$, is determined by the break even condition when the domestic bank serves the whole market, i.e., when the domestic bank undercuts the repayment demanded by the foreign bank. Formally, this condition can be written as:

$$q\underline{R_D^G} - I = 0 \text{ or} \tag{1}$$

$$\underline{R_D^G} = \frac{I}{q}. \tag{2}$$

The minimal repayment of the foreign bank, $\underline{R_F^G}$, is derived by studying the average quality of firms applying when the foreign bank serves the whole market. The foreign bank finances all bad old borrowers that have generated a positive signal. Moreover, it finances all new firms with a positive signal. Since the signal is imperfect, a share of

$(1-s)(1-p)$ old borrowers and $(1-s)(1-q)$ new borrowers receive credit although they are not creditworthy. The break even condition is given by:

$$\mu(1-\pi)(1-s)(1-p)(-I)+(1-\mu)\left(qs\left(\underline{R_F^G}-I\right)+(1-q)(1-s)(-I)\right)=0 \quad (3)$$

This condition determines the minimal repayment as:

$$\underline{R_F^G}=I\frac{\mu(1-\pi)(1-s)(1-p)+(1-\mu)(qs+(1-q)(1-s))}{(1-\mu)sq} \quad (4)$$

Since the foreign bank has to incur a fixed cost K for entering the market, it will do so only if it makes a positive profit on the credit market. This will be the case if its minimal repayment satisfies $\underline{R_F^G}<\underline{R_D^G}$. This implies that, given $\underline{R_D^G}=\frac{I}{q}$, the foreign bank makes positive profits whenever it serves the whole market.

In equilibrium, banks mix continuously on the range $[\underline{R},X)$ or do not bid at all. Given these minimal repayments, banks decide about their required repayment R_i^G, $i=D,F$, the cumulative distribution function F_i^G and the probability of denying credit $prob_i^G(D)$. Proposition 1 shows the resulting equilibrium in mixed strategies.

Proposition 1 *If the foreign bank enters through a greenfield investment, there exists an equilibrium in mixed strategies where repayments received from new applicants are higher for the domestic bank compared to the foreign bank:*

- *The domestic bank demands a repayment from new applicants in the range* $\left[\frac{I}{q},X\right]$, *according to the following cumulative distribution function:*

  $F_D^G(R)=(qR-I)\frac{s}{qsR-2qsI-I+sI+qI}\ \forall\ R_D^G\ \epsilon\ \left[\frac{I}{q},X\right)$

  and does not make an offer with probability $prob_D^G(D)=I(1-q)\frac{2s-1}{qsX-2qsI-I+sI+qI}$.

- *The foreign greenfield bank demands a repayment from new applicants in the range* $\left[\frac{I}{q},X\right]$, *according to the following cumulative distribution function:*

  $F_F^G(R)=(qR-I)\frac{1}{qsR-2qsI-I+sI+qI}\ \forall\ R_F^G\ \epsilon\ \left[\frac{I}{q},X\right)$

  and $prob\left(R_F^G=X\right)=\frac{qX(-1+s)-I(2qs-s-q)}{qsX-2qsI-I+sI+qI}$.

Proof. See the Appendix. ■

From proposition 1 it is easy to note that the value of the domestic bank's cumulative distribution function is always a fraction s of the foreign bank's cumulative distribution function, i.e., $F_D^G(R)=sF_F^G(R)$. Thus, R_D^G first order stochastically dominates R_F^G. This

implies that the expected repayment demanded by the domestic bank will be higher than the one demanded by the foreign *de novo* bank.

The domestic bank decides not to offer a credit contract with positive probability because it faces a so-called "winner's curse problem". All new firms that apply to the domestic bank are those which were denied credit by the foreign bank after generating a bad signal. In order to limit the risk to end up with a loss, the domestic bank will deny credit with a positive probability $prob_D^G(D)$. This probability increases as the screening technology of the foreign bank improves. The intuition is that a better screening technology of the foreign bank deteriorates the average quality of firms that apply to the domestic bank. In order to avoid losses, the domestic bank therefore rations credit with a higher probability.

The foreign bank will only enter the market if it has an absolute advantage in terms of information. When the foreign bank decides to enter, the domestic bank will have an informational disadvantage compared to the foreign bank with respect to the new applicant firms. The domestic bank will therefore stay out of the market with positive probability and with each repayment $\underline{R_D^G}$ make zero expected profit from the new applicant firms. For each repayment the foreign bank makes the same expected profit, which is given by:

$$\begin{aligned} & \mu(1-\pi)(1-s)(1-p)(-I) + (1-\mu)(qs(\underline{R_D^G} - I) + (1-q)(1-s)(-I)) \\ = \; & I((1-\mu)(1-q)(2s-1) - \mu(1-\pi)(1-s)(1-p)) \end{aligned} \tag{5}$$

Corollary *Foreign banks only enter through greenfield investment if its screening skill is high enough, i.e.,* $s > \widetilde{s} = \frac{\left((1-q+\mu q-\mu p-\mu\pi+\mu\pi p)+\frac{K}{I}\right)}{(2-2q+2\mu q-\mu-\mu p-\mu\pi+\mu\pi p)}$.

Entry through a greenfield investment is attractive only if $I((1-\mu)(1-q)(2s-1) - \mu(1-\pi)(1-s)(1-p)) > K$. Rearranging this condition, we find that the quality of the signal generated by screening must exceed $\widetilde{s}$. Naturally, the higher the fixed cost of market entry, K, the higher $\widetilde{s}$ has to be. The higher I, the amount of credit needed, the lower is $\widetilde{s}$. Comparative statics further show that the higher the share of old firms, the higher the screening quality of the foreign banks must be.

This corollary explains why banks find greenfield investment attractive in emerging markets. In these economies, there are many *de novo* firms which have not yet established a bank relationship. Therefore, the share of applicants about which neither foreign nor domestic banks know the type is high. With respect to the new firms, the foreign bank has an absolute advantage compared to the domestic bank because it possesses a better screening technology than the domestic bank. The threshold $\widetilde{s}$ indicates how much better the foreign bank must be than the domestic bank, which by assumption does not get an informative signal, as we have normalized the quality of the signal of the domestic bank to 0.5. Consequently, better screening skills of domestic banks increase $\widetilde{s}$. This explains why in industrialized countries, where domestic banks possess sophisticated screening tools, market entry through greenfield investment is less attractive for foreign banks.

3.2.2 Market Entry through Acquisition

Assume that initially there exist two identical banks. One of the banks is sold to a foreign bank for a price P^A which is exogenously given. When taking over the bank, the foreign bank acquires information about all the customers of the existing bank. Moreover, it can implement its screening technology without any costs and screening generates the same quality of signals as in the case of a greenfield investment. As before, the domestic bank has information about the quality of its old customers. Now the acquired banks also has information about the stock of customers it inherited from the past. One could think of the credit files it received through the acquisition or the staff it continues to employ. The bank staff possess soft information about the firms that have already established a bank relationship.

Analogously to the case of greenfield investment, we determine the minimal repayments necessary for the domestic and the foreign bank, respectively. When serving the whole market, the break even condition for the domestic bank is determined by the quality of firms that receive credit. Since the domestic bank does not screen, it serves all customer that apply, i.e., all bad old customers that are switching bank. The number of bad old firms that apply to the domestic bank is $\mu(1-\pi)0.5\,(1-p)\,(-I)$. Formally, the break even condition is given by:

$$\mu(1-\pi)0.5\,(1-p)\,(-I)+(1-\mu)\,(q\underline{R_D^A}-I) = 0 \text{ or} \quad (6)$$

$$\underline{R_D^A} = I\frac{1-\frac{1}{2}\mu(1-\pi)\,(1-p)}{(1-\mu)\,q}. \quad (7)$$

In contrast to the domestic bank, the foreign bank screens its applicants. Consequently, the foreign bank finances only those firms that generate a positive signal. The break even condition is given by:

$$\mu(1-\pi)0.5\,(1-s)\,(1-p)\,(-I)+(1-\mu)\,(qs(\underline{R_F^A}-I)+(1-q)\,(1-s)\,(-I))=0. \quad (8)$$

The minimal repayment for the foreign bank is given by:

$$\underline{R_F^A} = I\frac{\frac{1}{2}\mu(1-\pi)\,(1-s)\,(1-p)+(1-\mu)\,((1-q)\,(1-s)+qs)}{(1-\mu)\,sq}.$$

It is easy to show that $\underline{R_D^A} > \underline{R_F^A}$. This implies that the foreign bank has positive profits whenever it demands exactly $\underline{R_D^A}$.[10] Since each repayment has to generate the same expected payoff, the foreign bank makes an expected profit on the credit market. The foreign bank decides to enter the credit market if the expected profit exceeds the acquisition price P^A.

Proposition 2 describes the equilibrium in mixed strategies in more detail:

[10] This result is obtained as long as screening produces an informative signal, i.e., $s > 0.5$. Only then will the screening capability make the foreign bank relatively stronger compared to the domestic bank.

Proposition 2 *If the foreign bank enters through acquisition, there exists an equilibrium in mixed strategies where repayments received from new applicants are higher for the domestic bank compared to the foreign bank:*

- *The domestic bank demands a repayment from new applicants in the range* $[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X]$*, according to the following cumulative distribution function:*

  $F_D^A(R) = \frac{1}{2}\frac{s(2qR-2\mu qR-2I+\mu I+\mu pI+\mu\pi I-\mu\pi pI)}{(1-\mu)(qsR-2qsI-I+sI+qI)} \;\forall\; R_D^A \in \left[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X\right)$
  and does not make an offer with probability $prob_D^A(D) = 1 - F_D^A(X)$.

- *The foreign acquired bank demands a repayment from new applicants in the range* $[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X]$*, according to the following cumulative distribution function:*

  $F_F^A(R) = \frac{1}{2}\frac{(2qR-2\mu qR-2I+\mu I+\mu pI+\mu\pi I-\mu\pi pI)}{(1-\mu)(qsR-2qsI-I+sI+qI)} \;\forall\; R_F^A \in \left[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X\right)$
  and $prob\left(R_F^A = X\right) = 1 - F_F^A(X)$.

Proof. See the Appendix. ■

Again, $F_D^A(R) = sF_F^A(R)$, such that the domestic bank's expected repayment is always above the one demanded by the acquired bank.

3.2.3 Comparison

We compare what credit contracts look like when a foreign bank enters either through a greenfield investment or through acquisition. Since the entry mode determines the degree of competition, we investigate the competition effect here. The results are summarized in propositions 3 and 4.

Proposition 3 *The domestic bank's expected repayments from new applicants are higher in the case of acquisition than in the case of a greenfield investment.*

Proof. See the Appendix. ■

In order to study expected repayments, we compare the cumulative distribution functions of repayments for both modes of entry. We can show that both $F_D^A(R) < F_D^G(R)$ and $prob\left(R_D^A = X\right) > prob\left(R_D^G = X\right)$ hold. Thus, higher repayments are assigned a higher probability in the case of acquisition. This is confirmed when we look at the probability that $R = X$ (the probability with which the foreign bank demands the highest repayment). This probability is higher in the case of acquisition. As a consequence, the repayment is higher in the case of acquisition. Since the expected repayment demanded by the domestic bank exceeds the repayment asked by the foreign bank, we obtain the following result for foreign banks.

Proposition 4 *The foreign bank's expected repayments from new applicants are higher in the case of acquisition than in the case of a greenfield investment.*

Proof. The cumulative distribution function of the domestic bank is always a fraction s of the foreign bank's cumulative distribution function (see propositions 1 and 2). Therefore, the comparison of repayments between the two modes of entry is the same as for the domestic bank. ■

We have shown that competition is stronger in the case of a greenfield investment. The explanation for this result is as follows. The market entry strategy influences how information about old firms is distributed between the two competing banks. In the case of greenfield investment, the domestic bank has information about all old firms whereas the foreign bank does not observe the quality of the good and bad old firms. In contrast, in the case of acquisition, each bank knows the quality of its old customers. The mode of entry determines the distribution of information, and, consequently, the position of the weaker bank. Independent of the mode of entry, the domestic bank is always the weaker bank. However, the information disadvantage of the domestic bank with respect to the foreign bank depends on the entry mode. The degree to which the domestic bank has a disadvantage in terms of information determines the scope of the foreign bank to extract rents from the firms by demanding a higher repayment.

In the case of a greenfield investment, the relative position of the domestic bank is determined by the amount of information it has about its old customers compared to the screening skills of the foreign bank. The relative position of the domestic bank is weaker in the case of acquisition compared to the case of greenfield. Now the foreign bank does not only possess a better screening technology but has information about old firms as well. Consequently, the foreign bank is better able to exclude bad old firms from receiving credit than in the case of greenfield investment. This also implies that the domestic bank receives more applications from bad old firms. Due to the lack of screening techniques, it finances the bad old firms coming from the foreign bank. This means that in the case of acquisition the domestic bank needs a higher repayment compared to the foreign bank in order to make zero expected profits.[11]

3.3 Credit Contract Offered to Incumbent Firms

The population of incumbent customers consists of successful firms and old firms. The incumbent bank can always make an offer that matches the one offered by the outside bank. The incumbent firms will then demand credit from the bank with which they already established a relationship. Thus, the outside option of the incumbent firms determines the repayment that the incumbent bank can demand. Since there is perfect information on the type of successful firms, there is perfect competition for these firms.

[11] Along the same line of arguments, the domestic bank rations credit with a higher probability since it wants to avoid making losses.

Successful firms will always repay I to either bank from which they demand a loan. The repayment that the incumbent bank demands from good old firms depends on the entry mode. The incumbent bank does not provide credit to bad old firms in order to avoid making expected losses. The relative impact of the competition effect for new applicants on *average* lending rates depends on the portfolio composition of the banks. We show that the mode of entry generates a differential portfolio composition effect.

3.3.1 Market Entry through Greenfield Investment

The incumbent firms that apply to an outside bank face the risk of not receiving an offer. If a good old firm which had a relationship with the domestic bank asks for credit at the foreign *de novo* bank, it is rejected with probability $(1-s)$. This is the probability with which the screening generates an incorrect signal. In this case, the domestic bank is the only bank that is willing to lend. It exerts its market power by demanding $R = X$. If the foreign bank makes an offer, the domestic bank adapts its offer to the outside offer and demands R_F^G as well. As a result, a foreign *de novo* bank does not possess incumbent customers. Proposition 5 characterizes the average repayment of the domestic bank.

Proposition 5 *If the foreign bank enters through a greenfield investment, the domestic bank receives an average repayment* $E(R_D^G(in))) = \frac{\pi I+(1-\pi)p(sE(R_F^G)+(1-s)X)}{\pi+(1-\pi)p}$ *from successful and good old firms.*

Proof. See the Appendix. ■

3.3.2 Market Entry through Acquisition

In contrast to the previous case, the foreign bank now possesses a customer base. Good old firms from the acquired bank have the chance to apply to the domestic bank. However, the domestic bank only offers credit with probability $F_D^A(X)$. With probability $prob_D^A(D)$ the domestic bank does not make an offer at all. In this case, the foreign bank is able to act like a monopolist. Proposition 6 characterizes the average repayment of both the domestic and the acquired bank.

Proposition 6 *If the foreign bank enters through acquisition:*

- *The foreign bank receives an average repayment from successful and good old firms that equals:*
  $E(R_F^A(in))) = \frac{\pi I+(1-\pi)p(F_D^A(X)E(R_D^A)+(1-F_D^A(X))X)}{\pi+(1-\pi)p}$.
- *The domestic bank receives an average repayment from successful and good old firms that equals:*
  $E(R_D^A(in)) = \frac{\pi I+(1-\pi)p(sE(R_F^A)+(1-s)X)}{\pi+(1-\pi)p}$.

Proof. See the Appendix. ■

3.3.3 Comparison

The average lending rate that we observe in the data depends on the competition effect and the portfolio composition effect. We compare the repayments offered to the new applicants relative to the repayments offered to the incumbent firms in order to evaluate how the two effects are related to each other.

Domestic bank In Proposition 3 we have shown that a domestic bank demands more from its new applicants if the foreign bank enters through acquisition rather than through a greenfield investment. From propositions 5 and 6 it follows that the domestic bank also demands less from its incumbent customers in the case of greenfield investment. We therefore obtain the following result about the domestic bank's average repayment.

Proposition 7 *The domestic bank demands lower average repayments if market entry is through greenfield investment rather than through acquisition.*

Proof. See the Appendix. ■

The fact that market entry through greenfield investment reduces the domestic bank's repayments relatively more compared to entry via acquisition follows from the competition effect. Since competition is more intense in the case of a greenfield investment, the repayments that the domestic and the foreign bank demand from new applicants decreases more strongly. The repayment that the foreign bank offers to new applicants determines the repayment that the domestic bank offers to good old customers. Thus, competition drives down lending rates for new applicants and good old firms. Since the rates for both types of customers decrease, the different composition of the domestic bank's loan portfolio in the case of a greenfield investment and acquisition does not matter for the comparison.

Foreign bank From the previous analysis we know that acquired banks demand higher repayments from new applicants than greenfield banks. In order to derive a prediction on the average lending rate (received from incumbent customers and new applicants) we compare the repayment that an acquired bank offers to incumbent firms with the repayment that a greenfield bank offers to new applicants. Proposition 8 describes the result.

Proposition 8 *The competition and the portfolio composition effect work in different directions for foreign banks. The competition effect reduces the average repayment of the greenfield bank compared to that of an acquired bank. However, the portfolio composition*

effect reduces the average repayment of the acquired bank, but it does not affect the average repayment of the greenfield bank.

Proof. See the Appendix. ■

Proposition 8 indicates that, depending on the relative share of successful firms, acquired banks may charge lower lending rates compared to greenfield banks, on average. The result of the comparison depends on the two opposing effects. On the one hand, acquired banks have successful firms in their portfolio which pay low interest rates. On the other, competition is less intense than in the case of a greenfield investment. Therefore, the interest rate that an acquired bank offers to good old firms and new applicant firms is higher. The higher the share of successful firms the more likely it is that the repayment of the greenfield bank is higher than the repayment of the acquired bank.

4 Empirical Validity of the Model

4.1 Estimation strategy

The propositions presented above lead to a number of empirically verifiable hypotheses for observed lending rates:

- *Hypothesis 1:*Foreign banks charge lower rates than domestic banks, on average. Due to better screening skills, foreign banks are able to undercut the domestic banks' lending rates, irrespective of their mode of entry.

  We include a variable *Foreign Bank* to test whether foreign and domestic bank lending rates significantly differ. *Foreign Bank* is a dummy variable that is one for banks that are already foreign owned at from the start of the sample (1995).

- *Hypothesis 2:* Acquired banks offer higher lending rates to new applicants than greenfield banks. The acquired bank lending rate offered to incumbent firms is however below the rate offered to new applicants. Therefore, depending on the loan portfolio composition of the acquired and the domestic banks, the average expected repayment of foreign greenfield ($E(R^G)$), domestic ($E(R^D)$) and foreign-acquired banks ($E(R^A)$) can be ranked either as

  - $E(R^G) < E(R^D) < E(R^A)$ or as
  - $E(R^G) > E(R^D) > E(R^A)$.

  The higher the share of successful firms the more likely it is that the lending rate of the greenfield bank is higher than the average lending rate of both the domestic and the acquired bank. We include *Foreign MA* and *Foreign Greenfield* to test whether foreign acquired and foreign greenfield banks charge lower rates compared

to domestic banks. *Foreign MA* is a dummy variable that is one from the moment that a foreign bank acquires a domestic bank within the sample period and obtains a majority ownership share. *Foreign Greenfield* is a dummy variable that is one from the moment that a bank entered during the sample period as a foreign *de novo* bank. We interact the mode of entry variables with the age of the bank to account for age dynamics. As foreign banks become more acquainted with the market, differences in information asymmetries will gradually disappear. Moreover, domestic banks will benefit from positive spill-over effects following entry and invest in better screening technologies. We therefore expect that lending rates converge as banks grow older.

- *Hypothesis 3:* Foreign bank entry negatively impacts domestic bank lending rates, irrespective of the mode of entry.

  Due to increased competition, lending rates for new applicants decrease and the hold-up problem that old firms face will be significantly reduced. We include *Foreign bank share*, the ratio of foreign loans to total market loans, to test for the competition effect. We expect a significant negative impact of foreign bank market share on domestic bank lending rates.

- *Hypothesis 4:* The negative impact of foreign bank entry on domestic bank lending rates is more pronounced when a majority of foreign banks entered via a greenfield investment.

  Domestic banks reduce their interest rates for good old firms and new applicants more when foreign banks enter through a greenfield investment. To test this differential competition effect, we differentiate foreign bank market share in loans and define *Bank share of Foreign MA* versus *Bank share of Foreign Greenfield*. We expect a larger negative impact on domestic bank lending rates following entry via greenfield investment.

In what follows, we analyze the impact of the mode of foreign bank entry on a measure for the lending rate, while controlling for a number of variables. In particular, we estimate regressions of the following form:

$$\begin{aligned} r^{L}_{i,j,t} \;=\; & \beta_0 + \beta_1 \cdot Foreign\ Bank_{i,j} + \\ & \beta_2 \cdot Foreign\ MA_{i,j,t} + \\ & \beta_3 \cdot Foreign\ Greenfield_{i,j,t} + \\ & \beta_4 \cdot Foreign\ Bank\ Share_{j,t} + \\ & \beta_5 \cdot CONTROLS + \\ & Country\ FE + Year\ FE + \varepsilon_{i,j,t}. \end{aligned} \tag{9}$$

The dependent variable is the (nominal) lending rate, defined as:

$$r^{L}_{i,j,t} = \frac{RI_{i,j,t}}{\frac{1}{2}(L_{t-1} + L_t)},$$

with $RI_{i,j,t}$ interest income and $L_{i,j,t}$ the volume of loans for each bank i in country j at time t, taken from the *Bankscope* database. Because we are dividing a flow variable by a stock variable, we use the average of the stock variable between t and $t-1$. Next to variables that capture the mode of entry, we control for a number of bank and country-specific variables that are expected to determine bank lending rates. Definitions and sources of all these variables are described in table 1.

[Table 1]

Since we are interested in explaining how bank lending rates vary over time within a country, we include country fixed effects. To account for the macroeconomic developments within a country, we include measures for GDP growth, inflation and the real short term interest rate. Any other year fixed effects that may not have yet been accounted for can be captured by including year dummies. We show estimation results that both include and exclude year fixed effects in our regressions for the following reasons. First, since we include time-varying country macro-variables, we already account for time dynamics per country. Second, because we want to asses the impact of the ownership and credit registry dummies on average lending rates, there is a potential problem in disentangling the impact of these variables when time fixed effects are also included. This is because many credit registries were installed in the second half of the nineties, which corresponds with the later years of our sample period. Furthermore, many foreign acquisitions occurred in the later part of our sample. These events therefore create a correlation between the *Foreign MA*, *Bank share Foreign MA*, *Foreign bank share* and *Credit Registry* variables and the time fixed effects that is negative in the first years and positive afterwards (this can be seen in the correlation table in the Appendix). Furthermore, we want to test for more complex dynamics, such as the impact of the bank's age on lending rates, depending on ownership, that cannot be captured by including year fixed effects. In the presentation of our results, we therefore also show the results of the specifications that additionally include year fixed effects as a robustness check to document how our results are affected.

4.2 Descriptive statistics and sample properties

We use yearly data of about 200 individual banks in 10 Eastern European transition countries, namely Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia for the period (1995-2003). These countries have shown widely different policies towards the mode of foreign bank entry. Table 2 presents the means of the variables used for estimation. Foreign bank participation in the sample encompasses 15% of foreign banks that are foreign from the start of the sample (with an average market share of 41%), 20% of foreign acquisitions (with a market share of 28%) and 5% foreign *de novo* banks (with a market share of 5%). Figure 2 indicates that in the

beginning of the 1990s, foreign entry predominantly happened via establishing a foreign *de novo* bank. In our data window (1995-2003) foreign acquisition eventually became the more popular mode of entry. Panel A indicates that a large proportion of the original foreign banks in our sample were initiated as greenfield investments. Panel B shows that foreign acquired bank market shares however dominate greenfield bank market shares since 1997. Together with a wave of foreign acquisitions, bank markets became more and more concentrated. On average, the market share of the top 3 banks per country amount to almost 60 percent. The mode of entry variables used for estimation are defined within the sample, such that we can adequately assess the impact of entry, depending on the mode. This additionally enables us to interpret age dynamics appropriately.

[Table 2]

[Figure 2]

4.3 Results

Table 3 presents the estimation results for equation (9) that includes all banks. The first three columns show estimates that are based on ordinary least squares regressions that include country fixed effects. The last three columns additionally include year fixed effects. From equation (I) it follows that (1) foreign banks, on average, charge lower lending rates - about 1.33% less than domestic banks;[12](2) foreign acquired banks charge about 0.21% less (although this is not significantly different from domestic banks in general), while foreign greenfield banks charge, on average, 0.96% more than domestic banks.[13] When we include linear age dynamics in equation (II), we can derive that in the first year after entry, foreign greenfield banks charge about 4% more than domestic banks, while foreign acquired banks only charge 0.55% more in the first year after acquisition. Both types of foreign banks significantly reduce their lending rates a couple of years after entry. Equation (III) on the other hand indicates that greenfield banks may be characterized by non-linear age dynamics and significantly reduce their lending rates at a faster pace than acquired banks. The lower average age of acquired banks does not allow us to find a significant non-linear age effect for this mode of entry. Figure 3 summarizes how foreign bank lending rates evolve in the years after entry, relative to domestic bank lending rates.

[Figure 3]

Our results further indicate that a higher foreign bank share in loans negatively impacts the average lending rate, which supports the competition effect. This finding corroborates previous empirical literature (Martinez Peria and Mody (2004), Claessens

[12]This finding is in line with the result by Dell'Ariccia and Marquez (2004), namely that if an uninformed lender with lower costs enters, the incumbent bank reacts and finds it more profitable to lend to firms in more opaque sectors.

[13]We additionally investigated the impact of mergers between two foreign banks on lending rates, but this was never significant. These results are available upon request.

et al. (2001)). The competition effect can however not be confirmed once we include year fixed effects.

In order to be able to fully disentangle the impact of foreign greenfield banks on bank lending rates, we include the number of banks as a control variable. Although we do not consider the total number of banks as a good proxy for competition, it may bias our results with respect to the *Foreign Greenfield* dummy when leaving this out of the estimation. The results indicate that a higher number of banks leads to higher bank lending rates. This is surprising at first, but can be explained as follows. Even though the countries in our sample have been characterized by an inflow of greenfield banks in the early 1990s, most bank entry happened via foreign acquisitions afterwards (see Figure 2). Moreover, a number of failures and mergers led to a gradual reduction of the number of banks in the later years of our sample. The process of consolidation has therefore likely led to a reduction in lending rates, due to efficiency gains.

[Table 3]

Table 4 presents the results of separate regressions for domestic and foreign banks. The coefficients for *Foreign MA* and *Foreign Greenfield* show the difference in average lending rates relative to banks that are already foreign owned in 1995. The results in equations (II) and (IV) indicate that foreign *de novo* banks charge higher lending rates than foreign acquired banks. Taken together, the results from Table 3 and Table 4 indicate that the loan portfolio composition effect dominates the competition effect. Specifically, greenfield banks may be predominantly serving new applicants, while domestic and foreign acquired banks still serve a large share of old and successful firms. [14]

Some important differences between foreign and domestic banks emerge. Bank-specific credit growth is positive and significant for foreign banks. Credit growth can be seen as an (imperfect) proxy for the relative share of new firms with respect to incumbent firms. A large share of new firms may allow foreign banks to charge higher lending rates, because foreign banks have a screening advantage over domestic banks, while domestic banks e.g. ration credit. Alternatively, foreign banks may be better able to price the increased risk that follows from credit expansions. We include the loans-to-assets ratio to control for the fact that some banks (notably domestic banks) may be investing solely in government bonds, what would lead to an increase in their interest revenues. However, the share of loans to assets does not influence foreign and domestic bank lending rates differently.[15] Costs in itself are important for all banks, but more so for foreign banks. Bank market share increases foreign bank lending rates, while domestic banks do not seem to be able to exploit market power.

The results in Table 3 did not reveal any significant impact of market concentration

[14] Since we are unable to distinguish the share of successful firms, we cannot directly control for banks' portfolio composition with respect to old and new firms. When we add as a proxy for the share of successful firms the share of bad loans in a country, our results remain unaltered.

[15] We additionally tested the impact of government securities on bank lending rates, but these results were never significant. These results are available upon request.

on average lending rates. The results in Table 4 however show that a highly concentrated market leads to lower foreign interest rates but it does not impact domestic banks' lending rates. On the one hand, highly concentrated markets may render competition less intense, which may lead to higher lending rates (Berger, 1995). On the other, highly concentrated markets may be the result of a consolidation process in which banks with superior management or production technologies have lower costs and subsequently can offer more competitive interest rates on loans, leading to a negative relationship between market concentration and lending rates. The high concentration of foreign banks - that are generally more efficient and more profitable (Martinez Peria and Mody (2004) and Bonin et al. (2005)) - may therefore be responsible for the observed negative relation between concentration and lending rates.

Finally, the incorporation of a credit registry does not lead to significantly lower interest rates. This indicates that information sharing via the incorporation of credit registries has not yet significantly reduced the degree of asymmetric information in the countries included in our analysis.

[Table 4]

The competition effect coming from the presence of foreign banks is especially important for the domestic banks. In Table 5, we investigate hypothesis 4, namely whether there is a differential competition effect on domestic bank lending rates, depending on the mode of entry. The results in equation (II) indicate that a one percent increase in foreign *de novo* market share would lead to a reduction in domestic bank average lending rates of 0.17% compared to a reduction of 0.13% of a one percent increase in foreign acquired market share. These results indicate that competition is more intense when entry predominantly happened via a greenfield investment, although the two coefficients only marginally significantly differ.

[Table 5]

5 Concluding Remarks

We analyzed the question how the entry mode of foreign banks influences the credit market in the host country, particularly the lending rate. Since access to finance and the cost of financing are important factors influencing the development of the corporate sector, foreign bank entry receives a lot of attention from policy makers (EBRD, 2005).

This paper investigates the impact of foreign bank entry on the costs of financing. In a theoretical model, we have shown that the mode of entry determines the distribution of information between foreign and domestic banks, which affects the degree of competition. Therefore, the mode of entry generates a differential competition effect. We also take into account that a bank's portfolio composition of new applicants and incumbent firms depends on the mode of entry. In contrast to new applicants, successful incumbent firms can signal their type. For these firms, competition drives down the interest rate. Thus,

the higher the share of successful incumbent firms, the lower will be the average lending rate demanded by acquired banks. The predictions of the theoretical model reveal that the competition effect reduces the lending rates of the domestic bank more strongly if entry occurred through greenfield investment. However, the competition effect and the portfolio composition effect work in different directions when greenfield and acquired banks are compared.

Our empirical analysis shows indications that the competition effect is indeed stronger when entry happened predominantly as a greenfield investment. This is due to the competition for new firms. The portfolio composition effect however weakens the relative position of the foreign *de novo* bank such that the latter demands higher interest rates compared to domestic and acquired banks as a result. Alternatively, greenfield banks may specialize in certain segments of the market in which they can exert market power. To investigate this hypothesis, we need information on the type of borrowers that each foreign bank has. We leave these issues for future research.

Concerning the access to credit, we observe a lending boom in most of the 10 countries of our sample (EBRD, 2005). The lending boom is characterized by extremely high growth rates of loans made to the private sector. Admittedly, the initial values of financial intermediation are very low. The future development will show how sustainable the growth rates are and how much foreign ownership and the mode of entry matters for the quality of the loans granted.

References

[1] Berger, Allen N., 1995, The Profit-structure Relationship in Banking: Tests of Market-power and Efficient-structure Hypotheses, Journal of Money, Credit and Banking 27 (2), 404-431.

[2] Berger, Allen N., DeYoung, Robert, Genay, Hesna and Udell, Gregory F., 2000, Globalization of financial institutions: Evidence from cross-border banking performance, in: Brookings-Wharton Papers on Financial Activity, 3, 23-158.

[3] Besanko, David, and Thakor, Anjan V., 1987, Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets, International Economic Review 28 (3), 671-689.

[4] Bonin, John P., Hasan, Iftekhar and Wachtel, Paul, 2005, Privatization Matters: Bank Efficiency in Transition Countries, Journal of Banking and Finance 29 (1), 31-53.

[5] Boukaert, Jan and Degryse, Hans, 2006, Entry and Strategic Information Display in Credit Markets, Economic Journal, forthcoming.

[6] Claessens, Stijn, Demirgüç-Kunt, Asli, Huizinga, Harry, 2001, How Does Foreign Entry Affect Domestic Banking Markets, Journal of Banking and Finance, 25, 891-911.

[7] Clarke, George R. G., Cull, Robert and Martinez Peria, Maria Soledad, 2001, Does Foreign Bank Penetration Reduce Access to Credit in Developing Countries?, World Bank Policy Research Working Paper No. 2716.

[8] de Haas, Ralph and Naaborg, Ilko, 2005, Does Foreign Bank Entry Reduce Small Firms Access to Credit? Evidence from European Transition Economies, De Nederlandsche Bank Working Paper No. 50/August 2005.

[9] Dell'Ariccia, Giovanni, Friedman, Ezra and Marquez, Robert, 1999, Adverse selection as a Barrier to Entry in the Banking Industry, RAND Journal of Economics 30 (3), 515-534.

[10] Dell'Arricia, Giovanni and Marquez, Robert, 2004, Information and Bank Credit Allocation, Journal of Financial Economics, 72 (1), 185-214.

[11] Demirgüç-Kunt, Asli, and Huizinga, Harry, 2000, Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence, World Bank Economic Review 13, 379-408.

[12] Djankov, Simeon, McLiesh, Caralee and Shleifer, Andrei, 2005, Private Credit in 129 Countries, NBER Working Paper No. 11078, January 2005.

[13] DeYoung, Robert and Nolle, Daniel, 1996, Foreign-owned banks in the US: Earning market share or buying it? Journal of Money, Credit, and Banking, 28 (4), 622-636.

[14] Dittus, Peter, and Prowse, Stephen, 1996, Corporate Control in Central Europe and Russia. Should Banks Own Shares?, in: Roman Frydman, Cheryl W. Gray, and Andrzej Rapaczynski (Eds.): Corporate Governance in Central and Eastern Europe and Russia, Vol. 2., Insiders and the State, Central European University Press, Budapest, 1996, 20-67.

[15] EBRD, Transition Report 2005, EBRD, London, 2005.

[16] ECB, 2005, EU Banking Structures, October 2005.

[17] Gehrig, Thomas, 1998, Screening, Cross-Border Banking, and the Allocation of Credit, mimeo, University of Freiburg, August 1998.

[18] Giannetti, Mariassunta, and Ongena, Steven, 2005, Financial Integration and Entrepre-neurial Activity: Evidence from Foreign Bank Entry in Emerging Markets, mimeo, Stockholm School of Economics.

[19] Haselmann, Rainer, Pistor, Katharina, and Vikrant, Vig, 2005, How Law Affects Lending, Columbia Law and Economics Working Paper No. 285, October 2005.

[20] International Monetary Fund, 2000, International Capital Markets. Developments, Prospects, and Key Policy Issues, Chapter VI Washington DC, September 2000, 152 - 182, available at http://www.imf.org/external/pubs/ft/icm/2000/01/eng/.

[21] Levine, Ross, 2004, Denying Foreign Bank Entry: Implications for Bank Interest Margins, in: Luis Antonio Ahumada and J. Rodrigo Fuentes (Eds.), Bank Market Structure and Monetary Policy, Santiago, Chile: Banco Central de Chile, 271-292

[22] Majnoni, Giovanni, Shankar, Rashmi and Vàrhegyi, Eva, 2003, The Dynamics of Foreign Bank Ownership: Evidence from Hungary, World Bank Policy Research Working Paper No. 3114, August 2003.

[23] Martinez Peria, Maria Soledad and Mody, Ashoka, 2004, How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America, Journal of Money Credit and Banking 36 (3), 511-537.

[24] Mian, Atif, 2006a, Distance Constraints: The Limits of Foreign Lending in Poor Economies, Journal of Finance, forthcoming.

[25] Mian, Atif, 2006b, Foreign, Private Domestic, And Government Banks: New Evidence from Emerging Markets, Journal of Banking and Finance, forthcoming.

[26] Papi, Luca and Revoltella, Debora, 2000, Foreign Direct Investment in the Banking Sector: A Transitional Economy Perspective, in: Claessens, Stijn and Jansen, Marion (Eds.): The Internationalization of Financial Services – Issues and Lessons for Developing Countries, Kluwer Law International, The Hague, November 2000, 437-457.

[27] Sengupta, Rajdeep, 2005, Foreign Entry and Bank Competition, mimeo, Vanderbilt University, June 2005.

[28] Stein, Jeremy C., 2002, Information Production and Capital Allocation: Decentralized versus Hierarchical Firms, Journal of Finance 57 (5), 1891-1921.

[29] Weill, Laurent, 2003, Banking Efficiency in Transition Economies. The Role of Foreign Ownership, Economics of Transition 11 (3), 569-592.

A Proofs

A.1 Proof of Proposition 1

Step 1: We show that old customers stay with their incumbent bank.

- Bad old customers are denied credit by their incumbent bank because they generate a payoff of $0 < I$.
- Due to the sequential nature of offers, the foreign bank underbids the domestic bank marginally (and vice versa) and keeps its good old firms, i.e. $R_F^G = R_D^G$, because the old firms have a slight preference for the incumbent bank.

Step 2: We show that no equilibrium in pure strategies exists.

$\underline{R}_D^G$ denotes the repayment that the domestic bank needs for making zero expected profit.

Suppose there exists a symmetric equilibrium with $R_F^G = R_D^G > \underline{R}_D^G$. The foreign bank has an incentive to marginally undercut R_D^G and still make a positive expected profit. Suppose that $R_F^G = R_D^G = \underline{R}_D^G$. The foreign bank has an incentive to undercut the domestic bank and still make positive expected profit. In this case, the domestic bank would make an expected loss and, thus, it would be better to make no offer at all.

Suppose there exists an asymmetric equilibrium in pure strategies. Suppose that $R_F^G > R_D^G > \underline{R}_D^G$. The foreign bank has an incentive to marginally undercut the domestic bank and make positive expected profit. Suppose that $R_F^G > R_D^G = \underline{R}_D^G$. The foreign bank has an incentive to undercut the domestic bank and still make positive expected profit. In this case, the domestic bank would make an expected loss and, thus, it would be better to make no offer at all. Suppose that $R_D^G > R_F^G \geq \underline{R}_D^G$. The domestic bank has an incentive to demand a marginally lower repayment than the foreign bank and make a non-negative profit.

Step 3: We show that $F_D^G(R)$ and $F_F^G(R)$ are continuous and strictly monotonously increasing on an interval $\left(\underline{R}_D^G, X\right)$.

Suppose that F_j^G, $j = D, F$, is discontinuous at R^*, i.e. there exists an atom in F_j^G, then bank i's action of playing $R^* - \epsilon$ strictly dominates playing $R^* + \epsilon$, $\epsilon > 0$. Therefore, bank i, $i \neq j$, $i = D, F$, will not bid a free-market repayment $[R^*, R^* + \epsilon)$. But then bank j can raise its repayment without losing customers, so R^* cannot be an optimal action for bank j. Hence, F_j^G must be continuous.

Suppose that F_j^G is non-increasing over some interval, i.e. there exists an interval $(R_a, R_b) \subseteq (\underline{R}, X)$ for which $f_i(R) = 0 \ \forall \ R\epsilon(R_a, R_b)$. But then $prob(R_i < R_j \mid R_i = R_a) = prob(R_i < R_j \mid R_i \epsilon (R_a, R_b))$, but profits are strictly

higher for $R_i > R_a$ (conditional on winning), so that bank i maximizes its payoff by playing $R_i = R_b$ and hence would never offer a repayment in the interval. But then bank j can increase its profits by playing $R_j = R_b - \epsilon$ with positive probability, where $\epsilon < R_b - R_a$, since this will lead to strictly higher profits than any interest rate offer in a neighborhood of R_a. However, this contradicts the assumption that $f_i(R) = 0 \ \forall \ R\epsilon (R_a, R_b)$.

Step 4: We determine the equilibrium in mixed strategies as described in the proposition.

Consider the profit function of the domestic bank conditional on the offer of the foreign bank:

$$\Pi_D^G(R) = (1-\mu)\left(\left(1-F_F^G\right)(qR-I) + F_F^G\left((1-s)\,q\,(R-I) - s\,(1-q)\,I\right)\right) \forall R\epsilon \left[\underline{R}_D^G, X\right).$$

The domestic bank will participate only if $\Pi_D^G(R) \geq 0$ or

$$\lim_{R_D^G \to X}\left(1-F_F^G\right) \geq \frac{qsR - qR - 2qsI + Is + Iq}{qsR - 2qsI - I + Is + Iq}$$

There are two ways for getting $\lim_{R_D^G \to X}\left(1-F_F^G\right) > 0$:

- There is an atom at X in F_F^G. However, there cannot exist an atom in both F_F^G and F_D^G since then neither $F_F^G = X$ nor $F_D^G = X$ would be optimal.
- Either the domestic bank or the foreign bank does not always bid on the free market. As shown below, this has to be the domestic bank. This implies that its expected profit is zero because each offer generates the same profit.

Step 5: We determine the minimum repayment $\underline{R}_D^G$. $\underline{R}_D^G$ is determined by the condition that the domestic bank wins the free market with certainty:

$$\Pi_D^G\left(\underline{R}_D^G\right) = (1-\mu)\left(q\underline{R}_D^G - I\right) = 0$$

$$\underline{R}_D^G = \frac{1}{q}I$$

Step 6: We determine the expected profit of the foreign bank.

The return of the foreign bank for $\underline{R}_D^G$ is:

$$\begin{aligned}
\Pi_F^G(\underline{R}_D^G) &= (1-s)\,\mu(1-\pi)\left((1-p)\,(-I)\right) + (1-\mu)\left(qs(\frac{I}{q} - I) + (1-q)\,(1-s)\,(-I)\right) \\
&= I\left((1-\mu)\,(1-q)\,(2s-1) - \mu(1-\pi)\,(1-s)\,(1-p)\right) \\
&\equiv \overline{\Pi}_F^G > 0
\end{aligned}$$

Unless $\overline{\Pi}_F^G > 0$, the foreign bank would not enter because it has to cover the fixed cost of market entry K. Thus, it is shown that the domestic bank does not always bid on the free market and therefore makes zero expected profit.

Step 7: We determine the mixing probabilities.

Let us use the fact that $\Pi_F^G(R) = \overline{\Pi}_F^G$ and $\Pi_D^G(R) = 0$ for each repayment.

- For the foreign bank we determine $F_F^G(R)$ by setting

  $$\Pi_D^G(R) = (1-\mu)\left(\left(1-F_F^G\right)(qR-I) + F_F^G\left((1-s)\,q\,(R-I) - s\,(1-q)\,I\right)\right) = 0$$

  Accordingly, $F_F^G(R) = (qR-I)\,\frac{1}{qsR-2qsI-I+sI+qI} \forall R_F^G \,\epsilon\, \left[\frac{I}{q}, X\right)$
  and $prob\left(R_F^G = X\right) = \frac{qX(-1+s)-I(2qs-s-q)}{qsX-2qsI-I+sI+qI}$.

- For the domestic bank we determine $F_D^G(R_D^G)$ by setting

  $$\begin{aligned}\Pi_F^G(R) &= (1-s)\,\mu(1-\ pi)\left((1-p)\,(-I)\right) + (1-\mu)\left(1-F_D^G\right)\cdot \\ &\quad (qs\,(R-I) + (1-q)\,(1-s)\,(-I)) \\ &= I\left((1-\mu)\,(1-q)\,(2s-1) - \mu(1-\pi)\,(1-s)\,(1-p)\right) \\ &\equiv \overline{\Pi}_F^G\end{aligned}$$

  Accordingly, $F_D^G(R) = (qR-I)\,\frac{s}{qsR-2qsI-I+sI+qI} \forall R_D^G \,\epsilon\, \left[\frac{I}{q}, X\right)$. With probability $prob_D^G(D) = I\,(1-q)\,\frac{2s-1}{qsX-2qsI-I+sI+qI}$ the domestic bank makes no offer at all.

Q.E.D.

A.2 Proof of Proposition 2

The first three steps are analogously to the Proof of Proposition 1.

Step 4: We determine the equilibrium in mixed strategies as described in the proposition.

Consider the profit function of the domestic bank conditional on the offer of the foreign bank:

$$\Pi_D^A(R) = \mu(1-\pi)(\frac{1}{2}\,(1-p)\,(-I)) + (1-\mu)\cdot$$
$$\left(\left(1-F_F^A\right)(qR-I) + F_F^A\left((1-s)\,q\,(R-I) - s\,(1-q)\,I\right)\right)$$

$\forall R \epsilon [\underline{R}_D^A, X)$.

The domestic bank will participate only if $\Pi_D^A(R) \geq 0$ or

$$\lim_{R_D^A \to X} \left(1 - F_F^A\right) \geq \left(1 - \left(\frac{1}{2} \frac{(\mu I + \mu I p - 2I + 2qR - 2\mu qR + \mu\pi I - \mu\pi pI)}{((1-\mu)(-I + Iq + qsR - 2qsI + Is))}\right)\right)$$

There are two ways for getting $\lim_{R_D^A \to X} \left(1 - F_F^A\right) > 0$:

- There is an atom at X in F_F^A. However, there cannot exist an atom in both F_F^A and F_D^A since then neither $F_F^A = X$ nor $F_D^A = X$ would be optimal.
- Either the domestic bank or the foreign bank does not always bid on the free market. As shown below, this has to be the domestic bank. This implies that its expected profit is zero because each offer generates the same profit.

Step 5: We determine the minimum repayment $\underline{R}_D^A$. $\underline{R}_D^A$ is determined by the condition that the domestic bank wins the free market with certainty:

$$\Pi_D^A(R) = \mu(1-\pi)\frac{1}{2}(1-p)(-I) + (1-\mu)(qR - I) = 0$$

$$\underline{R}_D^A = I\frac{1 - \frac{1}{2}\mu(1-\pi)(1-p)}{q(1-\mu)}$$

Step 6: We determine the expected profit of the foreign bank.

The return of the foreign bank for $\underline{R}_D^A$ is:

$$\begin{aligned}
\Pi_F^A(\underline{R}_D^A) &= (1-s)\mu(1-\pi)\left(\frac{1}{2}(1-p)(-I)\right) + (1-\mu)\cdot \\
&\quad \left(qs\, I\frac{1 - \frac{1}{2}\mu(1-\pi)(1-p)}{q(1-\mu)} - I\right) + (1-q)(1-s)(-I)\Big) \\
&= \frac{1}{2}\left(\mu + \mu p + \mu\pi s(1-p) - 2(1-s)(q\mu + 1 - q) + 2(1-q)s(1-\mu)\right) I \\
&\equiv \overline{\Pi}_F^A > 0
\end{aligned}$$

Thus, it is shown that the domestic bank does not always bid on the free market and therefore makes zero expected profit. The foreign bank makes positive expected profits since it enters the credit market only if the expected profit exceeds the acquisition price P^A.

Step 7: We determine the mixing probabilities.

Let us use the fact that $\Pi_F^A(R_F^A) = \overline{\Pi}_F^A$ and $\Pi_D^A(R_D^A) = 0$ for each repayment.

- For the foreign bank we determine $F_F^A(R)$ by setting

$$\begin{aligned}\Pi_D^A(R) &= \mu(1-\pi)\left(\frac{1}{2}(1-p)(-I)\right)+(1-\mu)\cdot \\ &\quad \left(\left(1-F_F^A\right)(qR-I)+F_F^A\left((1-s)\,q\,(R-I)-s\,(1-q)\,I\right)\right) \\ &= 0\end{aligned}$$

Accordingly, $F_F^A(R) = \frac{1}{2}\frac{(2qR-2\mu qR-2I+\mu I+\mu pI+\mu\pi I-\mu\pi pI)}{(1-\mu)(qsR-2qsI-I+sI+qI)} \forall R_F^A \in \left[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X\right)$
and $prob\left(R_F^A = X\right) = 1-F_F^A(X)$.

- For the domestic bank we determine $F_D^A(R_D^A)$ by setting

$$\begin{aligned}\Pi_F^A(R) &= (1-s)\,\mu(1-\pi)\left(\frac{1}{2}(1-p)(-I)\right) \\ &\quad +(1-\mu)\left(1-F_D^A\right)(qs(R-I)+(1-q)(1-s)(-I)) \\ &= \frac{1}{2}\left(\mu+\mu p+\mu\pi s(1-p)-2(1-s)(q\mu+1-q)+2(1-q)\,s\,(1-\mu)\right)I \\ &\equiv \overline{\Pi}_F^A\end{aligned}$$

Accordingly, $F_D^A(R) = \frac{1}{2}\frac{s(2qR-2\mu qR-2I+\mu I+\mu pI+\mu\pi I-\mu\pi pI)}{(1-\mu)(qsR-2qsI-I+sI+qI)} \forall R_D^A \in \left[I\frac{1-\frac{1}{2}\mu(1-\pi)(1-p)}{(1-\mu)q}, X\right)$. With probability $prob_D^A(D) = 1-F_D^A(X)$ the domestic bank makes no offer at all.

Q.E.D.

A.3 Proof of Proposition 3

We will show that $F_F^A(R) < F_F^G(R), prob\left(R_F^A = X\right) > prob\left(R_F^G = X\right)$. This implies that the cumulative distribution function of repayments sets higher probability mass on higher repayments when the bank enter through acquisition instead of greenfield investment.

(1) We show that $prob\left(R_F^A = X\right) > prob\left(R_F^G = X\right)$:

$prob\left(R_F^A = X\right) - prob\left(R_F^G = X\right) =$
$\left(\frac{1}{2}\frac{(-2qsX-2Iq+4qsI-2sI+2qsX\mu-I\mu+2I\mu q-4\mu qsI+2\mu sI+I\mu p+2qX-2qX\mu-I\mu\pi+I\mu\pi p)}{((-1+\mu)(qsX-I+Iq-2qsI+sI))}\right) -$
$\left(\frac{(Is+Iq+qsX-2qsI-qX)}{(qsX-I+Iq-2qsI+Is)}\right) = \left(\frac{1}{2}I\mu(1+\pi)\frac{(1-p)}{((1-\mu)(qsX-I+Iq-2qsI+sI))}\right) > 0$

as $(qsX-I+Iq-2qsI+Is) > 0$
(which can be seen from $prob_D^G(D) = I(1-q)\left(\frac{(2s-1)}{(qsX-2qsI-I+sI+qI)}\right) > 0$)

(2) We show that $F_F^A(R) < F_F^G(R)$:

$$\mathrm{F}_F^A(R) - F_F^G(R) = \left(\frac{1}{2}\frac{(2I-\mu I-\mu Ip-2qR+2\mu qR+\mu\pi I-\mu\pi pI)}{((-1+\mu)(-I+sI+Iq+qsR-2qsI))}\right) - \left(\frac{(qR-I)}{(-I+sI+Iq+qsR-2qsI)}\right) =$$

$$\left(-\frac{1}{2}I\mu(1+\pi)\frac{(1-p)}{((1-\mu)(-I+sI+Iq+qsR-2qsI))}\right) < 0$$

Q.E.D.

A.4 Proof of Proposition 5

If the foreign bank enters through greenfield investment, the domestic bank finances $\mu\pi$ successful firms from which it gets a repayment I. It also grants loans to $\mu(1-\pi)p$ good old firms. Their repayment depends on their outside option, i.e., on whether they receive an offer from the foreign bank. Provided they receive an offer, which happens with probability s, they repay R_F^G, otherwise they repay X. The total number of incumbent firms financed by the domestic bank is $\mu\pi + \mu(1-\pi)p$. Thus, the expected repayment from incumbent firms is $E(R_D^G(in)) = \frac{\pi I+(1-\pi)p(sE(R_F^G)+(1-s)X)}{\pi+(1-\pi)p}$.

Q.E.D.

A.5 Proof of Proposition 6

In the case of acquisition, successful firms repay I, good old firms that do not get an outside offer X. If a good old firm receives an outside offer, the incumbent bank demands the same repayment as the outside bank: the acquired bank demands R_D^A, the domestic bank R_F^A.

The foreign bank finances 0.5μ successful firms and $0.5\mu(1-\pi)p$ good old firms. Thus, the foreign banks expected repayment from incumbent firms is $E(R_F^A(in)) = \frac{\pi I+(1-\pi)p(F_D^A(X)E(R_D^A)+(1-F_D^A(X))X)}{\pi+(1-\pi)p}$.

The domestic bank finances 0.5μ successful firms and $0.5\mu(1-\pi)p$ good old firms. Thus, the foreign banks expected repayment from incumbent firms is $E(R_D^A(in)) = \frac{\pi I+(1-\pi)p(sE(R_F^A)+(1-s)X)}{\pi+(1-\pi)p}$.

Q.E.D.

A.6 Proof of Proposition 7

$$E(R_D^G(in)) - E(R_D^A(in))$$
$$= \frac{(\pi I + 1 - \pi)p(sE(R_F^G + (1-s)X))}{\pi + (1-\pi)p} - \frac{(\pi I + (1-\pi)p(sE(R_F^A + (1-s)X))}{\pi + (1-\pi)p}$$
$$= \frac{(1-\pi)ps(E(R_F^G - E(R_F^A)}{\pi + (1-\pi)p} < 0$$

as we have shown in Proposition 3 that $E(R_F^G - E(R_F^A) < 0$.

Q.E.D.

A.7 Proof of Proposition 8

We compare the repayment the acquired bank demands from its incumbent firms with the repayment of the greenfield bank.

$$E(R_F^A(in)) - E(R_F^G(in)) =$$
$$(\ \pi(I - E(R_F^G)) + (1-\pi)p(F_D^A(X)(E(R_D^A) - E(R_F^G)) + (1 - F_D^A)(X - E(R_F^G))) \text{ with}$$

- $I - E(R_F^G) < 0$,
- $E(R_D^A) - E(R_F^G) > 0$,
- $X - E(R_F^G) > 0$

Q.E.D.

B The role of information sharing

There are two sources responsible for the superior information of incumbent banks. First, the incumbent bank has lent to firms in the past and thereby can observe their type. Second, the incumbent bank obtains soft information by having a business relationship, for example keeping a firm's account.

So far, we assumed that there is no information sharing on the credit history of old firms, i.e., credit registries do not exist. How are our results affected when a credit registry is incorporated? Information sharing implies that there is no asymmetric information about the old firms' credit history. Old firms that have borrowed in the past can be identified as old firms and therefore are no longer pooled with new firms. As a result, bad old firms will not be financed since all banks have the information that they are not creditworthy. Good old firms can show their type to the outside bank. Therefore, there is perfect competition for good old firms and they no longer face a hold-up problem. As a result, interest rates for good old firms will decline to the rate demanded from successful firms. Competition for new applicant firms, which now are only new firms, does not

change. For new firms, the foreign bank has the advantage of possessing a screening technology, and therefore remains the "stronger" bank. The information advantage of the domestic and the acquired bank with respect to old firms is however significantly reduced. As a result, the different entry modes converge in terms of information distribution because the information on old firms' credit history is now publicly available. With respect to soft information, the incumbent bank keeps its information advantage on firms' creditworthiness.

Overall, the incorporation of a credit registry reduces asymmetric information and negatively impacts average lending rates for all banks. Moreover, the average quality of loans granted increases because some of the bad old firms are not financed any more.

Table 1: Variable definitions

Variable	Description
1. The (nominal) **lending rate**	The share of interest income (flow variable) over loans (stock variable). Because we are dividing a flow variable by a stock variable, we use the average of the stock variable between *t* and *t-1*. (%).*
2. Ownership/mode of entry variables.#	
a) **Foreign Bank**	A dummy that is one for banks that were already foreign-owned before the start of the sample. These include all the greenfield banks or foreign acquisitions (that resulted in majority foreign ownership) that happened before or in 1995. *Foreign Bank* indicates the own effect of bank origin or the own effect of foreign bank presence.
b) **Foreign MA**	A dummy that is one from the moment that a foreign bank acquires a domestic bank within the sample period and obtains a majority ownership share.
c) **Foreign Greenfield**	A dummy that is one from the moment that a bank entered during the sample period as a *de novo* bank with a majority foreign ownership share.
d) **Foreign bank share (%)**	The ratio of foreign loans to a country's total volume of loans. This variable measures the competition effect following foreign bank entry.*
3. Bank-specific control variables.*	
a) **Liquidity (%)**	The ratio of liquid to total assets. Liquid assets comprise cash and bank deposits, including central bank deposits. High cash holdings represent an opportunity cost of holding higher-yielding assets (e.g. loans) that can increase lending rates.
b) **Costs (%)**	The ratio of total expenses to average assets. Higher costs will lead banks to charge higher lending rates.
c) **Market share (%)**	The share of loans to a country's total bank loans. Market share intends to capture market power. More market power can result in higher lending rates.
d) **Loans-to-assets ratio (%)**	The ratio of loans to total assets captures banks' portfolio composition. Banks that have a relatively high share of loans are able to charge lower lending rates.
e) **Δ Loan loss reserves**	The log difference in loan loss reserves with respect to the previous year is intended as a proxy for credit risk. A rise in credit risk will lead banks to increase their lending rates.
f) **Capital (%)**	The capital-to-assets ratio. Banks need to hold regulatory capital as a buffer against credit risk; however, large capital holdings are costly for banks. A high capital ratio may consequently lead to high lending rates.
g) **Credit growth**	The log difference of loans with respect to the previous year is intended to proxy for the demand for new loans. An increasing loan demand may lead to higher lending rates.
4. Country-specific control variables.	

a)	**Top 3 bank share (%)**	This variable captures market concentration in loans.*
b)	**Total number of banks**	A country's total number of banks. This variable is included to control for the increase in the number of banks following a *de novo* entry.@
c)	**Credit registry**	A dummy variable that equals one from the year of the incorporation of a credit registry onward, zero otherwise. The incorporation of a credit registry induces a downward shift in the overall degree of banking market asymmetry, which is expected to lead to lower lending rates.+
c)	**Inflation (%)**	Changes in inflation will be paralleled by changes in the nominal lending rate.@
d)	**GDP growth (%)**	The real growth in GDP captures the business cycle and represents another loan demand factor.@
e)	**Real short term interest rate (%)**	The real short term interest rate defines a lower bound for bank funding and represents another cost.§

*Source: Fitch/IBCA/BvD/Bankscope. #Source: Central banks, bank annual reports. +Source: Djankov, McLiesh and Shleifer (2005). @Source: EBRD Transition reports. §Source: International Financial Statistics.

Table 2: Descriptive Statistics
(808 Obs)

Variable	Mean
Lending rate	17.62
Foreign bank	0.15
Foreign MA	0.20
"."*Age	3.34
"."*Age2	14.64
Foreign Greenfield	0.05
"."*Age	5.59
"."*Age2	34.18
Foreign bank share	40.80
Bank share of Foreign MA	27.91
Bank share of Foreign Greenfield	4.86
Liquidity	27.44
Δ Loan loss reserves	45.79
Costs	10.40
Market share	7.18
Loans-to-assets	48.24
Capital	11.98
Credit growth	0.23
Credit Registry	0.56
Top 3 bank share	59.39
Total number of banks	37.44
Inflation	6.17
GDP growth	3.98
Real interest rate	4.15

Table 3: Bank Lending Rates

	I	II	II	IV	V	VI
Dependent variable			Lending rate			
Foreign bank	-1.33**	-1.42**	-1.45**	-1.40**	-1.45**	-1.48***
	[0.56]	[0.57]	[0.57]	[0.57]	[0.57]	[0.57]
Foreign MA	-0.21	0.92	-0.12	-0.24	0.63	-0.29
	[0.43]	[0.61]	[0.77]	[0.44]	[0.64]	[0.79]
"."*Age		-0.37***	0.33		-0.29*	0.35
		[0.14]	[0.45]		[0.15]	[0.47]
"."*Age2			-0.09			-0.08
			[0.06]			[0.06]
Foreign Greenfield	0.96	4.73***	-6.12	0.74	3.71**	-4.75
	[0.76]	[1.75]	[3.86]	[0.77]	[1.80]	[3.79]
"."*Age		-0.69***	3.50**		-0.54**	2.74**
		[0.23]	[1.35]		[0.23]	[1.32]
"."*Age2			-0.37***			-0.29**
			[0.12]			[0.12]
Foreign bank share	-0.02*	-0.02**	-0.02*	-0.01	-0.01	-0.01
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Liquidity	0.00	0.00	0.00	0.00	0.00	0.00
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Δ Loan loss reserves	0.00	0.00	0.00	0.00	0.00	0.00
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Costs	0.29***	0.29***	0.29***	0.27***	0.27***	0.27***
	[0.09]	[0.09]	[0.09]	[0.09]	[0.09]	[0.08]
Market share	0.02	0.02	0.02	0.01	0.01	0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Loans-to-assets	-0.23***	-0.23***	-0.22***	-0.22***	-0.22***	-0.22***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Capital	0.07***	0.07***	0.07***	0.06**	0.05**	0.05**
	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Credit growth	1.66**	1.69**	1.66**	1.85**	1.83**	1.77**
	[0.81]	[0.80]	[0.80]	[0.88]	[0.87]	[0.86]
Credit Registry	-0.5	-0.35	-0.33	-0.07	-0.02	-0.04
	[0.58]	[0.58]	[0.59]	[0.56]	[0.56]	[0.57]
Top 3 bank share	-0.04	-0.04	-0.04	-0.07	-0.06	-0.06
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Total number of banks	0.17***	0.16***	0.16***	0.14***	0.14***	0.14***
	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.05]
Inflation	0.05	0.05	0.05	0.03	0.03	0.02
	[0.06]	[0.06]	[0.06]	[0.06]	[0.06]	[0.06]
GDP growth	-0.08	-0.07	-0.07	-0.16*	-0.17*	-0.18**
	[0.08]	[0.08]	[0.08]	[0.09]	[0.09]	[0.09]
Real interest rate	0.23***	0.22***	0.22***	0.18***	0.17***	0.17**
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
Country Dummies	yes	yes	yes	yes	yes	yes
Year Dummies	no	no	no	yes	yes	yes
Observations	808	808	808	808	808	808
N banks	206	206	206	206	206	206
R-squared	0.60	0.60	0.61	0.62	0.62	0.62

Table 4: Foreign versus Domestic banks

	I	II	III	IV
Dependent variable		Lending rate		
	Domestic	**Foreign**	**Domestic**	**Foreign**
Foreign MA		0.19		0.21
		[0.44]		[0.43]
Foreign Greenfield		1.59**		1.41*
		[0.78]		[0.76]
Foreign bank share	-0.04**	0.00	-0.01	-0.02
	[0.02]	[0.01]	[0.02]	[0.01]
Liquidity	0.00	0.01	0.01	0.00
	[0.03]	[0.02]	[0.03]	[0.02]
Δ Loan loss reserves	0.00	-0.00**	0.00	-0.00**
	[0.00]	[0.00]	[0.00]	[0.00]
Costs	0.20**	0.70***	0.18**	0.67***
	[0.09]	[0.09]	[0.08]	[0.09]
Market share	0.01	0.04***	0.00	0.04***
	[0.03]	[0.01]	[0.02]	[0.02]
Loans-to-assets	-0.20***	-0.25***	-0.19***	-0.26***
	[0.03]	[0.02]	[0.03]	[0.02]
Capital	0.07**	0.08**	0.05*	0.08***
	[0.03]	[0.03]	[0.03]	[0.03]
Credit growth	0.78	2.93***	0.42	3.28***
	[0.90]	[0.78]	[0.91]	[0.79]
Credit Registry	-1.35	1.00	-1.19	1.25*
	[0.98]	[0.68]	[0.90]	[0.69]
Top 3 bank share	0.00	-0.16**	-0.02	-0.15**
	[0.05]	[0.07]	[0.05]	[0.06]
Total number of banks	0.10**	0.24***	0.00	0.27***
	[0.05]	[0.06]	[0.06]	[0.07]
Inflation	0.02	0.16**	-0.07	0.16**
	[0.05]	[0.07]	[0.06]	[0.08]
GDP growth	-0.05	-0.17*	-0.33***	-0.12
	[0.09]	[0.10]	[0.12]	[0.11]
Real interest rate	0.13	0.21***	-0.02	0.22***
	[0.08]	[0.06]	[0.09]	[0.07]
Country Dummies	yes	yes	yes	yes
Year Dummies	no	no	yes	yes
Observations	480	328	480	328
N banks	139	97	139	97
R-squared	0.47	0.82	0.51	0.83

Table 5: Competition Effect

	I	II	II	IV	V	VI
Dependent variable			Lending rate			
	All banks	**Domestic**	**Foreign**	**All banks**	**Domestic**	**Foreign**
Foreign MA	0.21		0.14	0.21		0.17
	[0.39]		[0.44]	[0.39]		[0.44]
Foreign Greenfield	1.34*		1.38*	1.1		1.30*
	[0.69]		[0.77]	[0.68]		[0.77]
Foreign bank share	0.04	0.09	-0.04	0.05	0.13*	-0.04
	[0.04]	[0.06]	[0.04]	[0.04]	[0.07]	[0.04]
Bank share of	-0.07*	-0.13**	0.04	-0.07	-0.14*	0.02
Foreign MA	[0.04]	[0.06]	[0.05]	[0.04]	[0.07]	[0.05]
Bank share of	-0.06	-0.17*	0.12*	-0.03	-0.13	0.07
Foreign Greenfield	[0.07]	[0.09]	[0.06]	[0.07]	[0.10]	[0.07]
Liquidity	0.00	0.00	0.01	0.00	0.01	0.00
	[0.02]	[0.03]	[0.02]	[0.02]	[0.03]	[0.02]
Δ Loan loss reserves	0.00	0.00	-0.00**	0.00	0.00	-0.00**
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Costs	0.31***	0.19**	0.72***	0.30***	0.18**	0.68***
	[0.09]	[0.09]	[0.09]	[0.09]	[0.08]	[0.09]
Market share	0.02	0.01	0.04***	0.02	0.00	0.04***
	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]	[0.02]
Loans-to-assets	-0.24***	-0.20***	-0.25***	-0.23***	-0.19***	-0.25***
	[0.02]	[0.03]	[0.02]	[0.02]	[0.03]	[0.02]
Capital	0.08***	0.07**	0.08***	0.06**	0.05*	0.09***
	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Credit growth	1.63**	0.77	2.93***	1.81**	0.41	3.29***
	[0.77]	[0.87]	[0.80]	[0.84]	[0.87]	[0.80]
Credit Registry	-0.11	-0.76	0.58	0.17	-0.84	0.97
	[0.56]	[0.86]	[0.77]	[0.54]	[0.79]	[0.79]
Top 3 bank share	-0.03	0.01	-0.19***	-0.06	-0.02	-0.18***
	[0.04]	[0.05]	[0.07]	[0.04]	[0.05]	[0.07]
Total number of banks	0.17***	0.13**	0.24***	0.14***	0.03	0.26***
	[0.04]	[0.05]	[0.06]	[0.05]	[0.06]	[0.08]
Inflation	0.04	0.02	0.16**	0.02	-0.07	0.16*
	[0.06]	[0.05]	[0.07]	[0.07]	[0.06]	[0.08]
GDP growth	-0.1	-0.1	-0.18*	-0.19**	-0.36***	-0.13
	[0.07]	[0.09]	[0.10]	[0.08]	[0.11]	[0.12]
Real interest rate	0.23***	0.13	0.22***	0.19***	-0.03	0.24***
	[0.07]	[0.08]	[0.07]	[0.07]	[0.08]	[0.08]
Country Dummies	yes	yes	yes	yes	yes	yes
Year Dummies	no	no	no	yes	yes	yes
Observations	808	480	328	808	480	328
N banks	206	139	97	206	139	97
R-squared	0.59	0.48	0.83	0.61	0.51	0.83

Figure 1: Composition of the population of firms.

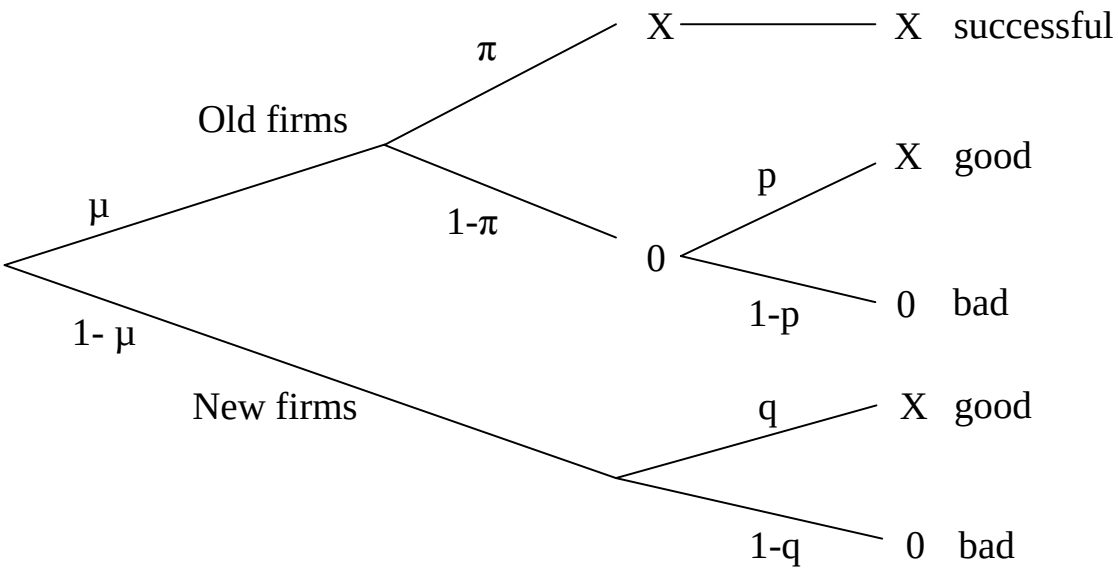
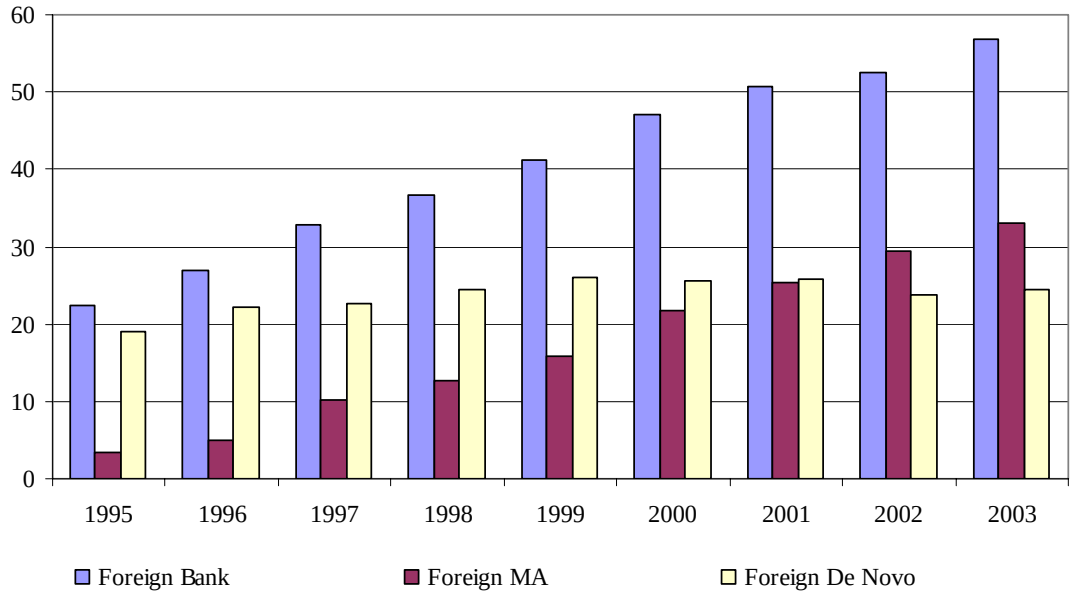
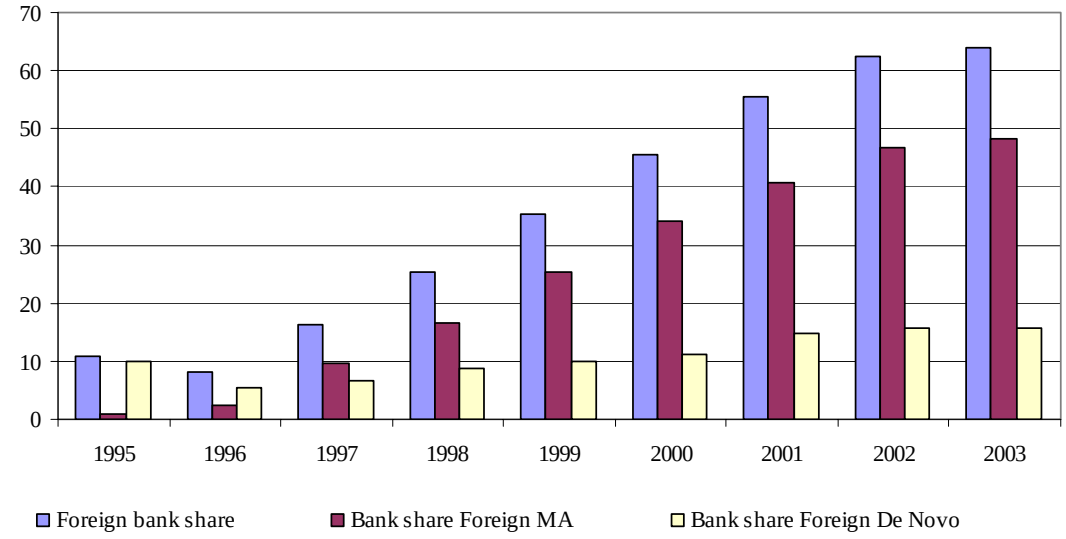


Figure 2: Percentage and market share of foreign banks by mode of entry.

A. Percentage of foreign bank presence by mode of entry

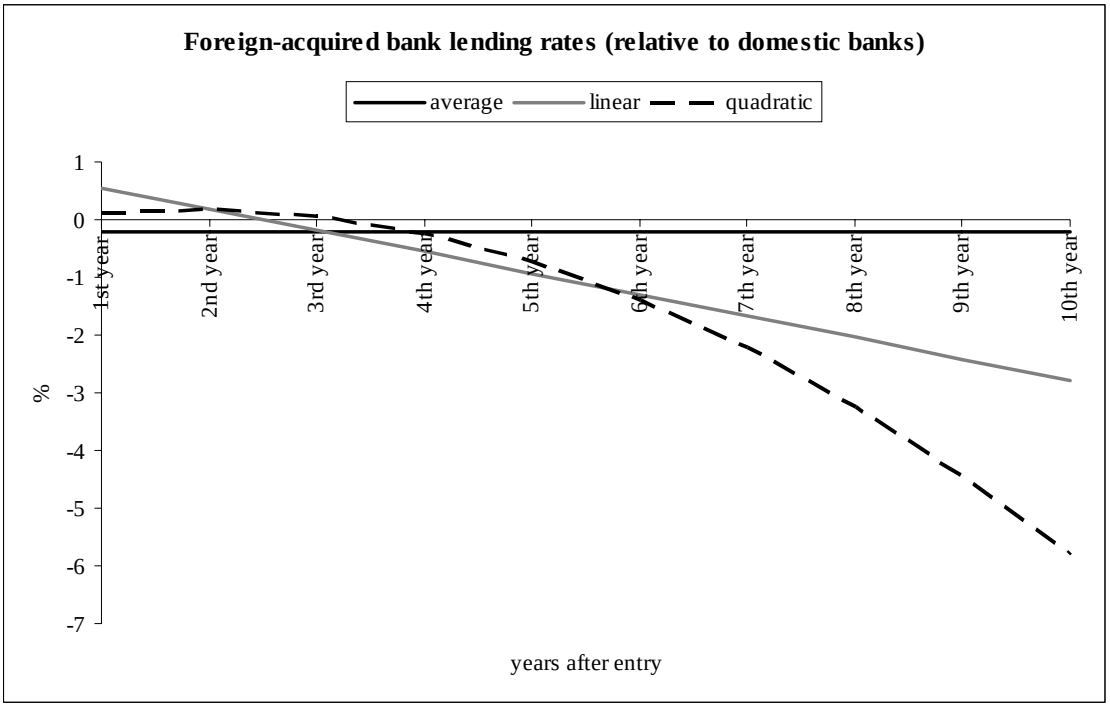


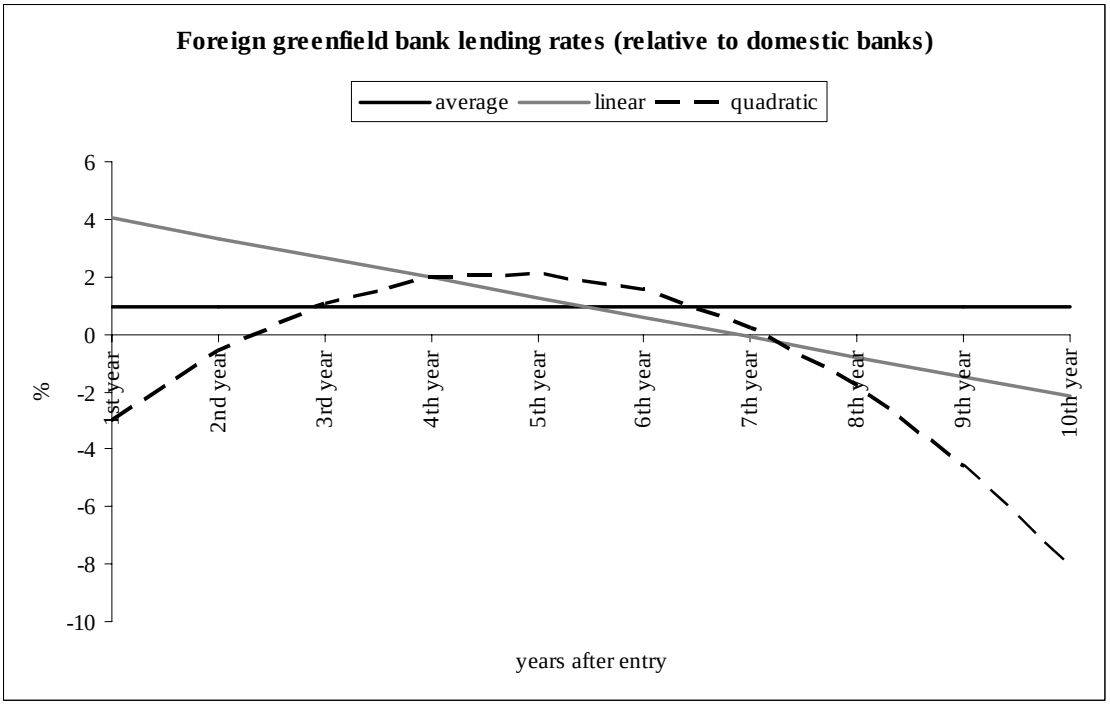
B. Market share of foreign banks by mode of entry



Countries included are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Market shares in loans are calculated using Bankscope data. Ownership data is taken from Central Banks' and commercial banks' annual reports and varies over time. More detailed information on variable construction is provided in table 1.

Figure 3: Foreign bank lending rates relative to domestic bank lending rates (years after entry).





Correlation Matrix: Correlation between Foreign MA, Bank Share Foreign MA, Foreign Bank Share, Credit Registry and the year dummy variables.

	Foreign MA	Bank share Foreign MA	Foreign Bank share	Credit Registry	1995	1996	1997	1998	1999	2000	2001	2002	2003
Foreign MA	1												
Bank share Foreign MA	0.3634*	1											
Foreign Bank share	0.3163*	0.9071*	1										
Credit Registry	0.1945*	0.3922*	0.3617*	1									
1995	-0.0682	-0.1696*	-0.1267*	-0.1123*	1								
1996	-0.0955*	-0.2375*	-0.2467*	-0.0992*	-0.0252	1							
1997	-0.1338*	-0.3283*	-0.3440*	-0.0730*	-0.0436	-0.0611	1						
1998	-0.0855*	-0.2559*	-0.2814*	-0.1435*	-0.0465	-0.0651	-0.1128*	1					
1999	-0.0394	-0.1056*	-0.1201*	-0.0629	-0.0549	-0.0769*	-0.1334*	-0.1420*	1				
2000	0.0032	0.0097	0.0108	0.0343	-0.0552	-0.0773*	-0.1341*	-0.1427*	-0.1688*	1			
2001	0.0720*	0.1111*	0.1396*	0.0014	-0.0555	-0.0777*	-0.1348*	-0.1434*	-0.1696*	-0.1705*	1		
2002	0.0968*	0.2490*	0.2698*	0.0918*	-0.058	-0.0812*	-0.1408*	-0.1499*	-0.1772*	-0.1782*	-0.1791*	1	
2003	0.1226*	0.4028*	0.3906*	0.2077*	-0.0569	-0.0797*	-0.1382*	-0.1470*	-0.1739*	-0.1748*	-0.1756*	-0.1836*	1

* indicates significance at the 5 % level.

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