Foreign Entry and Bank Competition

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Abstract

Foreign entry and bank competition are modeled as the interaction between asymmetrically informed principals: the entrant uses collateral as a screening device to contest the incumbent's informational advantage. Both better information *ex ante* and stronger legal protection *ex post* are shown to facilitate the entry of low-cost outside competitors into credit markets. The entrant's success in gaining borrowers of higher quality by offering cheaper loans increases with its efficiency (cost) advantage. This paper accounts for evidence suggesting that foreign banks tend to lend more to large firms thereby neglecting small and medium enterprises. The results also explain why this observed "bias" is stronger in emerging markets.
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1 Introduction

Traditional theories of financial intermediation assert that information asymmetries are central to bank lending. Prospective borrowers typically know more about their ability to repay loans than lenders do. Accordingly, banks screen borrowers to select high-quality entrepreneurs and reduce risk of default among low quality ones. A more recent literature on relationship lending takes the view that repeated interactions can reduce such information asymmetries between bank and borrower (see references in Boot, 2004). According to this view, banks gain "knowledge" about payoff-relevant borrower attributes during the course of a lending relationship. Consequently, relationships emerge as a prime source of an incumbent bank's comparative advantage over potential outside lenders. This undermines competition in credit markets; the incumbent's superior information about its own clients weakens a competitor's ability to offer credit at lower interest rates.

The purpose of this paper is to understand how this problem affects foreign entry and lending behavior in credit markets.[1] Banks are modeled as asymmetrically informed principals: the incumbent has complete information about borrower credit-risk, but the entrant does not.[2] This relies on the notion that much of the information regarding a borrower's *unobservable* risk can only be obtained in the process of lending (Boot and Thakor 1994, 2000). This paper studies competition between an entrant bank (uninformed lender) that faces *observationally identical* borrowers, who can be one of two types (high-risk or low-risk), and an incumbent (informed lender) that can distinguish between these borrower types.

In addition, banks may require the borrower to secure loans with collateral. Interestingly, both theoretical and empirical findings have shown that collateral requirements fall over the duration of the bank-borrower relationship (Boot and Thakor, 1994; Petersen and Rajan, 1994; Berger and Udell 1995; Harhoff and Körting, 1998). This contrast between secured lending for new borrowers

[1] The intention here (and in the title of the paper) is to use the term "foreign" in the broad sense of the word. As Morgan and Strahan (2004, p. 241) observe, "In the United States, banks from other states were long viewed as foreign, and most states strictly forbade entry by banks from other states until the mid-1970s. Even banks from other cities *within* a state were often blocked from opening branches in other cities in the state. Loosely speaking, the hometown bank was local, and banks from anywhere else were foreign."

[2] At the outset, it is important to emphasize that borrower risk here refers to the *unobservable* component in credit-risk, as opposed to *observable* risk, that is readily evaluated from company financial statements and credit reports. This paper considers *de novo* foreign entry in terms of outside banks setting up a branch or a subsidiary in a new location. The analysis presented here abstracts from alternative modes of entry like mergers and acquisitions, and from situations that describe the complementarities between informed (bank) capital and uninformed capital (Morgan et al. 2004; Morgan and Strahan, 2005).

and unsecured lending for established ones is suggestive of the information content in collateral requirements (Sharpe, 1990; Boot and Thakor, 1994). Relevant to the discussion here is the implication that this role of secured credit assumes greater importance for an entrant seeking to create new relationships than for an incumbent lending to its established clients. Accordingly, this paper uses a screening model, based on Besanko and Thakor (1987a, hereafter B-T), to examine the entrant's use of collateral as a screening device to contest the incumbent's informational advantage.

The results indicate that both ex ante better information and ex post stronger legal protection can facilitate the entry of low-cost outside competitors into credit markets. Market segments characterized by a greater proportion of high-risk borrowers frustrate the entrant's ability to pool borrowers. On the other hand, poor legal protection can prevent the use of collateral as an effective means to successfully sort borrowers. In this model, both pooling and separating equilibria are shown to exist. Importantly, the entrant's success in gaining borrowers of higher quality (lower risk) by offering cheaper loans increases with its cost advantage. Three major results are summarized here. First, for small cost advantages, the entrant cannot attract both risk types either by pooling or by sorting. Consequently, it succeeds in capturing high-risk borrowers but not the low-risk ones. Second, both the entrant's success in pooling borrowers and its profits from such pooling contracts are increasing in its cost advantage. Therefore, even with a moderate cost advantage, the entrant can successfully pool all borrowers, but only in market segments characterized by a higher fraction of low-risk borrowers. This result of the model helps in understanding the differences in observed lending behavior of entrants and incumbents in different market segments. It indicates how incumbents are likely to retain clients in riskier segments of the market when faced with more efficient outside competitors that can provide cheaper loans. Third, entry into sectors characterized by stronger information asymmetries requires a sufficiently large cost advantage, so that the entrant can successfully sort borrowers. The magnitude of this cost advantage is shown to depend on the legal and institutional features of the host country. As discussed below, this result formalizes a link between financial development and the legal and informational environment in which lenders and borrowers operate.

The theoretical results obtained here find support in empirical findings on entry into credit markets both across states within the US (Jayaratne and Strahan, 1998) and across countries of

the world (Claessens et al. 2001; Beck et al. 2004). The model developed here also offers a new insight for analyzing some of the evidence that has received wide attention in recent empirical studies on (foreign) entry in banking. Claessens et al. (2001) show that the effect of foreign entry is very different in developed versus developing countries. An important concern in this context is the evidence suggestive of the possibility that foreign (and large national) banks have difficulty extending loans to informationally opaque small firms (Stiglitz, 2000; Berger et al. 2001, 2005). This evidence, which appears stronger in emerging markets, has led some policymakers to believe that foreign banks "cream skim" or "cherry pick", leaving the worst risks to the domestic banks.[3] This paper provides an integrated theoretical framework to examine these issues and their implications for policy and institutions (see Section 4 for details).

Theory predicts that collateral can help sort observationally identical borrowers: entrepreneurs with lower risk of default post higher collateral that is unattractive to high-risks (Bester, 1985; Besanko and Thakor, 1987 a,b; Dell'Ariccia and Marquez, 2005). Clearly, such predictions are based on *unobservable* risk, and the difficulty in estimating such adverse selection models lies in finding direct measures of unobservable risk characteristics.[4] The representation of banks as asymmetrically informed principals helps in getting around this problem. Here, a borrower's unobservable risk is known only to the incumbent (from previous lending relationships), while a borrower's observable risk is common knowledge. Therefore, by analyzing differences in the equilibrium behavior of asymmetrically informed banks, one can generate testable predictions on collateral use that depend on unobservable risk characteristics.

The work most closely related to this paper is Dell'Ariccia and Marquez (2004, hereafter D-M), in which an entrant becomes a victim of the "winner's curse" because of the incumbent's informational advantage. The entrant is unable to distinguish between "lemons" rejected by the incumbent and *new* borrowers shopping around for lower interest rates (Broecker, 1990; Dell'Ariccia et al. 1999). An interesting feature of these models is that the incumbent successfully retains all of its creditworthy clients, and therefore, the entrant effectively competes for new borrowers

[3] Racocha (2003) observes that, "In the Czech Republic, the privatization of banks had been delayed ... by the experience with foreign banks that were entering the market since 1992 and cherry-picking their clients."

[4] On the other hand, testing empirical predictions based on observable risk is relatively simpler. Empirical evidence on pre-loan credit analysis reveals that commercial lenders require the *observably* risky borrowers to pledge more collateral (Orgler 1970, Scott and Smith 1986, Berger and Udell 1990, 1992, 1995, Brick et al., 2005). This mitigates lenders' problems of moral hazard and strategic default (Boot et al. 1991).

only.[5] Yet, at any given time, the number of new entrepreneurs seeking credit may be small when compared to the number of existing firms in the market. As a result, the entrant's success on entry may depend on its ability to attract clients away from the incumbent. Indeed, as Jayaratne and Strahan (1998, p. 240) note, a "natural process of selection" occurs when "better-managed, lower-cost banks expand at the expense of inefficient ones." Accordingly, this paper aims to study competition over the incumbent's "captive" and creditworthy borrowers and the entrant's ability to attract creditworthy clients away from the incumbent. To this end, I consider a situation where the incumbent's informational advantage extends to all borrowers. Unlike D-M (2004), banks are armed with the use of collateral requirements in their contracts. The use of collateral is important in this context. First, Morgan and Strahan (2004) observe that foreign banks respond more elastically to collateral shocks than domestic banks.[6] Second, Tornell and Westermann (2004) find that collateral is viewed as a significant obstacle to obtaining bank credit in most middle income countries.

Why is removing entry barriers to competition important for credit market efficiency? This paper follows Rajan and Zingales (2003, p.19) in their characterization of "a more efficient financial system" as one that "facilitates entry, and thus leads to lower profits for incumbent firms and financial institutions." While there is almost no opposition to the idea that an efficient financial system is one that helps new firms obtain external finance, theory offers competing hypotheses about whether competition among financial institutions (like banks) is beneficial for economic activity (Gorton and Winton, 2003). In contrast, a large body of empirical evidence argues that relaxing entry restrictions in banking helps both new and mature firms obtain external finance (Jayaratne and Strahan, 1996, 1998; Black and Strahan, 2002; Cetorelli and Strahan, 2004).[7] Indeed, any

[5] Dell'Arricia and Marquez (2005) study lending booms and financial distress in situations where banks use collateral to sort unknown borrowers. Here too, banks are unable to poach profitably from the pool of borrowers known to their rivals.

[6] Morgan and Strahan (2004) use the value of a country's traded equity as a proxy for the value of potential collateral. Elsewhere, the use of collateral is pervasive in bank lending as reported in empirical studies for US (Berger and Udell, 1990), UK (Black et al., 1996) and Germany (Harhoff and Körting, 1998). The importance of collateral in theoretical studies on bank loans is best understood when one considers the bankruptcy literature; there, bank debt is synonymous with secured debt, as opposed to public debt, that tends to be unsecured (Gertner and Scharfstein, 1991; James, 1996).

[7] Indeed Cetorelli and Strahan (2004, p. 26) assert that recent empirical evidence on this debate is unambiguous, "While theory does not paint a clear picture about how competition in banking ought to affect the firm-size distribution, the empirical work does. Comparing industry structure across local markets within the U.S., or comparing structure across a large number of countries (both developed and developing), one reaches the same conclusion. ... banks with market power erect an important financial barrier to entry to the detriment of the entrepreneurial sector of the economy, perhaps in part to protect the profitability of their existing borrowers."

theory that seeks to explain the determinants of efficient financial systems must account for entry barriers to new financial institutions.

A growing literature suggests that a country's institutions affect financial development (Beck and Levine, 2005). Among the most prominent are empirical studies by La Porta et al. (1997, 2000), which show that better legal protection against expropriation by insiders increases the efficiency of financial systems (both corporate financing and development of financial institutions). For corporate financing, their hypothesis follows from theories on corporate governance (Shleifer and Vishny, 1997). In contrast, the precise channel through which a country's legal institutions affect the development of its financial institutions (like banks) is less well formalized.[8] Why, for instance, might stronger creditor rights lead to a more efficient banking system? In terms of the characterization of an efficient financial system as one that facilitates entry, how might better legal protection assist in the entry of low-cost competitors? This model formalizes a precise channel through which a country's legal environment affects the efficiency of its financial markets by facilitating (or discouraging) the entry of low-cost, outside competitors.

Before describing the details of this model, I sketch the intuition. Interestingly, theoretical studies that demonstrate collateral use as a screening device also assume that collateral is costly (Bester, 1985; Besanko and Thakor, 1987a, b; Boot et al., 1991). Banks incur a dissipative cost in taking possession of and liquidating collateral. Consequently, the lender valuation of collateral is typically lower than that of the borrower (Barro, 1976). Given that collateral is costly for a bank, better information on borrower credit-risk (gained in the course of a bank-borrower relationship) reduces a bank's incentive to secure loans with collateral. This is consistent with the findings that collateral requirements fall over the duration of the bank-borrower relationship. It also implies that in markets with poorer borrower quality overall, collateral assumes greater importance for entrants than for incumbents. Stronger legal protection reduces the deadweight losses of seizing and liquidating collateral and this enables an entrant to bid more aggressively by screening the incumbent's clients. In contrast, weak legal protection discriminates against the uninformed entrant because it reduces the efficacy of collateral use. The model formalizes how variations in law and

[8] For example, Castro et al. (2004) study the impact of investor protection on economic growth, while Levine (1998, 1999) traces the empirical linkages between legal environment, banking development and economic growth. However, these papers point to no theoretical work that formalizes the linkages between a country's legal environment and the development of its financial institutions.

its enforcement are central to the efficiency and growth of financial markets in general (La Porta et al. 1997, 2000), and the banking sector in particular (Levine 1998, 1999).

The rest of the paper is organized as follows. Section 2 lays out the basic model. It eliminates a set of dominated strategies for both principals (incumbent and entrant bank). When competing with its rival, a bank will never play from the set of dominated strategies. Section 3 analyzes the equilibria under bank competition. Sections 4 and 5 provide a discussion of the results. All proofs are in the appendix.

2 The Model

I consider a risk-neutral economy in which each entrepreneur has unconstrained access to collateral.[9] The entrepreneur can borrow \$1 from a bank and invest in a project that yields revenue x with probability $(1-\theta)$ and zero with probability θ. Following B-T (1987a), a debt contract specifies a repayment R to the lender if the project is successful, and an amount of collateral $C(\geq 0)$ to be paid to the lender if the project fails; this contract is denoted as (R, C). As in Barro (1976), I assume a disparity in collateral valuation between borrower and lender by defining the lender's valuation of collateral as βC, where $0 \leq \beta < 1$. The project involves a fixed non-monetary cost U^0 for the entrepreneur (the opportunity cost of her time). Lenders are assumed to have a perfectly elastic supply of funds and I denote the bank's cost of these funds by ρ. The entrepreneur's expected utility is U^0 if she does not borrow, and $U(R, C, \theta) = (1-\theta)(x-R) - \theta C$ if she borrows under the contract (R, C). The bank's payoff from contract (R, C) is given by $\pi(R, C, \theta) = (1-\theta)R + \beta\theta C - \rho$ if it lends and 0 otherwise. The surplus generated from a loan contract (R, C) is $[(1-\theta)x - \rho - U^0] - (1-\beta)\theta C$. Accordingly, when a bank uses a contract with a positive collateral requirement $C(> 0)$, there is a deadweight loss of social surplus in the order of $(1-\beta)\theta C$. Banks face a fixed pool of borrowers consisting of two types: fraction ν of borrowers are high-risk $(\theta = \theta_H)$ and fraction $1-\nu$ are low-risk types $(\theta = \theta_L)$, with $0 < \theta_L < \theta_H < 1$. I assume $(1-\theta_H)x > \rho + U^0$ to ensure that all (zero-collateral) loan contracts generate positive social surplus.

Using the setup described above, I model competition between an entrant bank (Bank E) and

[9] This assumption ensures that there are no distortions from endowment constraints. I assume that the collateral pledged is tied to production so that liquidating collateral to self-finance the project is never preferred to the bank loan (Boot et al., 1991).

an incumbent that (pre-entry) is a price setting monopolist (Bank I). These banks differ on two counts. First, they have different costs of funds; Bank E's cost of funds is ρ^E, while Bank I's cost of funds is ρ^I. I assume that these differences in the banks' cost of funds arise because the two banks differ in their efficiencies of converting deposits to loans (Freixas and Rochet, 1997, p. 51). Second, they are asymmetrically informed about borrower types; Bank I can distinguish between a high-risk and a low-risk borrower, while Bank E cannot.[10] Stated differently, the information asymmetry in this model arises from the assumption that entrepreneurs have private information about θ, which can only be obtained by banks in the course of a lending relationship. Like Dell'Ariccia et al. (1999, p. 515.), I "have in mind a situation where the existing banks (i.e., "incumbent") in a market have an informational advantage over other potential lenders (i.e., "entrant") by virtue of their established relationships with borrowers seeking credit...". In short, this model studies bank competition as competition between asymmetrically informed non-identical principals.[11] The information asymmetry discussed here is only restricted to distinguishing between borrower types. The payoff functions of banks (their cost of funds, ρ^E and ρ^I) and the distribution of borrower types in the population (the value of ν) are common knowledge. If one denotes a bank's profits from loan (R, C) to borrower k by $\pi_k(R, C) \equiv \pi(R, C, \theta_k)$, and Bank j's offer to borrower k by (R^j_k, C^j_k) where $j = I, E$ and $k = H, L$, then one can write Bank j's overall profits as $\Pi^j \equiv \nu\pi^j_H(R^j_H, C^j_H) + (1-\nu)\pi^j_L(R^j_L, C^j_L)$. Also, borrower k's utility from loan (R, C) can be written as $U_k(R, C) \equiv U(R, C, \theta_k)$, $k = H, L$.

I begin with a discussion of a single bank. A monopolist bank never requires a borrower to secure a loan with collateral. Under both complete and incomplete information, collateral is an inefficient sorting device for a single bank, and is optimally set to zero (B-T, 1987a). The key to a monopolist bank using collateral to sort borrowers lies in relaxing the assumption that borrowers' reservation utilities are type-independent. Freixas and Rochet (1997) consider a situation of *countervailing incentives* where borrowers' *exogenous* reservation utilities are type-dependent–the opportunity

[10] This stylized assumption follows Bond and Gresik (1997), and is intended to focus attention on situations where the entrant competes over the incumbent's existing clients.

[11] Several theoretical models have analyzed competition between symmetrically uninformed principals under perfect competition (Rothschild and Stiglitz, 1976), in duopolistic settings (Biglaiser and Mezzetti 1993, 2000) and in common agency environments (Bernheim and Whinston 1985, 1986). Although Bond and Gresik (1997) analyze situations of common agency, to the best of my knowledge, theirs is the only other paper to study equilibrium behavior for principals that are asymmetrically informed about agents' preferences.

cost of the efficient (low-risk) agent U_L^0 is sufficiently higher than that of the inefficient (high-risk) agent U_H^0, such that

$$\frac{U_L^0}{1-\theta_L} > \frac{U_H^0}{1-\theta_H}. \tag{1}$$

They argue that countervailing incentives, as given by (1), are needed to model an uninformed monopolistic lender that uses collateral as a screening device. This model *endogenizes* the situation of countervailing incentives by analyzing competition between asymmetrically informed principals. Theoretically, this helps in modeling the entrant's use of collateral as a screening device to contest the incumbent's information advantage.

Next, I consider contracts under complete information for both the entrant and the incumbent. Note that collateral is an inefficient sorting device and, under complete information, is optimally set to zero. Therefore, (complete information) contracts with zero collateral requirements are *first-best* because they maximize social surplus. I define $\bar{R}_k^j$ to be the *first-best maximum repayment* that Bank j can charge borrower k by providing her reservation utility U^0, where $k = H, L$ and $j = I, E$. Analogously, $\underline{R}_k^j$ is the *first-best minimum repayment* that bank j can charge under complete information, subject to breaking even on borrower k. These *first-best* repayments are given by

$$\bar{R}_k^j = x - \frac{U^0}{1-\theta_k}, \tag{2}$$

$$\text{and } \underline{R}_k^j\left(\rho^j\right) = \frac{\rho^j}{1-\theta_k}, \text{ where } k = H, L \text{ and } j = I, E. \tag{3}$$

While maximum repayment $\bar{R}_k^j$ is the same for either bank (and henceforth, I drop superscript j), the minimum $\underline{R}_k^j$ depends on Bank j's cost of funds ρ^j, $j = I, E$. Also, a monopolist bank with complete information would charge $\bar{R}_k$ given by (2), whereas the competitive equilibrium under complete information would have each bank setting repayment at $\underline{R}_k^j\left(\rho^j\right)$, given in (3).

Banks as asymmetrically informed principals Turning to the characterization of banks as asymmetrically informed principals, one observes that Bank I's information advantage allows it to charge borrower k any repayment in $[\underline{R}_k^I(\rho^I), \bar{R}_k]$ and still break even (or better). However, Bank E cannot charge any repayment in $[\underline{R}_k^E(\rho^E), \bar{R}_k]$ because it cannot identify borrower types. For

example, Bank E's expected profits from its offer $(\underline{R}_L^E(\rho^E), 0)$ to low-risks would always be negative because it cannot prevent high-risks from borrowing under this contract. Therefore, offering contract $(\underline{R}_L^E(\rho^E), 0)$ is a dominated strategy for Bank E.

I start by eliminating contracts for each bank that are strictly dominated. In doing so, I describe the sets of contracts that each bank can offer in competition. For the incumbent bank, let $Z_k^I(\rho^I)$ denote the set of these contracts (R_k^I, C_k^I), one for each borrower type, $k = H, L$. Similarly, the set $Z^E(\rho^E)$ consists of the entrant's offers. This set includes both the set of pooling contracts (R_P^E, C_P^E) (subscript P for "pooling"), denoted by $Z_P^E(\rho^E)$, and the set of separating contracts $[(R_H^E, C_H^E); (R_L^E, C_L^E)]$, denoted by $Z_S^E(\rho^E)$ (subscript S for "separating"). Finally, I characterize the equilibrium for all possible values of ρ^I and ρ^E.[12] All proofs are given in Appendix A.

Incumbent Bank First, since Bank I can identify borrower type, it will optimally set the collateral requirement to zero in all its offers. Second, it is a dominated strategy for Bank I to offer a contract with $\pi_k^I < 0$. If $\pi_k^I < 0$ for some k, then Bank I could profitably withdraw this contract and shed the borrowers of type k. Lemma 1 characterizes Bank I's set of offers in $Z_k^I(\rho^I)$.

Lemma 1 *The incumbent bank offers borrower k a contract from the set $Z_k^I(\rho^I) = \{(R_k^I, 0) : R_k^I \in [\underline{R}_k^I(\rho^I), \bar{R}_k]\}$ where $\underline{R}_k^I(\rho^I)$ and $\bar{R}_k$ are the incumbent's first-best maximum and first-best minimum repayments respectively, $k = H, L$.*

The stylized result of zero collateral requirements in the incumbent's contract is intended to capture a simple feature of credit markets: collateral requirements fall as banks know more about a borrower's credit-risk. To summarize, I can restrict my attention to Bank I's offer from the set $Z_L^I(\rho^I)$ for low-risk borrowers and the set $Z_H^I(\rho^I)$ for high-risk types. From (2) and (3), I get $\bar{R}_k = x - \frac{U^0}{1-\theta_k}$ and $\underline{R}_k^I(\rho^I) = \frac{\rho^I}{1-\theta_k}$, $k = H, L$. Contract $(\underline{R}_k^I(\rho^I), 0)$ yields borrower k the maximum utility Bank I can provide, denoted $\bar{U}_k^I(\rho^I)$, and is defined by

$$\bar{U}_k^I(\rho^I) \equiv (1 - \theta_k)x - \rho^I. \tag{4}$$

Entrant Bank Bank E faces borrowers whose participation constraints are determined by the

[12] An alternative approach could be to compute best response correspondences for each bank. This approach is considerably more complicated and the model becomes less tractable; for example, Bank E's best response to Bank I's offer of U_H^I to H-types and U_L^I to L-types would need to be computed for all possible values of ρ^I and ρ^E.

utility from contracts offered by Bank I. Therefore, in eliminating dominated strategies for the entrant, I do not use participation constraints explicitly.[13] Note that under competition, high-risk borrowers have the incentive to mimic low-risk ones.[14] A standard result follows: there is no distortion from first-best in the uninformed principal's contract for the inefficient agent (high-risk borrower). Bank E never requires high-risks to secure their loans with collateral, i.e., $C_H^E = 0$ (Appendix A.2). This holds true for both pooling and separating contracts.[15] Bank E's break-even pooling contract is denoted by $(R_P^{\min}(\rho^E), 0)$, where

$$R_P^{\min}(\rho^E) = \frac{\rho^E}{1 - E\theta} \tag{5}$$

and $E\theta = \nu\theta_H + (1-\nu)\theta_L$ is the expected value of θ. Note that $\underline{R}_L^E(\rho^E) < R_P^{\min}(\rho^E) < \underline{R}_H^E(\rho^E)$, where $\underline{R}_k^E(\rho^E)$ denotes Bank E's *first-best* minimum repayments for borrower k. Bank E's expected profits from $(R_P^{\min}(\rho^E), 0)$ are zero; it subsidizes loans to high-risk borrowers with profits from low-risk ones. The entrant's pooling contracts are summarized in Lemma 2.

Lemma 2 *The entrant's offer of a pooling contract is from the set* $Z_P^E(\rho^E) = \{(R_P^E, 0) : R_P^E \in [R_P^{\min}(\rho^E), \bar{R}_H]\}$ *where* $R_P^{\min}(\rho^E)$ *is the minimum the entrant can charge in a pooling contract subject to breaking even.*

The next result characterizes Bank E's separating contracts by the following Lemma.

Lemma 3 *The entrant's offer of separating contracts* $[(R_H^E, 0); (R_L^E, C_L^E)]$ *in the set* $Z_S^E(\rho^E)$ *must satisfy:*

(a) *high-risk borrower's incentive constraint* (IC_H) *binds,* $U_H(R_H^E, 0) = U_H(R_L^E, C_L^E)$;

(b) *overall expected profits are non-negative,* $\Pi^E[(R_H^E, 0); (R_L^E, C_L^E)] \geq 0$;

(c) *expected profits from loans to low-risk types are non-negative,* $\pi_L^E(R_L^E, C_L^E) \geq 0$.

[13] When we show that the menu of contracts M is strictly dominated by a menu N (i.e., the entrant's profits from N are strictly greater than profits from M), we also show that menu N yields both borrower types at least as much utility as menu M. In this process of eliminating dominated strategies, it is implicit that if menu M satisfies the relevant participation constraints for both borrower types, so does menu N.

[14] Under competition, principals offer agents more of the surplus so as to prevent competing principals from luring them away. Since the surplus generated from borrower-L is greater than that from borrower-H, high-risks have the incenitve to mimic low-risks to obtain the greater surplus.

[15] A separating contract $[(R_H^E, C_H^E); (R_L^E, C_L^E)]$ is strictly dominated by the menu $[(\hat{R}_H^E, 0); (R_L^E, C_L^E)]$, where $U_H(\hat{R}_H^E, 0) = U_H(R_H^E, C_H^E)$. Similarly, a pooling contract (R_P^E, C_P^E) is strictly dominated by the menu $[(\hat{R}_H^E, 0); (R_P^E, C_P^E)]$, where $U_H(\hat{R}_H^E, 0) = U_H(R_P^E, C_P^E)$. Note that our assertion in footnote 13 holds true.

Result (a) follows from the single-crossing property.[16] Result (b) follows from Bank E's choice to lend. Finally, if $\pi_L^E < 0$ in any menu $[(R_H^E, 0); (R_L^E, C_L^E)]$ that satisfies (a) and (b), then Bank E can always profitably withdraw the contract for L-types. If L-types now select the remaining contract for H-types, Bank E's expected profits from both types will be positive. This gives (c). In summary, I will define the set of contracts that Bank E can offer by $Z^E(\rho^E) = Z_P^E(\cdot) \cup Z_S^E(\cdot)$ where $Z_P^E(\cdot)$ and $Z_S^E(\cdot)$ are given by Lemmas 2 and 3.

3 Bank competition

The timing of events is as follows. Nature selects borrower types and while Bank I observes this, Bank E does not. Banks move first, simultaneously, anticipating agents' subsequent behavior, and optimizing accordingly within the set of contracts. Bank I sets out two contracts, one for each type, from $Z_k^I(\rho^I)$, $k = H, L$. Bank E offers any contract in $Z^E(\rho^E)$. Each entrepreneur chooses the contract that maximizes her *ex ante* expected utility. For example, the low-risk entrepreneur selects from Bank I's offer in $Z_L^I(\rho^I)$ and Bank E's offer in $Z^E(\rho^E)$; if Bank E offers a menu $[\left(R_H^E, 0\right); (R_L^E, C_L^E)]$, borrower L can choose either contract in this menu or Bank I's offer of (R_L^I, C_L^I) to low-risk types. Finally, contracts are executed.

I focus exclusively on pure strategy equilibria. An equilibrium of this game is a menu of contracts such that each bank's choice of menu maximizes its expected profits given the contracts offered by the other bank and the maximizing choices of the borrowers. As is standard in the principal-agent literature, I will assume that if the borrower is indifferent between two loan contracts *offered by the same bank*, she chooses the one that the bank prefers. Also, if a borrower is indifferent between contracts offered by the incumbent and the entrant, in equilibrium she borrows from the bank that makes higher profits from the contract.[17]

[16] If IC_H is slack, Bank E can provide the L-type borrowers a new contract with a higher R and a lower C and increase its profits. If the new contract yields the L-types the same utility as the old contract, it must yield the H-types strictly greater utility. This follows from the single-crossing property: H-type's preference for a contract with a higher R and a lower C is greater compared to the L-type. Since we start from a position where IC_H is slack, we can find such a new contract that still satisfies this constraint for the high-risk borrower. Also, Bank E will prefer the new contract (with a higher R and a lower C) since it yields higher profits. Therefore in an offer by Bank E, IC_H must bind.

[17] When a borrower is indifferent between loan contracts offered by two banks, where one bank makes positive profits and other bank zero, then the bank that makes positive profits can lower its profits by $\epsilon > 0$ and offer the borrower greater utility. The bank making zero profits cannot do so and still break even.

To derive a complete characterization of equilibria, I hold the entrant's cost of funds constant at ρ^E and vary the incumbent's cost of funds ρ^I. In what follows, I will describe the equilibria for situations where entrant has the cost advantage, that is, $\rho^I > \rho^E$; first, for the entrant's offer of a separating contract (Proposition 1) and then for its offer of a pooling contract (Proposition 2). Details of the equilibria for $\rho^I \leq \rho^E$, along with all the proofs, are provided in Appendix A. Finally, this section concludes with a summary of the characterization of equilibria (see Table 1 and Figure 2).

I begin by describing the solution to a particular case of this problem, namely the situation in which the entrant bank can successfully screen borrowers. As will be described shortly, the entrant bank cannot always successfully screen borrowers; it can only do so when its cost advantage is sufficiently large, that is, when ρ^I is greater than the screening cutoff $\tilde{\rho}_S \equiv \frac{\rho^E}{1-(1-\beta)\theta_L}$. This case is discussed in the next paragraph and the optimal contract for the entrant when $\rho^I \geq \tilde{\rho}_S$ is derived in Appendix B. The optimal contract derived in Appendix B helps in building the intuition behind the screening cutoff $\tilde{\rho}_S$ described in Proposition 1(a).

Bank E can successfully sort all borrowers only if its incentive scheme yields at least as much utility as contracts offered by Bank I. Consequently, Bank E faces borrowers whose reservation utilities are determined by the maximum utility that Bank I can offer borrowers, that is, $\bar{U}_k^I(\rho^I)$. From (4), it follows that $\frac{\bar{U}_L^I}{1-\theta_L} > \frac{\bar{U}_H^I}{1-\theta_H}$. This inequality holds for all ρ^I, given the earlier assumption $\rho^I < (1-\theta_H)x - U^0$. Stated differently, Bank E's optimization problem can be viewed as that of a monopolist facing borrowers with type-dependent reservation utilities $\bar{U}_k^I(\rho^I)$ that satisfy countervailing incentives.[18] Appendix B provides the solution to this optimization problem. Note that the solution is built on the premise that the entrant is able to dominate the incumbent.[19] Evidently, this does not hold true for all values of $\rho^I > \rho^E$. The equilibria in such cases are discussed in Proposition 1(b) given below.

Proposition 1 (a) *If* $\rho^I \geq \tilde{\rho}_S > \rho^E$ *and* $\nu > \nu_1$, *where* $\tilde{\rho}_S \equiv \frac{\rho^E}{1-(1-\beta)\theta_L}$ *and* $\nu_1 \equiv \frac{(1-\beta)\theta_L(1-\theta_L)}{(\theta_H-\beta\theta_L)-(1-\beta)\theta_L^2}$, *then the incumbent offers* $(\underline{R}_H^I, 0)$ *to high-risks and* $(\underline{R}_L^I, 0)$ *to low-risks. The*

[18] As mentioned earlier, Freixas and Rochet (1997) require countervailing incentives, the *exogenous* condition (1), to show an uninformed lender's use of collateral as a screening equilibrium. Note that, here, this condition is derived endogenously.

[19] *Domination* by a principal implies that it can attract all agent types away from its rival (Biglaiser and Mezzetti, 1993).

entrant offers $[(\underline{R}_H^I, 0); (R_L^E, C_L^E)]$ *where* $U_H(R_L^E, C_L^E) = U_H(\underline{R}_H^I, 0)$ *and* $U_L(R_L^E, C_L^E) = U_L(\underline{R}_L^I, 0)$. *If* $\rho^I > \tilde{\rho}_S$, *the entrant captures all borrowers and its expected profits from all loans are strictly positive. If* $\rho^I = \tilde{\rho}_S$, *low-risks borrow from either bank but high-risks borrow only from the entrant. Expected profits from loans to low-risks are zero but the entrant's profits from loans to high-risks are strictly positive.*

(b) *If* $\tilde{\rho}_S > \rho^I > \rho^E$, *the entrant offers* $[(\underline{R}_H^I, 0); (R_L^E, C_L^E)]$ *where* $U_H(R_L^E, C_L^E) = U_H(\underline{R}_H^I, 0)$ *and* $\pi_L^E(R_L^E, C_L^E) = 0$. *The incumbent offers* $(\underline{R}_H^I, 0)$ *to high-risks and* $\left(R_L^I, 0\right)$ *to low-risks where* $U_L\left(R_L^I, 0\right) = U_L(R_L^E, C_L^E)$. *High-risks go to the entrant but the incumbent retains the low-risks. Banks' expected profits from loans disbursed are strictly positive.*

The equilibrium in Proposition 1(a) provides a cut-off $\tilde{\rho}_S \equiv \frac{\rho^E}{1-(1-\beta)\theta_L}$ such that, when $\rho^I > \tilde{\rho}_S$, the entrant can capture all borrowers by offering a separating contract. How does the entrant's cost advantage help in competing with its informed rival? Clearly, a bank with lower cost generates a greater surplus from loans to borrowers than its rival. Thus, it is able to provide a borrower the maximum surplus that its rival can generate (from loans to the same borrower) and still retain a part of the surplus for itself. Providing this surplus is easy when the lender can distinguish borrower type but more difficult when the lender has to sort borrowers. As noted earlier, sorting borrowers with a positive collateral requirement $C(> 0)$ is costly because it implies a deadweight loss of $(1 - \beta)\theta C$. In Appendix B it is shown that, in a separating equilibrium where the entrant captures the low-risks, it requires the low-risks to secure loans with collateral $C_L^E = \rho^I$. But, in the event of failure (which occurs with probability θ_L), the entrant gets only $\beta\rho^I$ after liquidation: an expected loss of $(1 - \beta)\theta_L\rho^I$. Since the entrant factors in such *ex post* deadweight losses in calculating profits *ex ante,* a simple cost advantage $\rho^E < \rho^I$ is insufficient to capture low-risks. A greater cost advantage is needed to overcome this informational disadvantage; the condition under which the entrant dominates the incumbent is given by $\rho^E < \rho^I - (1 - \beta)\theta_L\rho^I$ (Proposition 1a).

When the entrant dominates the incumbent by using a separating contract, it gives borrowers two options: the first merely matches the incumbent's offer to high-risks, but the second offers a cheaper loan rate than the incumbent's offer to low-risks. However, among borrowers with indistinguishable risk, the entrant offers the second to only those who pledge collateral. Note that, since $C_L^E = \rho^I$, this collateral requirement increases with the entrant's cost advantage (recall that

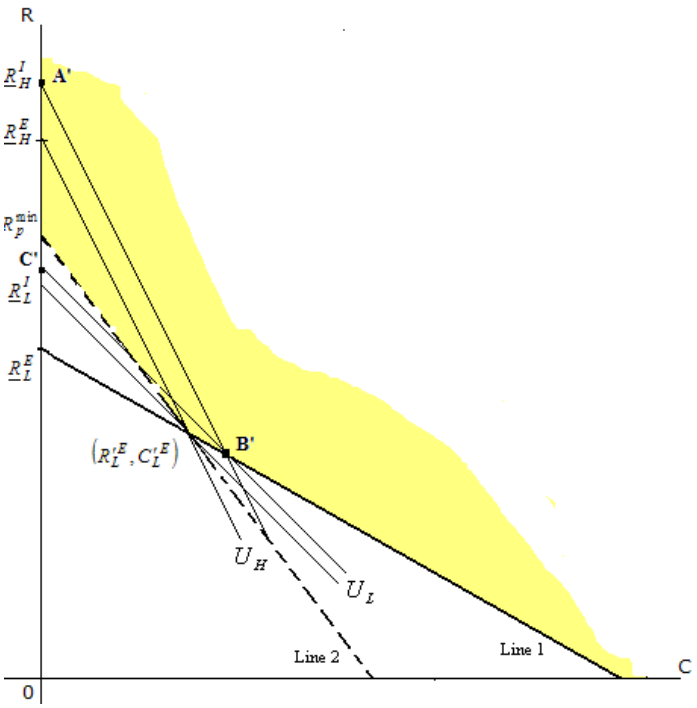

Figure 1: Equilibrium for the case $\tilde{\rho} > \rho^I > \rho^E$. Bank I offers A' to the H-types and C' to the L-types. Bank E offers the menu $(A';\ B')$. Here Bank E's profits from the contract B' are zero, but Bank I makes positive profits from contract C'. Bank I's profits from the contract A' is zero, but Bank E makes positive profits from the same contract. Banks split the market; the high-risk types borrow from the entrant and the low-risk types borrow from the incumbent.

the model assumes that all entrepreneurs have unconstrained access to collateral). In the next section, these results are used to explain why foreign banks tend to lend less to smaller firms.

The equilibrium described in Proposition 1(b) holds for all values of ν. Strictly speaking, Proposition 1(b) characterizes a candidate equilibrium; if there is no pooling contract that does better for the entrant, then this candidate will be the equilibrium. Figure 1 illustrates the (candidate) equilibrium in Proposition 1(b) in (R, C) space. Borrowers' payoffs increase as one moves southwest, while lenders' profits increase going northeast. Indifference curves for borrowers (indicated by U_H and U_L) are given by the pairs of thin lines: high-risks have steeper indifference curves than low-risks (single-crossing property). Line 1 (in bold) passing through $(\underline{R}_L^E, 0)$ is the entrant's zero-profit line for L-types. Note that it is flatter than the indifference curves for L-types. The broken line 2 passing through $(R_P^{\min}, 0)$ is the locus of (R_L^E, C_L^E) such that $U_H\left(R_H^E, 0\right) = U_H(R_L^E, C_L^E)$ (Lemma 3a) and $\Pi^E[\left(R_H^E, 0\right); (R_L^E, C_L^E)] = 0$. This line passes through $(\acute{R}_L^E, \acute{C}_L^E)$ and the entrant

offering menu $[(\underline{R}_H^E, 0); (\acute{R}_L^E, \acute{C}_L^E)]$ makes zero profits from both H-types and L-types. Clearly, the entrant's offers in $Z^E(\rho^E)$ lie in the shaded region, bounded from below by lines 1 and 2. Bank I offers $\mathbf{A}'$ to the H-types and $\mathbf{C}'$ to the L-types. Bank E offers the menu ($\mathbf{A}'$; $\mathbf{B}'$). Here, Bank E's profits from contract $\mathbf{B}'$ are zero, but Bank I makes positive profits from contract $\mathbf{C}'$. On the other hand, Bank I's profits from contract $\mathbf{A}'$ are zero, but Bank E makes positive profits from the same contract. Accordingly, banks split the market; the high-risks borrow from the entrant and the low-risks borrow from the incumbent. Note that Bank E attracts both borrower types if it offers the menu $[(\underline{R}_H^E, 0); (\acute{R}_L^E, \acute{C}_L^E)]$. However, it chooses menu ($\mathbf{A}'$; $\mathbf{B}'$) that yields higher profits overall. By holding ρ^E constant, the entrant's offers in $Z^E(\rho^E)$ are fixed to the shaded region in Figure 1. Varying the incumbent's cost of funds ρ^I changes minimum repayment $\underline{R}_k^I(\rho^I)$ in (3). It follows that different ρ^I give rise to different equilibria in the model. These include equilibria where the entrant pools borrowers as given by the following proposition.

Proposition 2 *If $\nu \leq \nu_1$ and $\rho^I > \tilde{\rho}_P^2(\nu)$ where $\tilde{\rho}_P^2(\nu) \equiv \frac{\rho^E}{1-(\frac{\nu}{1-\nu})(\frac{\theta_H-\theta_L}{1-\theta_L})}$, the entrant pools at $(\underline{R}_L^I(\rho^I), 0)$. The incumbent's best response is to offer $(\underline{R}_H^I(\rho^I), 0)$ to high-risks and $(\underline{R}_L^I(\rho^I), 0)$ to the low-risks. The entrant captures all borrowers and its expected profits overall are non-negative.*

Figure 2 characterizes two non-linear bounds for the entrant's pooling contracts, $\tilde{\rho}_P^1(\nu)$ and $\tilde{\rho}_P^2(\nu)$ that are both strictly increasing and strictly convex in ν. The first bound $\tilde{\rho}_P^1(\nu) \equiv (\frac{1-\theta_L}{1-E\theta})\rho^E$, characterizes a feasibility condition for the entrant's pooling contracts; the entrant can successfully pool borrowers only if $\rho^I > \tilde{\rho}_P^1(\nu)$. First, note that for $\rho^I \leq \tilde{\rho}_P^1(\nu)$, the entrant fails to pool borrowers because the incumbent undercuts the entrant's offer to capture low-risk types. Second, this bound is increasing in ν, indicating that a higher cost advantage is required to pool borrowers in markets characterized by stronger information asymmetries. Finally, for all such pooling contracts, the entrant's profits from loans to low-risks are always greater than that from loans to high-risks. In fact, if entrant's cost advantage is not too large, it subsidizes losses from high-risks with profits from low-risk borrowers. Consequently, the entrant's choice of a pooling contract is optimal only if the proportion of high-risks in the borrower population is sufficiently small ($\nu \leq \nu_1$).

This gives a second bound, $\tilde{\rho}_P^2(\nu)$ (for $\nu \leq \nu_1$), which characterizes an optimality condition for the entrant's pooling contracts; if $\rho^I > \tilde{\rho}_P^2(\nu)$ and $\nu \leq \nu_1$, the entrant's optimal strategy is to pool all borrowers. This second bound determines the entrant's choice between its pooling option

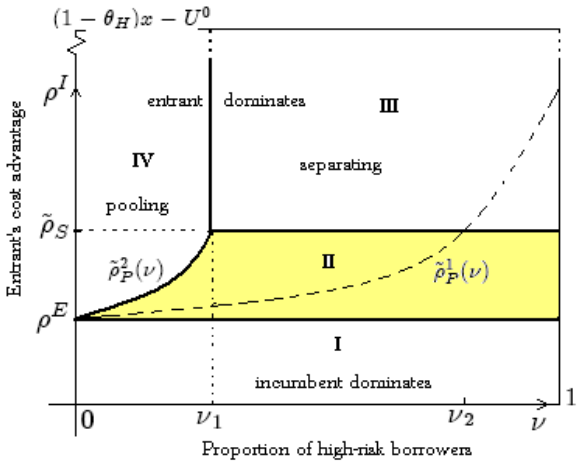

Figure 2: The entrant's cost is fixed at ρ^E and the figure describes equilibria for varying levels of the incumbent's cost ρ^I. The shaded region II shows the equilibrium described in Proposition 1 (b). The incumbent dominates in region I, while the entrant dominates by sorting borrowers in region III and by pooling them in region IV.

(Proposition 2) and its offer of a contract that captures high-risk borrowers only (Proposition 1b). Notice that when $\tilde{\rho}_P^2(\nu) \geq \rho^I > \tilde{\rho}_P^1(\nu)$ and $\nu \leq \nu_1$, the entrant can capture all borrowers by offering a pooling contract that cross subsidizes high-risks with profits from low-risk types. Instead, it offers a separating contract as given in Proposition 1(b). Although this contract captures high-risk borrowers but not low-risk ones, it yields higher profits than the entrant's pooling option. The converse is true for $\rho^I > \tilde{\rho}_P^2(\nu)$ and $\nu \leq \nu_1$. This second bound is increasing in ν, showing that a higher cost advantage is required to offset the subsidies to a larger proportion of high-risks in the population. Note that when $\nu = \nu_1$, $\tilde{\rho}_P^2(\nu) = \tilde{\rho}_S$.

In summary, the entrant uses a pooling contract if and only if (i) the entrant has a sufficiently large cost advantage and (ii) the proportion of high-risk borrowers in the population is small, as given by region IV in Figure 2. Since the entrant's offer of a pooling contract has a zero collateral requirement, competition between the entrant and the incumbent here is much like Bertrand competition as modeled in DM (2004).[20]

[20] The equilibrium discussed here is similar to the situation in DM (2004) where the entrant emerges as a contestable monopolist. Just like in our model, Bank 2 (entrant) is a contestable monopolist if (i) proportion of unknown borrowers (λ) (their proxy for the degree of information asymmetry) is high and (ii) the entrant's cost of funds (δ) is low. See DM (2004), Figure 1, p.192.

TABLE 1. Characterization of Equilibria

Bank's cost of funds	Contract used by entrant	Borrower H goes to	Borrower L goes to	Bank I's profits high-risk	Bank I's profits low-risk	Bank E's profits high-risk	Bank E's profits low-risk
$\rho^I < \rho^E$	separating	Bank I	Bank I	$+$	$+$	(x)	(x)
$\rho^I = \rho^E$	separating	either bank	Bank I	0	$+$	0	(x)
$^{(*)}\tilde{\rho}_S > \rho^I > \rho^E$	separating	Bank E	Bank I	(x)	$+$	$+$	(x)
$\tilde{\rho}_S = \rho^I$ and $\nu > \nu_1$	separating	Bank E	either bank	(x)	0	$+$	0
$\rho^I > \tilde{\rho}_S$ and $\nu > \nu_1$	separating	Bank E	Bank E	(x)	(x)	$+$	$+$
$\rho^I > \tilde{\rho}_P^2(\nu)$ and $\nu \leq \nu_1$	pooling	Bank E	Bank E	(x)	(x)	$+/-$	$+$

$^{(*)}$ These candidate equilibria become equilibria of the model for either $\nu > \nu_1$ or when both $\nu \leq \nu_1$ and $\rho^I \leq \tilde{\rho}_P^2$. Positive, negative and zero profits of a bank are denoted by the signs $+$, $-$ and 0 respectively. The sign (x) implies that the bank does not get the borrower.

Table 1 summarizes the equilibrium outcomes and shows how the cost advantage of the entrant helps to overcome the information advantage of the incumbent. When the incumbent has both the cost and information advantage, it emerges as a contestable monopolist: it can match any offer by the entrant and still make positive profits. Recall that the entrant always offers a zero-collateral contract to high-risks. Therefore, the bank with the lower cost of funds captures high-risk borrowers. Moreover, if neither bank has the cost advantage, both entrant and incumbent can get the high-risks, but in competing with each other, profits from loans to high-risks are run down to zero. To illustrate why the entrant cannot capture low-risks when $\rho^I = \rho^E$, recall that it is a dominated strategy for Bank E to offer contract $(\underline{R}_L^E(\rho^E), 0)$. When $\rho^I = \rho^E$, it follows that $\underline{R}_L^I = \underline{R}_L^E$; and although the incumbent can always offer $(\underline{R}_L^I(\rho^I), 0)$ to low-risks, the entrant cannot match this offer with contract $(\underline{R}_L^E(\rho^E), 0)$. This characterization of equilibria for $\rho^I \leq \rho^E$ is given by region I in Figure 2.

The importance of the (candidate) separating equilibrium can be understood for situations where $\rho^I < \tilde{\rho}_S$ (see Figure 2). First, consider situations where it is optimal for the entrant to pool borrowers (i.e., $\nu \leq \nu_1$), but offering a pooling contract is infeasible because $\rho^I \leq \tilde{\rho}_P^1(\nu)$. Nevertheless, the entrant can capture high-risks in such situations using contracts in $Z_S^E(\rho^E)$. For example, if $\nu \leq \nu_1$ and $\tilde{\rho}_P^1(\nu) \geq \rho^I > \rho^E$, the candidate equilibrium in Proposition 1(b) emerges as the equilibrium of the game. Second, as noted earlier, with $\tilde{\rho}_P^2(\nu) \geq \rho^I > \tilde{\rho}_P^1(\nu)$ the entrant

offers a separating contract as given in Proposition 1(b), despite the fact that it can offer a pooling contract and capture all borrowers. Third, the same logic applies in situations where $\tilde{\rho}_S > \rho^I > \tilde{\rho}_P^1(\nu)$ and $\nu > \nu_1$.

The three situations described above belong to the set of equilibria given by Proposition 1(b), in which the entrant cannot capture the high-quality (low-risk) borrowers despite its cost advantage. This set is characterized by the shaded region II in Figure 2. Only when the entrant's cost advantage is sufficiently large does it dominate the incumbent and capture all borrowers. Figure 2 provides a characterization of these equilibria. Region III characterizes the entrant's offer of a separating contract as given in Proposition 1(a). Equilibria for the entrant's pooling contract in Proposition 2 are shown as region IV.

4 Implications of the model

I show next that the lessons gleaned from this highly stylized model can be of general interest. To this end, I discuss some of the important theoretical results (and their associated empirical predictions) in terms of the existing empirical evidence on foreign entry into credit markets.

Domestic welfare

A simple prediction of this model is that the removal of entry barriers lowers the rates at which credit is available to borrowers. Note that even when the incumbent has both cost and information advantage, relaxing entry restrictions means that it can no longer extract the entire surplus generated from loans. The threat of entry forces the incumbent (contestable monopolist) to provide borrowers the surplus that a potential competitor could provide in such situations. Thus, the removal of entry barriers in credit markets significantly raises borrower payoffs. This initial result agrees with empirical studies like Jayaratne and Strahan (1996, 1998) that find declines in average loan prices of about 40 basis points following branching deregulation in the US.

Interestingly, a rise in profits for the foreign entrant is matched by a corresponding decline in profits for its domestic rival (incumbent). Does foreign entry in banking hurt the domestic economy? Two key features of the model can help answer this question. First, poaching the incumbent's

clients is possible only if the entrant provides them the surplus that the incumbent can generate from loans. From a domestic country perspective, the entry of foreign banks redistributes the surplus from domestic banks to borrowers. Second, the entrant can successfully attract borrowers only when it has the cost advantage. By virtue of its lower cost of funds, the entrant bank generates a greater surplus from a loan contract than the incumbent. These expected efficiency gains can be passed on to the borrowers. For instance, when the entrant offers a pooling contract, high-risks obtain a strictly greater yield than that provided by the domestic bank. To summarize, under no equilibrium are domestic agents (banks and borrowers) worse off in aggregate.

Small business lending, cream skimming and foreign banks

Claessens et al. (2001) show that the effect of foreign entry is very different in developed versus developing countries. First, they find that foreign banks have lower profits than domestic banks in developed countries, but the opposite is true in developing countries. Second, their estimation results suggest that an increased presence of foreign banks leads to a lower profitability for domestic banks. Not surprisingly, a concern among policymakers and economists, particularly in emerging markets, is that foreign banks "cream skim" or "cherry pick", leaving the worst risks to the domestic banks. A related issue is that foreign banks (and large domestic banks) tend to lend more to large firms, thereby neglecting small and medium enterprises (SMEs) (Stiglitz, 2000; Berger et al. 2001, 2005; Clarke et al. 2001). Evidence in favor of this bias exists for the US (Berger and Udell, 1995; Berger et al. 2005) and for developing countries like Argentina (Berger et al. 2001). Clarke et al. (2001) find that foreign bank entry improves financing conditions for enterprises of all sizes, although larger firms benefit more. However, their study does not distinguish whether foreign banks provide credit to both large firms and SMEs, or foreign bank competition for large customers leads domestic banks to increase SME credit.[21]

The evidence discussed above can be rationalized in terms of the model. Notice that the model characterizes different equilibria for different degrees of the entrant's cost (efficiency) advantage. A likely scenario for developed countries is that the foreign entrant's cost advantage is significantly

[21] This issue is further complicated by different macroeconomic conditions across countries and by the role of domestic banks in these countries. For instance, in the context of emerging markets like India, there is evidence of even public sector banks rationing credit to a section of domestic firms (Banerjee and Duflo, 2001).

small. The model predicts that for very low degrees of cost advantage, like $\rho^E < \rho^I < \tilde{\rho}_P^1(\nu)$, an entrant can attract only high-risk borrowers from among the incumbent's clients. Since the incumbent almost always retains borrowers of higher quality, this could explain why foreign banks record lower profits than their domestic counterparts in developed economies.

In contrast, the entrant's cost advantage in developing countries is likely to be higher. Depending on how large this efficiency advantage is, the theory points to two possible scenarios. When this advantage is sufficiently large ($\rho^I > \tilde{\rho}_S$), the entrant can use pooling and separating contracts to dominate the incumbent. However, for moderately high cost advantages, like $\tilde{\rho}_S > \rho^I > \tilde{\rho}_P^1(\nu)$, only a pooling contract allows the entrant to capture all borrowers. In summary, the model predicts that for larger cost advantages, the foreign bank can dominate its domestic counterpart, particularly in sectors where the domestic banks' clients are of superior quality (low-risk). This accounts both for foreign banks recording higher profits than domestic banks in emerging markets and for an increased presence of foreign banks reducing the profitability of domestic banks, consistent with the findings in Claessens et al. (2001).

For moderately high cost advantages, the entrant's ability to attract low-risk borrowers depends on the value of ν. This could explain, for example, the differences in the observed lending behavior of foreign banks in different market segments. To see this, consider the (domestic) borrower market as composed of different market segments, each with its own value of ν. For example, a lower ν (smaller proportion of high-risks) characterizes a market segment where the average borrower quality is higher. By pooling both risk types, the entrant captures all of the incumbent's clients in these market segments. On the other hand, the entrant (despite its cost advantage) fails to screen borrowers in markets segments characterized by a high ν (region II in Figure 2). In these segments, the entrant can attract only high-risks.

This stylized result has two important implications. First, it helps provide an interpretation of the policymakers' concern about foreign banks "cream-skimming" domestic borrowers.[22] If "cream-skimming" is interpreted as dominance over better-quality market segments, then the entrant bank's ability to capture all borrowers in high quality (low ν) market segments can be viewed as cream-

[22] Given our assumption that the foreign entrant faces an information disadvantage, it seems paradoxical to think of a foreign bank cream-skimming borrowers. Although, a foreign bank may choose to cream-skim borrowers based on observable risk.

skimming. On the other hand, if cream skimming is interpeted as the entrant's ability to capture only the low-risk types, then the results show that it is not possible for the entrant to cream-skim domestic borrowers.[23] Second, the result can also explain the precieved lending bias of foreign banks against SMEs. As is well known, small business lending is based on "soft information" and is characterized by a larger proportion of borrowers that are high-risk (in terms of this model, a high ν). On the other hand, the large-firm market segment can be characterized by a larger proportion of borrowers that low risk (i.e., characterized by low ν). With a moderately high cost advantage, the entrant captures all borrowers in this market. However, in markets characterized by a high ν (as is true for SMEs), the incumbent, despite its cost disadvantage, retains the low-risk types. Whereas the entrant gains all borrowers in the large-firm market segment, it succeeds in attracting only a fraction of the borrower population in the small-firm segment, accounting for the observed bias in lending.

Legal protection

In markets with a larger fraction of high-risk borrowers (higher ν), a low cost entrant can successfully sort borrowers only if its cost advantage is sufficiently large (region III in Figure 2). Securing loans with collateral entails a deadweight loss of $(1-\beta)\theta_L\rho^I$. This loss is high in environments where β is low; that is, when dissipative costs of seizing and liquidating collateral are high.[24] The parameter β is the fraction of the pledged collateral that the lender can recover in the event of a default on the loan. Stated differently, β can be viewed as a proxy for legal efficiency, with higher βs corresponding to better legal enforcement.[25] Either way, stronger creditor protection and/or

[23] Admittedly, I have assumed that the entrant has the informational disadvantage. However, note that the principal-agent literature discusses cream-skimming by an *uninformed* principal (entrant) as an equilibrium where the inefficient agent (high-risk borrower) can be priced out of the market (Bolton and Dewatripont, 2005, p. 604). This involves the entrant offering a *shutdown contract* that is accepted only by the efficient agent (low-risk borrower), but rejected by his inefficient counterpart (Laffont and Martimort, 2002, p. 38). However, this model shows that under competitive pressures from the incumbent, the entrant cannot offer a shutdown contract in equilibrium. Moreover, in a separating equilibrium where the entrant dominates, the entrant's *ex ante* expected profits from high-risk borrowers are always greater than that from low-risk borrowers. Thus, the entrant would not choose to cream-skim low-risk borrowers.

[24] This could range from direct costs, like legal fees and accounting services, to indirect costs like time and effort in acquiring and selling the secured asset. Also, deadweight losses may arise from information and holdout problems that characterize financial distress (Gertner and Scharfstein, 1991; James, 1996).

[25] A caveat in this interpretation is that some of the debate on the distribution of rights between creditor and debtor is misguided. Stiglitz (2001, p. 4) observes "what is critical is the clarity of those rights; presumably, the terms of the contract can be adjusted to reflect those rights....Different bankruptcy rules do impose different information burdens

better law enforcement reduces the losses from default and thus encourages entrants to bid more aggressively for borrowers. This leads to a testable prediction of the model:

Prediction : *Ceteris paribus, countries with bankruptcy codes that reduce the cost of liquidating collateral should witness greater foreign bank lending.*

The entrant's success in gaining borrowers of higher quality by offering cheaper loans is sufficiently enhanced by increasing the efficiency of collateral use. In a recent study on how legal changes affect lending behavior, Haselmann et al. (2005) find that lending volume increases subsequent to legal changes facilitating the use of collateral, and that foreign greenfield banks extend their lending volume substantially more than domestic banks. Markets where creditor rights provide stronger protection to lenders will witness lower deadweight losses both in the repossession and in the liquidation of collateral; this, in turn, will promote entry of low-cost competitors. The argument above summarizes how an efficient legal framework helps in building an efficient financial market by promoting entry of low-cost competitors. It provides a theoretical underpinning for empirical findings on the legal determinants of the development of financial intermediaries like banks (Levine 1998, 1999).

It is worthwhile to recall that stronger legal protection (higher β, and consequently, a lower $\tilde{\rho}_S$) makes it easier for entrants to sort borrowers. Conversely, poor legal practices that increase deadweight losses (a higher $\tilde{\rho}_S$) can exacerbate the difficulties that foreign entrants face in lending to informationally opaque small firms. This result in the model explains why the foriegn banks' bias against SMEs appears stronger in emerging markets, where deadweight losses, both in the repossession and in the liquidation of collateral, can be quite large. As stated above, this has important policy implications for host countries: better creditor protection can facilitate foreign bank lending to small businesses.

Borrowers with collateral constraints

The previous result begs the following question: does the entrant's large firm bias disappear if it can successfully screen high-risk borrowers? This model can be extended to show that the uninformed lender's bias towards larger firms can persist even if lending towards SMEs as a whole increase.

and imply different allocations of risk bearing, and some of these arrangements may actually be inefficient."

Here, the separating equilibria in this framework identify a different mechanism at work. The earlier assumption that borrowers have unconstrained access to collateral is relaxed. In particular, it is assumed that there exists a distribution of borrowers (firms) who differ in their ability to post collateral. More specifically, I now assume that within a group of borrowers with indistinguishable risk, larger firms can readily post more collateral (per dollar of borrowings) whereas smaller firms can only pledge a lower C. This new assumption alters little in terms of equilibrium behavior of banks. In particular, one can focus attention on the equilibrium described in Proposition 1(a). Note that, if the entrant reduces the collateral requirement for low-risks, incentive compatibility requires that it reduce loan rates for the high-risks as well. Also, it can be shown that the entrant's profits from the high-risks (π_H^E) are greater than that from low-risks (π_L^E) (See Appendix B):

$$\begin{aligned} \pi_H^E &= \rho^I - \rho^E \\ \text{and } \pi_L^E &= [1-(1-\beta)\theta_L]\rho^I - \rho^E. \end{aligned} \tag{6}$$

Given that the profits from high-risks are strictly greater than that from low-risks, the entrant will not alter its collateral requirement for low-risks as long as the proportion of high-risks in the population is large ($\nu > \hat{\nu}$). Simply put, the entrant offers the following two options: (i) loans at a rate similar to the domestic bank's offer to high-risks and (ii) loans at a rate cheaper than the domestic bank's offer to low-risks, but only to those who pledge collateral $C_L^E = \rho^I$. In terms of the model, this implies that among borrowers with indistinguishable risk, the cheaper loan is available only to those willing to pledge collateral. This result gives another prediction of this model:

Prediction : *Conditional on observable risk, entrants to a credit market provide cheaper loans only to those borrowers who are willing to pledge (more) collateral.*

From a borrower's perspective, it appears that offers by the entrant are biased towards larger firms that can readily post collateral. Low-risk borrowers that cannot post this collateral will go to the (informed) local bank. This result accounts for the perceived bias in the entrant's separating contracts: larger firms that can post collateral go to the entrant, while the incumbent attracts only low-risk borrowers that are constrained in their ability to post collateral.

An important consideration here is that small firms tend to be observationally riskier than

large firms. However, within the same categories of observable risk, it is likely that larger firms can readily fulfil the collateral requirement that smaller firms cannot. There is some evidence in support of this phenomenon: Haynes et al. (2001) show that the smallest among small business borrowers in the US have less access to credit from large banks than other small business borrowers.

Again, one can explain why this problem turns out to be greater in emerging markets. First, note that the information problems are likely to be more acute (greater ν) in developing countries. Second, the entrant's cost advantage is also likely to be greater (higher ρ^I). In terms of the model, a greater cost advantage implies a higher collateral requirement ($C_L^E = \rho^I$). Finally, the collateralizable wealth of borrowers tends to be lower in developing countries. These three factors can combine to make this bias against SMEs seem more acute in developing countries.

5 Conclusion

This paper makes several contributions to the literature. To the best of my knowledge, it is the first paper that analyzes bank competition as competition between asymmetrically informed principals where contract menus (loan rates and collateral) are the strategic variables of competition. This theoretical approach has some important advantages.

First, it helps tie the early literature on information theories of credit to more recent studies in law and finance under a single framework. In a recent paper, Djankov et al. (2004) classify the literature on private credit into two broad, but interlinked categories: information theories of credit and theories that stress the importance of creditors' rights. This paper demonstrates how these two categories are interlinked; it supports their assertions that better legal environment can help overcome the stronger informational disadvantages that potential entrants encounter in credit markets. Conversely, limited property rights and poorly functioning legal systems can combine to reduce the use of collateralizable assets, thereby diminishing potential entrants' ability to sort borrowers. This conclusion from the model provides a theoretical underpinning for recent empirical studies on the importance of legal environments in explaining the variation in the size of private credit markets.

Second, as shown in the previous section, the results in this paper find support in empirical work

related to foreign entry in banking. Furthermore, the model makes two testable predictions. First, *ceteris paribus*, countries with bankruptcy codes that reduce the cost for seizing and liquidating collateral should witness greater foreign bank lending, particularly to SMEs. Second, the model predicts that in lending to observably riskier borrowers (like small firms) entrants to a credit market are likely to provide cheaper loans only to borrowers pledging more collateral. As mentioned earlier, these predictions on collateral use depend on borrowers' unobservable risk characteristics as opposed to previous studies that discuss observable risk.

Third, the model allows us to explore the impact of entry and bank competition on firms' access to credit. In particular, this model can explain the perceived bias that foreign (and large domestic) banks lend more to large firms thereby neglecting small enterprises. At the same time, it also explains why better informed domestic and local banks continue to find a market among such small firms. Lastly, it shows why this bias can be stronger in developing countries.

A final observation is that cream skimming by foreign banks can be rationalized if one defines cream-skimming as capturing market segments of higher (average) quality. However, cream-skimming interpreted as the poaching of only high-quality borrowers in a given market segment is not an equilibrium in this framework. On the contrary, this paper suggests that entrants with a cost advantage have to engage in costly screening only for the better firms, not the high-risk ones.

References

Barro, R., (1976), "The Loan Market, Collateral, and Rates of Interest," Journal of Money, Credit, and Banking, 8, 439-456.

Beck, T. and R. Levine (2005),"Legal institutions and financial development," in C. Menard and M. Shirley (eds.) Handbook of New Institutional Economics, Amsterdam, Springer.

Beck, T., A. Demirguc-Kunt, and V. Maksimovic (2004), "Bank Competition and Access to Finance: International Evidence." Journal of Money, Credit, and Banking, 36, 627–648.

Berger, A.N., L.F. Klapper and G.F. Udell (2001), "The ability of banks to lend to informationally opaque small businesses," Journal of Banking & Finance, 25, pp. 2127-2167.

Berger, A.N, N. Miller, M. Petersen, R. G. Rajan and J. Stein (2005), "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," Journal of Financial Economics, 76, 237-269.

Berger, A., and G. Udell (1990), "Collateral, loan quality, and bank risk," Journal of Monetary Economics, 25, pp. 21-42.

Berger, A. N. and G.F. Udell (1992), "Some evidence on the empirical significance of credit rationing,"Journal of Political Economy, 100, 1047-1077.

Berger, A.N. and G.F. Udell (1995), "Relationship lending and lines of credit in small firm finance," Journal of Business, 68, 351-382.

Berger, A. N. and G. F. Udell (1996), "Universal banking and the future of small business lending," in A. Saunders and I. Walter (eds.), Financial System Design: The case for universal banking, Burr Ridge, IL, Irwin Publishing.

Berger, A.N. and G.F. Udell (2004), "A more complete conceptual framework for SME finance", paper prepared for the World Bank Conference on Small and Medium Enterprises: Overcoming Growth Constraints, October 14-15 2004, World Bank, Washington D.C.

Banerjee, A. V. and E. Duflo (2001), "The nature of credit constraints: Evidence from an Indian bank", Mimeo, Massachusetts Institute of Technology, Cambridge, Massachusetts

Bernheim, D. B., and M. Whinston (1986), "Common Agency," Econometrica, 54, 923-43.

Bernheim, D. B., and M. Whinston (1985), "Common Marketing Agency as a Device for Facilitating Collusion," RAND Journal of Economics, 16, 269-81.

Besanko, D., and A. Thakor (1987a), "Collateral and rationing: Sorting Equilibria in monopolistic and competitive credit markets," International Economic Review, 28, 671-89.

Besanko, D., and A. Thakor (1987b), "Competitive equilibrium in the credit market under asymmetric information," Journal of Economic Theory, 71, 291-99.

Bester, H., (1985), "Screening vs. rationing in credit markets with imperfect information," American Economic Review, 75, 850-55.

Biglaiser, G. and C. Mezzetti (1993), "Principals Competing for an Agent in the Presence of Adverse Selection and Moral Hazard", Journal of Economic Theory, 61, 303-330.

Biglaiser, G. and C. Mezzetti (2000), "Incentive auctions and information revelation", RAND Journal of Economics, 31, pp. 145-164.

Black, J., D. de Meza, and D. Jeffreys (1996), "House Prices, the Supply of Collateral and the Enterprise Economy." The Economic Journal, 106, 60–75.

Black, S.E. and P.E. Strahan (2002), "Entrepreneurship and bank credit availability," Journal of Finance, 57, 2807-2833.

Bolton, P., and M. Dewatripont (2005), Contract Theory, MIT Press, Cambridge, Massachusetts.

Boot A., (2004), "Relationship Banking: What Do I Know?", Journal of Financial Intermediation, 9 (1), 2000, 7-25.

Boot A., and A. Thakor (1994), "Moral hazard and secured lending in an infinitely repeated credit market game," International Economic Review, 35, 899-920.

Boot A., and A. Thakor (2000), "Can relationship banking survive competition?," Journal of Finance, 45, 679-713.

Boot, A., Thakor A., and G. Udell (1990), "Secured lending and default risk: Equilibrium analysis and policy implications and empirical results," Economic Journal, 101, 458-72.

Bond, E. W., and Thomas A. Gresik (1997), "Competition between Asymmetrically Informed Principals," Economic Theory, 10, 227-40.

Broecker, T., (1990), "Credit-Worthiness Tests and Interbank Competition", Econometrica, 58, pp. 429-52.

Brick, I. E., E. J. Kane, and D. Palia (2005), "Evidence of Jointness in the terms of relationship lending, Working Paper, Rutgers University.

Castro, R., G. L. Clementi and G. MacDonald (2004), "Investor Protection, Optimal Incentives, and Economic Growth," The Quarterly Journal of Economics, 119(3), pages 1131-1175.

Cetorelli N., and P. Strahan (2004), "Finance as a barrier to entry: Bank competition and industry structure in local U. S. markets," Journal of Finance, forthcoming.

Claessens, S., Aslı Demirguç-Kunt, and H. Huizinga (2001), "How Does Foreign Entry Affect the Domestic Banking Market?" Journal of Banking and Finance 25, 891–911.

Clarke, G., R. Cull, and M.S. Martinez Peria (2001), "Does Foreign Bank Penetration Reduce Access to Credit in Developing Countries? Evidence from Asking Borrowers". World Bank Policy Research Working Paper No. 2716, World Bank, Washington D.C.

Dell'Ariccia, G., E. Friedman, and R. Marquez (1999), "Adverse Selection as a Barrier to Entry in the Banking Industry." Rand Journal of Economics 30, 515–534.

Dell'Ariccia, G. and Robert Marquez (2004), "Information and bank credit allocation." Journal of Financial Economics, 72, 185-214.

Dell'Ariccia, G. and Robert Marquez (2005), "Lending Booms and Lending Standards." Working paper.

Djankov S., McLiesh C, and A. Shleifer (2004), "Private Credit in 129 Countries," NBER Working Papers 11078, National Bureau of Economic Research, Inc.

Freixas X., and J.C. Rochet (1997), Microeconomics of Banking, MIT Press.

Gertner, R., and D. Scharfstein (1991), "A theory of workouts and the effects of reorganization law." Journal of Finance, 45, 1189 – 1222.

Gorton, G., and A. Winton (2003), "Financial intermediation," in G. M. Constantinides, M. Harris, and Rene M. Stulz, eds.: Handbook of the Economics of Finance (North Holland, Amsterdam).

Harhoff, D. and T. Körting (1998), "Lending relationships in Germany: empirical evidence from survey data." Journal of Banking and Finance, 22, 1317-1353.

Haselmann, R.F.H., K. Pistor and V. Vig, (2005), "How Law Affects Lending" . Columbia Law and Economics Working Paper No. 285

Haynes, G., Ou, C. and R.Berney, (1999). "Small business borrowing from large and small banks," in J. Blanton, A. Williams and S. Rhine (eds.), Business Access to Capital and Credit, A Federal Reserve System Research Conference.

James, C., (1996), "Bank debt restructurings and the composition of exchange offers in financial distress." Journal of Finance, 51, 711 -728.

Jayaratne, J. and P. E. Strahan (1996), "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation," Quarterly Journal of Economics, 111, 639-670.

Jayaratne, J. and P. E. Strahan (1998), "Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking," The Journal of Law and Economics, XL1 (1), 239-273.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. W. Vishny (1997), "Legal Determinants of External Finance", Journal of Finance, 52, 1131-1150.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. W. Vishny (1998), "Law and Finance", Journal of Political Economy, 106, 1113-1155.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. W. Vishny (2000), "Investor protection and corporate governance." Journal of Financial Economics, 58, 3–27.

Laffont, J. J. and D. Martimort (2002), The Theory of Incentives: The Principal-Agent Model, (Princeton, NJ: Princeton University Press).

Levine, R., (1998), "The Legal Environment, Banks, and Long-run Economic Growth," Journal of Money, Credit and Banking, 30, 596–620.

Levine, R., (1999), "Law, Finance, and Economic Growth," Journal of Financial Intermediation, 8 (1-2), 8-35.

Morgan, D. P., and P.E. Strahan (2004), Foreign Bank Entry and Business Volatility: Evidence from U.S. States and Other Countries, in Ahumada, L.A. and J.R. Fuentes (eds.), Banking Market Structure and Monetary Policy, Central Bank of Chile, Santiago, Chile.

Morgan, D.P., B. Rime and P.E. Strahan (2005), Bank Integration and State Business Cycles, Quarterly Journal of Economics, 119(4), 1555-85.

Orgler, Y., (1970), A credit scoring model for commercial loans, Journal of Money, Credit and Banking, 2, 435-445.

Petersen, M. A. and R. G. Rajan (1994), "The Benefits of Lending Relationships: Evidence from Small Business Data", Journal of Finance, 49, 3-37.

Racocha, P. (2003), "Joining the EU - Impact on the financial sector of new member states," speech by Pavel Racocha, Board Member, Czech National Bank, delivered at the conference "The Single Market for Financial Services in the EU and Its Impact on Globalization", Sydney, 3 November 2003.

Rajan, R. G., and L. Zingales (2003) "The Great Reversals: The Politics of Financial Development in the 20th Century," Journal of Financial Economics, 69, 5–50.

Rothschild, M. and J.E. Stiglitz (1976), "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information." Quarterly Journal of Economics, 90, 629-649.

Scott, J.A. and T.C. Smith, (1986), "The effect of the bankruptcy reform act of 1978 on small business loan pricing," Journal of Financial Economics, 16,119-140.

Shleifer, A. and R. W. Vishny (1997), "A survey of corporate governance," Journal of Finance, 52, 737-83.

Stiglitz, J.E., (2000), "Two Principles for the Next Round or, How to Bring Developing Countries in from the Cold" The World Economy, 23, 437-48.

Stiglitz, J.E., (2001), "Bankruptcy laws: basic economic principles", in Stijin Claessens, Simeon Djankov and Ashoka Mody (eds.). Resolution of Financial Distress: An International Perspective on the Design of Bankruptcy Laws, Washington D.C.: The World Bank.

Tornell, A. and F. Westermann, (2004), "Credit Market Imperfections in Middle Income Countries," NBER Working Papers 9737, National Bureau of Economic Research, Inc.

Appendix A: Proofs

The outlines of the proofs for Lemmas 1-3, Propositions 1-2, and the description of equilibria for situations where $\rho^I \leq \rho^E$ are given below. The details of some of the proofs provided here are available in the Extended Appendix.

(A.1) Proof of Lemma 1 Let us consider two contracts M and N offered by the incumbent, where $U_k^M = U_k^N$ with $R_k^M > R_k^N$, $C_k^M < C_k^N$ and $k = H, L$. With $U_k^M = U_k^N$, one obtains $(1-\theta_k)(R_k^M - R_k^N) = \theta_k(C_k^N - C_k^M)$. Hence, $\pi_k^M - \pi_k^N = \theta_k(1-\beta)(C_k^N - C_k^M) > 0$. Therefore, it must be true that $\pi_k^M > \pi_k^N$. Bank I will always choose a contract that sets its collateral requirement to zero. It is easy to show that $\pi_k^I \geq 0$, $k = H, L$ for all such contracts.

(A.2) Proof of Lemma 2 Let us consider two menus of contracts where $\hat{R}_H^E > \tilde{R}_H^E$ and $\hat{C}_H^E < \tilde{C}_H^E$ such that $U_H(\hat{R}_H^E, \hat{C}_H^E) = U_H(\tilde{R}_H^E, \tilde{C}_H^E)$. One can show that replacing the menu $[(\tilde{R}_H^E, \tilde{C}_H^E);\ (R_L^E, C_L^E)]$ with the menu $[(\hat{R}_H^E, \hat{C}_H^E);\ (R_L^E, C_L^E)]$ will (a) satisfy the participation and incentive compatibility constraints for all borrowers and (b) result in higher profits for the entrant (see Extended Appendix for details). Hence the entrant's offer sets collateral requirement of the high-risk borrower to zero; this is true for both pooling and separating contracts (see footnote 14). Hence pooling contracts are of the form $(R_P^E, 0)$ where $R_P^E \in [R_P^{\min}(\rho^E), \bar{R}_H]$ and $R_P^{\min}(\rho^E)$ is given by (5).

(A.3) Proof of Lemma 3 (i) Suppose not. Let us consider the menu $[(R_H^E, 0); (R_L^E, C_L^E)]$ such that IC_H is slack. One can find another menu $[(R_H^E, 0); (\hat{R}_L^E, \hat{C}_L^E)]$ where $\hat{R}_L^E > \tilde{R}_L^E$ and $\hat{C}_L^E < \tilde{C}_L^E$ such that $U_L(R_L^E, C_L^E) = U_L(\hat{R}_L^E, \hat{C}_L^E)$ and IC_H binds. Replacing menu $[(R_H^E, 0); (R_L^E, C_L^E)]$ with menu $[(R_H^E, 0); (\hat{R}_L^E, \hat{C}_L^E)]$ results in higher profits for Bank E (see Extended Appendix for details). (ii) holds because Bank E can always choose to stay out. (iii). From (ii) it follows that if $\pi_L^E < 0$, then $\pi_H^E > 0$. Removing contract (R_L^E, C_L^E) means that L-types either go to the incumbent or they choose the contract $(R_H^E, 0)$ originally selected by the H-types. In both cases Bank E's profits are higher.

(A.4) Proof of Proposition 1 (a) In order to ensure that both high-risk and low-risk borrow from it, the entrant's offer in $Z_S^E(\rho^E)$ must yield at least $\bar{U}_k^I$. Consequently, the menu $[(R_H^E,0);(R_L^E,C_L^E)]$ must be such that $U_H(R_H^E,0) \geq U_H(\underline{\mathrm{R}}_H^I,0)$ and $U_L(R_L^E,C_L^E) \geq U_L(\underline{\mathrm{R}}_L^I,0)$. First, I show that in any equilibrium where the entrant dominates the incumbent, it must be true that $U_L(R_L^E,C_L^E) = U_L(\underline{\mathrm{R}}_L^I,0)$. Suppose not. Then, it must be the case that $U_L(R_L^E,C_L^E) > U_L(\underline{\mathrm{R}}_L^I,0)$. However, one can find a $(\hat{R}_L^E,\hat{C}_L^E)$ in $Z_S^E(\rho^E)$ where $R_L^E < \hat{R}_L^E$ and $C_L^E > \hat{C}_L^E$ such that $U_L(\hat{R}_L^E,\hat{C}_L^E) = U_L(\underline{\mathrm{R}}_L^I,0)$ and $U_H(\hat{R}_L^E,\hat{C}_L^E) = U_H(R_L^E,C_L^E) = U_H(R_H^E,0)$. Replacing the entrant's menu $[(R_H^E,0);(R_L^E,C_L^E)]$ by $[(R_H^E,0);(\hat{R}_L^E,\hat{C}_L^E)]$ leads to unambiguously higher profits while ensuring that low-risks accept the new contract. Therefore, the entrant's offer must have $U_L(\hat{R}_L^E,\hat{C}_L^E) = U_L(\underline{\mathrm{R}}_L^I,0)$.

When the entrant dominates, one can focus attention on contracts in $Z_S^E(\rho^E)$ such that $U_L(R_L^E,C_L^E) = U_L(\underline{\mathrm{R}}_L^I,0)$.[26] Consider two such menus $[(\breve{R}_H^E,0);(\breve{R}_L^E,\breve{C}_L^E)]$ and $[(\hat{R}_H^E,0);(\hat{R}_L^E,\hat{C}_L^E)]$ such that $\breve{R}_L^E < \hat{R}_L^E$, $\breve{C}_L^E > \hat{C}_L^E$. It follows that $\breve{R}_H^E > \hat{R}_H^E$. From $U_L(\breve{R}_L^E,\breve{C}_L^E) = U_L(\hat{R}_L^E,\hat{C}_L^E)$, one gets

$$(1-\theta_L)(\breve{R}_L^E - \hat{R}_L^E) = \theta_L(\hat{C}_L^E - \breve{C}_L^E). \tag{A.1}$$

Also, $U_H(\hat{R}_L^E,\hat{C}_L^E) = U_H(\hat{R}_H^E,0)$ with $U_H(\breve{R}_L^E,\breve{C}_L^E) = U_H(\breve{R}_H^E,0)$ implies

$$(1-\theta_H)(\breve{R}_H^E - \hat{R}_H^E) = (1-\theta_H)(\breve{R}_L^E - \hat{R}_L^E) + \theta_H(\breve{C}_L^E - \hat{C}_L^E). \tag{A.2}$$

$$\text{Hence, } \Pi[(\breve{R}_H^E,0);(\breve{R}_L^E,\breve{C}_L^E)] - \Pi[(\hat{R}_H^E,0);(\hat{R}_L^E,\hat{C}_L^E)] = [\nu(\frac{\theta_H-\theta_L}{1-\theta_L}) - (1-\nu)(1-\beta)\theta_L](\breve{C}_L^E - \hat{C}_L^E).$$

RHS is positive for $\nu > \nu_1$. Intuitively, the entrant charges a higher R_H^E when the proportion of high-risks in the population is high and (a) follows. Solving the last two equations, one gets $R_L^E = C_L^E = \rho^I$ and the entrant's profits are strictly positive when $[1-(1-\beta)\theta_L]\rho^I > \rho^E$ and this gives us the cut-off $\tilde{\rho}_S \equiv \frac{\rho^E}{1-(1-\beta)\theta_L}$. If $\rho^I = \tilde{\rho}_S$, it follows that $\pi_L^E(R_L^E,C_L^E) = 0$. With Bank I offering $(\underline{\mathrm{R}}_L^I,0)$, both banks run down profits to zero profits and the low-risk borrower borrows from either bank.

(b) Finally, when $\rho^I < \tilde{\rho}_S$ it follows that $\pi_L^E(R_L^E,C_L^E) < 0$. In this situation, the entrant is forced to revise its offer to $[(\underline{\mathrm{R}}_H^I,0);(\tilde{R}_L^E,\tilde{C}_L^E)]$ such that $\pi_L^E(\tilde{R}_L^E,\tilde{C}_L^E) = 0$. But with $U_L(R_L^E,C_L^E) = U_L(\underline{\mathrm{R}}_L^I,0)$, Bank I revises its offer with $\left(R_L^I,0\right)$ to the low-risk borrower such that $U_L\left(R_L^I,0\right) = U_L(\tilde{R}_L^E,\tilde{C}_L^E) < U_L(\underline{\mathrm{R}}_L^I,0)$. It follows that $R_L^I > \underline{\mathrm{R}}_L^I$, and Bank I now makes positive profits from the low-risk borrower. Also, the entrant's offer to the high-risk borrower is $(\underline{\mathrm{R}}_H^I,0)$ where $\underline{\mathrm{R}}_H^I > \underline{\mathrm{R}}_H^E$ and the entrant makes positive profits of the high-risk borrower. Thus, in this equilibrium, the high-risk borrower borrows from Bank E while her low-risk counterpart borrows from Bank I (see Figure 1).

(A.5) Proof of Proposition 2 First, for a pooling contract $\left(R_P^E,0\right)$ to hold, the entrant has to ensure that it can capture the low-risk borrowers. Therefore, it must be true that $\underline{\mathrm{R}}_L^I > R_P^{\min}$, that is $\rho^I > (\frac{1-\theta}{1-E\theta})\rho^E \equiv \tilde{\rho}_P^1(\nu)$. For a pooling contract $\left(R_P^E,0\right)$, wherein Bank E captures all borrowers, one can show that $R_P^E = \underline{\mathrm{R}}_L^I$. For $R_P^E > \underline{\mathrm{R}}_L^I$, Bank I can always undercut Bank E's offer to low-risks and for $R_P^E < \underline{\mathrm{R}}_L^I$, Bank E can increase profits by pooling at $(\underline{\mathrm{R}}_L^I,0)$. The entrant makes strictly positive profits from all borrowers when $\underline{\mathrm{R}}_L^I > \underline{\mathrm{R}}_H^E$. Conversely, if $\rho^I \leq (\frac{1-\theta_L}{1-\theta_H})\rho^E$, the entrant covers expected losses from high-risks with profits from low-risks. Comparing the entrant's profits from pooling and separating contracts, one can show that the entrant chooses the pooling contract only when $\nu \leq \nu_1$ (see (B.8) in Appendix B). Note that, for $\rho^I \leq \tilde{\rho}_S$, the entrant gets the high-risk borrower only. Here comparing profits, gives us the second cutoff

[26] For all such contract offers, increasing entrant's profits from high-risks (by raising R_H^E) implies lowering profits from low-risks (lowering R_L^E and raising C_L^E). Thus the entrant's choice of optimal contract depends on ν.

$\tilde{\rho}_P^2(\nu) \equiv \frac{\rho^E}{1-(\frac{\nu}{1-\nu})(\frac{\theta_H-\theta_L}{1-\theta_L})}$, such that if $\rho^I > \tilde{\rho}_P^2(\nu)$, the entrant pools all borrowers. Note when $\nu = \nu_1$, $\tilde{\rho}_P^2(\nu) = \tilde{\rho}_S$.

Equilibria for $\rho^I \leq \rho^E$ When $\rho^I \leq \rho^E$, an equilibrium of the game has Bank E offering the menu $[(\underline{R}_H^I, 0); (R_L^E, C_L^E)]$ in $Z_S^E(\rho^E)$ where $\pi_L^E(R_L^E, C_L^E) = 0$. The incumbent's offers $(\underline{R}_H^I, 0)$ to Borrower-H and $\left(R_L^I, 0\right)$ to Borrower-L such that $U_L\left(R_L^I, 0\right) = U_L(R_L^E, C_L^E)$. Note that if $\rho^I < \rho^E$, the incumbent captures all borrowers but if $\rho^I = \rho^E$, Borrower-H borrows from either bank but Borrower-L borrows from the incumbent only (see Extended Appendix for details).

Appendix B: Entrant's optimization problem for $\rho^I \geq \tilde{\rho}_S (\equiv \frac{\rho^E}{1-(1-\beta)\theta_L})$.

Bank E's problem can be viewed as a principal facing agents under incomplete information where the agents' outside opportunities are determined by the max. utilities that Bank I can provide. Borrower goes to Bank E only if it offers an incentive scheme yielding at least, maximum utility, $\bar{U}_k^I$, i.e., reservation utility in borrower's IR constraint is now $\bar{U}_k^I$.

$$\text{Max} \quad \nu[(1-\theta_H)R_H^E + \beta\theta_H C_H^E - \rho^E] + (1-\nu)[(1-\theta_L)R_L^E + \beta\theta_L C_L^E - \rho^E] \tag{B.2}$$

$$\begin{aligned}
\text{subject to} \quad & (1-\theta_H)(x - R_H^E) - \theta_H C_H^E \geq \bar{U}_H^I, && \text{(B.2a)}\\
& (1-\theta_L)(x - R_L^E) - \theta_L C_L^E \geq \bar{U}_L^I, && \text{(B.2b)}\\
& (1-\theta_H)(x - R_H^E) - \theta_H C_H^E \geq (1-\theta_H)(x - R_L^E) - \theta_H C_L^E, && \text{(B.2c)}\\
& (1-\theta_L)(x - R_L^E) - \theta_L C_L^E \geq (1-\theta_L)(x - R_H^E) - \theta_L C_H^E && \text{(B.2d)}
\end{aligned}$$

The following results hold in equilibrium (i) the H-types are not required to put down any collateral, $C_H^E = 0$; (ii) IC_H (B.2c) must bind and (iii) IR_H (B.2a) must bind (see Extended Appendix). Now, the constraints in (B.2) can be written in terms of a single constraint in C_L^E as follows

$$0 \leq C_L \leq \frac{\frac{\bar{U}_L^I}{1-\theta_L} - \frac{\bar{U}_H^I}{1-\theta_H}}{\frac{\theta_H}{1-\theta_H} - \frac{\theta L}{1-\theta_L}} = \rho^I, \qquad \text{[using(4)]} \tag{B.3}$$

This gives the optimal separating contracts for the entrant as

$$R_{H,S}^E = \frac{\rho^I}{1-\theta_H} = \underline{R}_H^I,\ C_{H,S}^E = 0; \text{ and } R_{L,S}^E = \rho^I,\ C_{L,S}^E = \rho^I. \tag{B.4}$$

Bank E leaves both types of borrowers at $\bar{U}_k^I$—the maximum Bank I bank can give borrowers. Moreover, Bank E's expected profits from high-risks (π_H^E) and low-risks (π_L^E)are given by

$$\pi_H^E = \rho^I - \rho^E \text{ and } \pi_L^E = [1-(1-\beta)\theta_L]\,\rho^I - \rho^E. \tag{B.5}$$

Bank I's profits from providing each borrower $\bar{U}_k^I$, are zero. For both borrower types to accept loan contracts from Bank E only, its profits must be strictly positive, i.e., $\rho^I > [1-(1-\beta)\theta_L]\rho^I > \rho^E$. For Bank E's optimal pooling contracts are

$$R_P^E = \frac{\rho^I}{1-\theta_L} = \underline{R}_L^I,\ C_P^E = 0. \tag{B.6}$$

Given Bank E offers the pooling contract $(\underline{R}_L^I, 0)$ its profits from low and high-risks are given by

$$\pi_{L,P}^E = \rho^I - \rho^E \text{ and } \pi_{H,P}^E = (\frac{1-\theta_H}{1-\theta_L})\rho^I - \rho^E. \tag{B.7}$$

Bank E makes strictly positive profits from all borrowers when $\left(\frac{1-\theta_H}{1-\theta_L}\right)\rho^I > \rho^E$, i.e. when $\underline{R}_L^I > \underline{R}_H^E$. Bank E chooses the pooling contract when $\Pi_P^E(R_L^I, 0) \geq \Pi_S^E\left[\left(\underline{R}_H^I, 0\right); \left(R_L^E, C_L^E\right)\right]$, i.e., when

$$\nu \leq \frac{(1-\beta)\theta_L\left(1-\theta_L\right)}{(\theta_H - \beta\theta_L) - (1-\beta)\theta_L^2}. \tag{B.8}$$

Note that, when Bank E offers a separating contract, its profits from loans to the high-risk borrower are higher than profits from loans to low-risk borrowers. The converse is true for a pooling contract.