Costly Information, Entry, and Credit Access

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Abstract

Using a theoretical model that incorporates asymmetric information and differing comparative advantages among lenders, this paper analyzes the impact of lender entry on credit access. The model shows that lender entry has the potential to create a segmented market. This segmentation increases credit access for those firms targeted by the new lenders but potentially reduces credit access for all other firms. The overall impact on net output depends on the distribution of firms, the relative costs of lenders, and the cost of acquiring information. The model provides new insights into the evidence regarding foreign lenders’ entry into emerging markets.

Keywords: Asymmetric Information, Competition, Credit, Financial Liberalization

JEL Classification: D82, F3, G2, O16, O19.

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By allowing financial institutions in developed countries to lend directly to firms in less developed countries (LDCs), open capital markets are generally thought to alleviate domestic liquidity constraints, to improve the allocation of credit, and hence to increase aggregate output. As a result of these potential benefits, many LDCs opened their capital markets in the 1980s and 1990s. These openings fostered foreign lenders’ entry into their economies and changed the local competitive structure of their financial sectors. But, the assumption that opening capital markets is beneficial has recently come under serious doubt, as empirical studies have repeatedly failed to find a consistent relation between foreign lenders’ entry, credit access, and aggregate output in LDCs. This lack of empirical evidence leads to this paper’s central question: Why might the entry of new lenders, as experienced in many LDCs, not increase credit access and aggregate output?

In this paper, I show that information asymmetries and competitive interactions between lenders with differing comparative advantages provide an answer. This paper presents a theoretical framework that explains how lender entry into an already competitive credit market can affect firms’ access to credit when the entering lenders enjoy a different cost of capital and ability to acquire information about firms than incumbent lenders. Specifically, the model assumes entering lenders have a lower cost of capital but incumbent lenders determine firms’ quality at a lower fixed screening cost per firm. Within this framework, it is possible to derive a number of novel predictions.

First, new lender entry has the potential to induce a segmented credit market that reduces credit access for many firms. The intuition is straightforward. When screening costs are sufficiently high, a competitive, closed-economy equilibrium may occur in which incumbent lenders pool all firms together with a uniform financial contract rather than invest in the costly screening technology.

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2 The comparative advantage of entering lenders—a higher cost of screening but lower marginal cost of funds—finds substantial support in both the theoretical and empirical literatures on foreign lender entry into LDCs (e.g., see Stein, 2002; Mian, 2003 and 2006; Micco, Panizza, and Yañez, 2007). This evidence is discussed in Section 6.1.
Relative to the first-best allocation without information asymmetries, a pooling equilibrium overfunds low-return firms and underfunds high-return firms. But, the entrance of new lenders may break this pooling equilibrium. When entering lenders have a lower cost of funds, it can be worthwhile for them to target and finance the subset of high-return firms capable of profitably investing large amounts of capital—a practice commonly called “cream skimming”. Because screening costs are fixed, entering lenders’ lower marginal cost of funds allows them to offer a more competitive contract than incumbent lenders to these high-return firms, even when the entering lenders’ have a higher cost of screening. This cream skimming, however, reduces the average quality of firms being pooled by incumbent lenders and may eliminate the feasibility of a pooling equilibrium for firms in which incumbent lenders maintain a competitive advantage. If distinguishing the high-return firms not targeted by new lenders from the low-return firms is too costly, incumbent lenders may exit the market reducing credit access for firms not targeted by the new lenders.

This potential decline in credit leads to the model’s second implication: Additional lenders’ entry has the potential to either increase or reduce net output. Cream skimming by entering lenders can increase net output by eliminating the underfinancing of high-return firms capable of profitably investing large amounts of capital, and if incumbent lenders invest in the screening technology in response to entry, this investment will reduce the number of negative net present value (NPV) projects financed by incumbent lenders and also increase net output. However, if screening is too costly, such that incumbent lenders respond to this cream skimming by exiting some sectors of the economy entirely, many positive NPV projects may lose funding. These projects will remain unfunded if neither the incumbent nor the entering lenders find it cost-effective to screen firms in these sectors of the economy, and as a result, net output may fall.

The model thus provides a relatively simple explanation as to why open capital markets may not necessarily increase overall output in LDCs. In LDCs with significant costs to screening projects, the initial domestic allocation of credit may fail to achieve the first-best allocation because domestic lenders optimally choose to pool risks and cross-subsidize losses on low-return firms with gains on
high-return firms rather than invest in costly screening technologies. This type of lending pattern is a standard problem in emerging economies (Banerjee, Cole, and Duflo, 2005). Because the entering foreign lenders are relatively disadvantaged in acquiring information about local firms, they enter via cream skimming, which can both redirect credit toward the most profitable firms and reduce the credit access of firms that continue to rely on domestic lenders.

By demonstrating how the impact of lender entry will depend on the distribution of firms, the relative costs of lenders, and the cost of acquiring information, the model also sheds light on why the impact of lender entry might vary across countries and over time. A decline in net output will only occur if the new lenders’ screening cost is sufficiently high to facilitate market segmentation (i.e., cream skimming). Thus, country-level factors that might affect entering lenders’ cost of screening, including the quality of the country’s local institutions (e.g., weak enforcement of accounting standards or a lack of credit rating agencies), will be important. Cream skimming and a decline in net output are also less likely to occur when the comparative advantages of lenders can be combined through a merger or syndicated loan. Such combinations reduce the likelihood of an equilibrium where it is unprofitable to screen and finance firms with positive NPV investments.

The impact of entry may be heterogeneous for other reasons. A second factor that is necessary for a decline in net output is for it to be unprofitable for lenders to screen or pool the set of borrowers not cream skimmed in a separating equilibrium. Again, country-level institutions might increase screening costs and the likelihood of this occurring, but higher screening costs might also be driven by industry-specific characteristics, such as industry age, asset tangibility, or growth prospects. Moreover, an inability to profitably pool these firms will occur in markets in which low-return firms represent a larger fraction of entrepreneurs, when the expected losses of financing a low-return firm are high, or when the expected gains from financing the remaining positive NPV projects are low.

The model can explain a number of the existing empirical findings regarding foreign lenders’ entry, credit access, and aggregate output in LDCs. For example, the model can explain why foreign lenders often only target the least informationally opaque, largest, and most profitable firms (Berger, Klapper, and Udell, 2001; Clarke, Cull, Peria, and Sánchez, 2005; Mian, 2006; Gormley, 2010) and
why this cream skimming can be associated with an exit by domestic lenders and overall decline in credit (Beck, Demirguc-Kunt, and Peria, 2007; Detragiache, Gupta, and Tressel, 2008; Beck and Peria, 2010; Gormley, 2010). The model also provides an explanation as to why foreign lender entry is not always associated with an increase in subsequent economic growth or why financial liberalization might only be positively associated with growth in countries in which screening costs are likely less, such as high-income countries or countries with stronger local institutions (e.g., Quinn, 2000; Arteta, Eichengreen, and Wyplosz, 2001; Edwards, 2001; Galindo, Micco, and Ordoñez, 2002). The model can also explain why acquiring a domestic lender is a popular mode of entry in many LDCs or why an increase in growth might be observed when such acquisitions are allowed (e.g., Giannetti and Ongena, 2009; Bruno and Hauswald, 2011).

Using country-level panel data on economic outcomes and foreign bank entry in over 100 LDCs from 1995–2009, this paper also presents supportive evidence for other testable predictions of the model. In particular, a limited foreign lender entry (as would occur with cream skimming) is more likely to occur in countries in which the acquisition of domestic lenders is not observed. A decline in economic growth is also more likely to occur in countries that experience a limited foreign entry and in countries in which no domestic lenders are acquired by a foreign lender. Other predictions of the model, such as how the impact of lender entry might vary across industries or over time, provide promising avenues for future research on financial liberalization.

Overall, the analysis provides new insights about the potential consequences of financial liberalization and is related to four distinct literatures. First, the theoretical prediction that lenders more efficient at financing certain types of firms may exit following entry by other lenders is similar to the argument that competition does not always result in “survival of the fittest” (Bolton and Scharfstein, 1990; Zingales, 1998). The model extends this idea by demonstrating that the exit of the seemingly more efficient lender can occur even when the surviving lenders are not shielded from potential new entrants or when the exiting lender does not face direct competition in the market in which it enjoys an efficiency advantage. Instead, the exit is driven by additional entry making it difficult to offer cross-subsidized products in a market with informational asymmetries.
Second, this paper is related to the growing body of literature on the impact of open capital markets and capital inflows. Despite growing empirical and anecdotal evidence to suggest a potential dark side to capital inflows, the argument is often made that lowering entry barriers will be unambiguously beneficial to the growth of LDCs. One possible reason for this apparent disconnect is that there is little theoretical understanding as to how capital inflows might adversely affect the local economy beyond their potential to reduce financial stability (Stiglitz, 2000; Agénor, 2003; Kaminsky and Schmukler, 2008; Eichengreen and Leblang, 2003; Dell’Ariccia and Marquez, 2006). This paper formalizes a theory for why capital inflows may adversely affect the local economy, even in the absence of reduced financial stability. The model demonstrates this channel to be quite robust to assumptions about local competition, firms, and lenders, while also providing guidance on exactly when fostering entry into financial markets will be beneficial. The resulting policy implications of this analysis are quite different than those that focus on financial stability.

Third, this paper is related to the theoretical literature on the effects of competition in the presence of imperfect information. The potential for positive NPV firms to go unfinanced and the nonexistence of equilibrium is similar to that of Rothschild and Stiglitz (1976) and Stiglitz and Weiss (1981), and the resulting cream-skimming strategies are similar to that of Lewis and Sappington (1995). Rather than analyze the effects of competition among agents that share the same cost of screening, however, this paper analyzes how the entry of agents with a comparative disadvantage in screening can affect the competitive equilibrium. In this regard, the paper is similar to Martin (2010), which analyzes how the introduction of a non-exclusive alternative source of funds can affect the competitive equilibrium in a market with asymmetric information.

Finally, this paper is related to the growing body of literature concerning the effects of competition on lending relationships and credit access (e.g., Boot and Thakor, 2000; Petersen and Rajan, 1995). Rather than look at an increase in competition, however, this paper analyzes how the

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4 For example, in a memo to the World Trade Organization on June 6, 2005, delegations from Japan, the United States, and European Union argued that “Policies that impede competition, such as entry restrictions and restrictions on foreign banks, have been shown to raise the cost of financial services and hurt economic performance.” WTO Document #05-2335.
introduction of lenders with a different comparative advantage into an already competitive economy affects equilibrium contracts. This is similar to Dell’Ariccia and Marquez (2004) and Sengupta (2007), which demonstrate that this type of entry can induce segmented credit markets. However, by assuming that incumbent lenders have perfect information about borrower types, neither of these papers is able to shed light on why segmented markets might induce declines in credit access. While this possibility is explored in Detragiache, Gupta, and Tressel (2008), this paper differs in that it can capture both cases where all firms benefit from entry and cases where some firms do not. Additionally, this paper explores how the impact of entry on overall output will depend on the distribution of firms, the relative costs of lenders, and industry characteristics.

The remainder of this paper proceeds as follows. Section 1 provides the basic setup and assumptions of the model. Section 2 discusses the possible equilibria prior to the new lenders’ entry, and Section 3 describes the possible equilibria following entry. Section 4 then analyzes the factors that determine the impact of lender entry. Section 5 demonstrates the robustness of the models’ findings and discusses possible extensions. Section 6 discusses empirical evidence regarding the model’s key assumptions and testable predictions. Finally, Section 7 concludes.

1. The Basic Model

1.1 Agents and Technology

There are two types of agents: firms and lenders. All agents are risk neutral, and because of limited liability, no firm can end with a negative amount of cash.

The real sector consists of three types of firms, \( i \in \{A,B,C\} \), and a continuum, \( \theta_i \), of each type, where \( \theta_A + \theta_B + \theta_C \) is normalized to equal one. Each type of firm has the ability to implement one project of size \( I \in \{1,\lambda\} \), where \( \lambda > 1 \). If successfully implemented, the project yields a verifiable

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5 However, in Dell’Ariccia and Marquez (2004), lender entry does increase incumbent lenders’ loan portfolio risk, which in a more complete model with costly capital could cause a reduced lending capacity for incumbent lenders. Although this has the potential to generate adverse effects on credit similar to this paper, their paper does not explore this possibility.
return, $RI > r' I$, where $r'$ is an exogenous cost of capital. For simplicity, all firms have zero wealth and must borrow the entire amount $I$ from lenders to implement the project.

Among the three types of firms, there will be one type that lenders always want to finance, $C$ (the “cream”), another type they never want to finance, $B$ (the “bad”), and a third type that they only want to finance for small projects, $A$ (the “average”). This is formally established by having the three types differ in their ability to implement projects successfully. If financed, the cream firms always succeed with probability 1, regardless of project size, whereas bad firms only succeed with probability $p$. Projects that only succeed with probability $p$ have a negative net expected return given the cost of funds, $r'$, such that $pR < r'$. Average firms, however, implement the smaller project of size 1 with certain success, whereas larger projects only succeed with probability $p$. Given this setup, the first-best allocation of credit is achieved and net output is maximized when cream firms are financed for projects of size $\lambda$, average firms for projects of size 1, and bad firms are not financed.\(^6\)

The concept of cream firms should be interpreted broadly. Their ability to successfully implement the project of size $\lambda > 1$ serves to represent high-return firms capable of profitably investing large amounts of capital. This includes firms able to invest larger amounts of capital today or firms able to invest in more future projects. Hence, cream firms are not necessarily larger in size today or able to invest in larger projects. This ability to invest larger amounts of capital can also be generated endogenously in the model by adding a moral hazard problem and a higher return, $R$, on the projects of cream firms. This extension is discussed in Section 5.

The financial sector consists of many perfectly competitive lenders willing to extend capital in the amount of $I \in \{1, \lambda\}$. Without the costly screening of firms, lenders are unable to identify a firm’s type, thus providing the source of information asymmetry in the model. Lenders, however, may

\(^6\) This setup is a specific case of the more general framework, where bad firms succeed with probability $p_L$, cream firms succeed with probability $p_H > p_L$, and $p_H R > r' > p_L R$. Assuming that $p_H = 1$ and $p_L < 1$ only helps simplify expressions, and all subsequent findings and intuition hold in the more general case. Therefore, the implicit negative correlation between risk (variance of output) and productivity in this specific case is not necessary for the model’s findings. In the general case, the implicit correlation between risk and productivity can go either way.
invest in a screening technology that perfectly identifies a firm’s type. The cost of this screening technology will capture the severity of the asymmetric information problem. There will be two types of lenders: “domestic” and “foreign”. Domestic lenders will already be extending capital to firms in the local economy, whereas foreign lenders will be the potential new entrants into the economy.

Foreign and domestic lenders will differ in two key ways: Domestic lenders will find it less costly to overcome information asymmetries, whereas foreign lenders will enjoy a lower cost of funds. Specifically, domestic lenders can screen at cost $\kappa$ per firm, whereas foreign lenders must pay $\kappa' > \kappa$.\footnote{The assumption of a uniform, per firm screening costs greatly reduces the analysis, but is not essential. All subsequent findings will hold in a more general setting in which screening costs are allowed to vary with the scale of expected lending to a firm so long as the screening cost does not increase 1-1 with the amount of expected lending.} The lower screening cost for domestic lenders will reflect their prior experience with lending to firms in the local economy. Regarding the cost of funds, foreign lenders have access to an unlimited supply of funds at cost, $r^*$, whereas domestic lenders’ have access to an unlimited funds at a cost, $r$, where $r > r^*$. The lower cost of funds for foreign lenders will reflect some operational and technological advantage of the new entrant over that of the incumbent lenders.

The differences in costs provide each lender with a potential comparative advantage. Domestic lenders have a screening advantage per firm, whereas foreign lenders have a cost of capital advantage per dollar invested. Thus, for firms with large enough credit needs, a foreign lender will have a competitive advantage and an incentive to enter the economy. To formalize this comparative advantage and the above restrictions on parameter values, the following assumptions are made:

$$0 < r - r^* < \kappa^* - \kappa, \quad \text{(A1)}$$

$$r^* + \frac{\kappa^*}{\lambda} < r + \frac{\kappa}{\lambda} < R. \quad \text{(A2)}$$

Assumption (A1) formalizes that domestic lenders have a higher cost of funds and a lower screening cost, while also ensuring that they have a competitive advantage in screening and financing firms for the smaller project. Assumption (A2) ensures that projects of size $\lambda$ are sufficiently large to provide foreign lenders the competitive advantage in financing these projects and that it is always feasible to
screen and finance firms with these projects. The assumed comparative advantages of domestic and foreign lenders appear to fit well in the context of international capital markets and cross-border lending. This evidence is discussed in Section 6.1.

1.2 Timing of Events

There is no discounting between periods, and the timing of events is as follows:

\( t = 0 \): firms discover their type, \( i \),

\( t = 1 \): lenders choose their menu of financial contracts, \( F \); firms apply for financing,

\( t = 2 \): lenders screen applicants and provide capital, \( I \), to successful applicants,

\( t = 3 \): project outcomes are realized; financial contracts are settled.

The basic idea of this time line is the following: Lenders initially choose which menu of financial contracts they wish to offer firms. In doing this, they will choose both which type of financial contracts to offer and to which firms they will offer these contracts. Firms then approach lenders and apply for their preferred financial contract from the menu of available contracts. If the contract is designated for firms of a specific type, the lenders screen applicant firms to verify their type, and financing is provided to successful applicants. Finally, project outcomes are realized in the final period and all financial contracts are settled.

1.3 Financial Contracts and Strategies

Let \( F_j \) represent the menu of contracts offered by lender \( j \), where \( F_j^{i,k} \) denotes a financial contract from lender \( j \) in amount \( I \) designated for firms of type \( k \in \{0,A,B,C\} \). When \( k = 0 \), the contract is unscreened and available to all firms, regardless of type, but for \( k \neq 0 \), the contract is only available to a firms for which screening by the lender reveals \( i = k \).\(^8\) Each contract is a mapping of the observable output from the project into a payment for the firm. Specifically, \( F : \{0,RI\} \rightarrow \mathbb{R} \). Each type of contract maps into a nonnegative payment because firms have no initial wealth and

\(^8\) The analysis and subsequent findings are qualitatively similar if lenders are allowed to offer nondeterministic screening contracts in which screening only occurs with some probability \( \gamma \).
cannot receive a negative payment. Moreover, it is important to note that this mapping spans the universe of potential contracts, and hence the concept of a “lender” used here is very general and encompasses debt, equity, or any mixture thereof.

A strategy configuration in this economy consists of the set of contracts $F_j$ for each lender $j \in L$, and the contract choice, $f(i)$, for each firm $i \in E$. A firm’s choice is limited to the set of contracts offered by lenders, $\mathcal{F}$, or a choice of no contract, $f(i) = \emptyset$. The equilibrium concept used is subgame perfect, and a strategy configuration will be an equilibrium if each lender $j$ and each firm $i$ is maximizing its expected profits given the strategies of all other agents in the economy.

The expected profit of a firm $i$ with financial contract $F$ can be expressed as

$$\pi(F | i) = p(i | I)F(R) + (1 - p(i | I))F(0),$$

(1)

where $p(i | I)$ is the probability of success for a firm of type $i$ with a project of size $I$, which is determined by the amount of financing associated with the finance contract, $F$.

Likewise, the expected profits of lender $j$ lending to firm $i$ with contract $F$ is

$$\Pi_j(i | F) = [p(i | I)R - r(j)]I - \pi(F) - \kappa(j)S,$$

(2)

where $r(j)$ and $\kappa(j)$ represent the cost of funds and screening for lender $j$; $I$ represents the amount of financing associated with contract $F$; and $S = 0$ for unscreened contracts and equals one otherwise.

Finally, let $\chi(F, \mathcal{F})$ be the set of firm types that accept the contract offer $F$ when the set of available financial contracts is $\mathcal{F}$. In other words, $i \in \chi(F, \mathcal{F})$ if and only if $f(i) = F$. Given this, the economy’s equilibrium is formally defined as

**Definition of Equilibrium:** A strategy configuration, $f(i)$ for each firm $i \in E$ and $\mathcal{F}$ implied by $F_j$ for each lender $j \in L$, constitutes equilibrium if and only if

(1) given $\mathcal{F}$, each firm $i \in E$ chooses $f(i) \in \mathcal{F}$ to maximize $\pi(f)$;

(2) each lender $j \in L$ chooses $F_j$ to maximize $\int_{i \in \chi(F_j, \mathcal{F})} \Pi_j(i | F_j)di$, where $i \in \chi(F_j, \mathcal{F})$ is
given by condition 1; and

(3) because of free entry, each lender makes zero profits,

\[
\int_{X(F_i)} \prod_j (i \mid F_j) di = 0.
\]

The intuition for the equilibrium is as follows. The first condition states that, given the set of all available contracts offered by lenders, each firm in the economy is choosing the financial contract that maximizes their expected profits. The second condition states that, given each firm’s optimal contract choice from the available menu of contracts offered by all lenders, each lender is offering a menu of contracts that maximizes their own expected profits. In other words, no individual lender can improve their own profitability by deviating and offering a different set of contracts to firms. The third condition arises from free entry; all lenders make zero expected profits in equilibrium.

Before solving the equilibrium, it is first worth noting the two implicit assumptions being made in the model. These assumptions simplify the initial analysis but are not crucial to results.

First, I am assuming that all firms implement the project if they receive financing from a lender. In the absence of this assumption, lenders might have an incentive to offer a contract that actually pays bad firms to not implement the project. Whereas a contract that pays bad firms to do nothing can never be an equilibrium contract, because each individual lender could improve profitability by dropping the contract, this type of contract might be a profitable deviation for lenders in an equilibrium in which bad firms accept unscreened contracts and implement projects. Paying bad firms to do nothing may be less costly than allowing them to implement projects. In reality, this deviation is unlikely to be profitable because such payments for doing nothing would induce all individuals without projects to seek the same payoff. This can be easily captured by introducing a fourth type of firm that has no project. So long as the mass of these firms is sufficiently large, an unscreened contract that pays a positive amount to borrowers to take no action will not be feasible profitable deviation. A screened contract that pays bad firms to not implement a project will also not be a profitable deviation so long as the cost of screening exceeds the expected loss on bad firms.  

\[^9\] Acemoglu (1998) uses a similar method to eliminate these unrealistic types of contracts, and an extension of the model that relaxes this assumption about implementing projects is available from the author upon request.

\[^9\]
Second, I am implicitly assuming that lenders can fully commit to their financial contracts in two ways. (1) Lenders will always screen financial contracts of type $k \neq 0$. This eliminates lenders from deterring bad borrowers by declaring that all contracts will be screened, but not actually screening them. (2) Lenders can fully commit to the initial terms of any contract, $F$, and their initial menu of contracts, $F_j$. In other words, there is no possibility of renegotiation between lenders and firms after screening reveals a firm’s type, and hence firms will have no incentive to misrepresent their type when applying for a screened financial contract.

With a few extensions of the model, it can be shown that full commitment by lenders is an equilibrium strategy in a repeated game. In a repeated game, full commitment can be accomplished by assuming that firms observe whether lenders have violated full commitment in the past and by assuming that firms assign a nonzero probability of such lenders doing so again in the future. With these assumptions, deviations from full commitment, which can yield immediate gains, will attract applicants in the future that are ex ante unprofitable for the lender to do business with. The future cost of screening these unwanted applicants will exceed the immediate gains and prevent lenders from deviating. For example, consider an equilibrium in which bad firms are not financed and average and cream firms are offered screened contracts. If a lender deviates from full commitment and does not actually screen its average and cream applicants, it gains immediately by avoiding the screening costs. The cost, however, is that all bad firms will apply for the lender’s screened financial contract in the future because they assign a nonzero probability of the lender shirking again and their outside option is zero. Screening and turning away these bad firms in the future is costly, and the immediate gains from deviating from full commitment will be offset by these expected losses.10

2. Equilibrium prior to Entry

In an economy that consists of only domestic lenders, the domestic cost of screening, $\kappa$, will determine whether a pooling or separating equilibrium exists. Domestic lenders can always offer

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10 This repeated game extension is available from the author upon request.
cream firms a lucrative, screened contract of size $\lambda$ that provides expected profits of $\lambda(R - r) - \kappa$ to the firm. Although this contract clearly dominates any screened contract of size 1 for a cream firm, it may not dominate an unscreened contract. Unscreened contracts avoid the cost of screening, $\kappa$, but inevitably finance some negative NPV projects. When the cost of screening, $\kappa$, is sufficiently high, cream firms will prefer unscreened contracts being offered by domestic lenders, resulting in a pooling equilibrium in which all firms accept the same unscreened contract. And, when $\kappa$ is sufficiently low, cream firms prefer screened contracts, resulting in a separating equilibrium.

To simplify the equilibrium, I will assume there is a relatively small number of cream firms, such that lenders can never profitably pool just cream and bad firms together on an unscreened contract. This reduces the number of possible pooling equilibriums but does not qualitatively affect the subsequent results.\textsuperscript{11} This is accomplished with the following assumption:

$$\frac{\theta_b}{\theta_c} > \frac{(R - r)}{r - pR}.$$  \hspace{1cm} (A3)

This assumption ensures that for any unscreened contract, the net loss per unit of investment for bad firms, $\theta_b(r - pR)$, exceeds the net gain per unit of investment for cream firms, $\theta_c(R - r)$. This will hold whenever there is a significantly large ratio of bad to cream firms.

With the above assumption, the only possible pooling contract will be one that pools all firms onto the smaller project. The highest expected profits that such a contract can provide to cream firms is $R - r / [1 - (1 - p)\theta_b]$. Thus, when $\kappa > \kappa$, where $\kappa$ is defined by equation (3), the economy can exhibit a pooling equilibrium in which all firms prefer to accept a small unscreened contract of size 1. And, when $\kappa \leq \kappa$, the larger screened contract, which provides a payout, $\lambda(R - r) - \kappa$, is preferred by cream firms, resulting in a separating equilibrium in which cream firms prefer to take

\textsuperscript{11} Absent assumption (A3) and when $\lambda$ is sufficiently large, there will exist an unscreened contract that pools firms onto the larger project. But, similar to the smaller pooling contract, this larger pooling contract only exists in equilibrium if the cost of screening is sufficiently high that lenders cannot profitably offer a large, screened contract that is preferred by cream firms. For this reason, subsequent findings on the impact of foreign entry are similar when a domestic economy starts from such a pooling equilibrium; foreign entry still increases the likelihood of a separating equilibrium where average firms go unfinanced. However, one difference with this pooling equilibrium is that foreign entry does not have the potential to increase the output of cream firms.
screened contracts for the larger investment.\textsuperscript{12} 

\[ \kappa \equiv \lambda (R - r) - \left( R - \frac{r}{1 - (1 - p) \theta_h} \right) \]  

(3)

The range of screening costs when a separating equilibrium occurs, \( \kappa \leq \kappa \), will be higher when the amount of capital, \( \lambda \), and return, \( R \), of a cream firm’s investment is larger. This will increase the attractiveness of a screened contract to cream firms. An increase in the number of bad firms, \( \theta_h \), or a reduction in their probability of success, \( p \), will increase the cost of the pooling contract, also increasing the chance of a separating equilibrium. The outcome for average and bad firms in a separating equilibrium will depend on whether an unscreened contract that pools just bad and average firms is feasible or whether it is feasible for lenders to screen average firms.

The more intriguing equilibrium is the potential pooling equilibrium for \( \kappa > \kappa \). The pooling equilibrium always fails to achieve the first-best allocation because cream firms fail to take on larger projects, and bad firms are financed for negative NPV investments. Funds diverted away from bad firms toward larger projects for cream firms would increase net output, and there is a potential for the entry of new lenders, with a different comparative advantage, to increase overall output. The pooling equilibrium will exist if domestic lenders can profitably pool all borrowers, which is true when \( r / [1 - (1 - p) \theta_h] \leq R \), and there does not exist any other contract capable of enticing cream firms away from the unscreened contract (i.e., \( \kappa > \kappa \)). This equilibrium is described in Proposition 1.

**Proposition 1.** In an economy with only domestic lenders, where \( \kappa > \kappa \) and \( r / [1 - (1 - p) \theta_h] \leq R \), there exists an unique equilibrium in which all firms accept an unscreened financial contract of size \( I = 1 \) with payoffs

\[
F(Y) = \begin{cases} 
R - r / (1 - (1 - p) \theta_h) & \text{if } Y = R \\
0 & \text{otherwise} 
\end{cases}
\]

The equilibrium contract can be interpreted as a debt contract. Firms receive nothing in

\textsuperscript{12} Because they can successfully invest larger amounts of capital, cream firms, rather than average firms, are always the firms that lenders can most easily entice to take a screened contract, thus initiating a separating equilibrium.
failure but receive a positive payoff in success, with an implicit interest of \( r / (1 - (1 - p)\theta_b) > r \). This interest rate is just enough to offset lenders' expected losses on the fraction \((1 - p)\theta_b\) of projects that will be taken by bad firms and subsequently fail. A proof of Proposition 1 is found in the Appendix.

In the context of opening capital markets, the pooling equilibrium appears to capture economic characteristics often used to motivate financial liberalization in LDCs. There is an overfinancing of bad firms and underfinancing of good firms. Moreover, the pooling equilibrium occurs when information asymmetries are large and the cost of screening is high, which is a common characteristic of emerging economies (Aleem, 1990). Empirical evidence also suggests a lack of screening done by domestic lenders in many emerging markets.13 Given this, I will now analyze the impact of allowing foreign lenders to enter an economy that exhibits a pooling equilibrium.

3. Equilibrium after Entry

The equilibrium with both foreign and domestic lenders also depends on the cost of screening borrowers, but it now depends on both the foreign and domestic cost of screening. Foreign entry has no effect on the pooling equilibrium allocation of credit described in Proposition 1 if foreign lenders’ cost of screening firms is prohibitively expensive, such that \( \kappa > \bar{\kappa} \), where

\[
\bar{\kappa} = \lambda (R - r^*) - \left( R - \frac{r^*}{1 - (1 - p)\theta_b} \right).
\] (4)

This threshold \( \bar{\kappa} \) is similar to that of the economy with only domestic lenders, but now the threshold is determined by foreign lenders’ cost of funds, \( r^* \), and screening, \( \kappa^* \), because, by assumption (A2), they enjoy a comparative advantage in financing cream firms. When foreign lenders’ cost of capital is sufficiently low, such that \( \kappa^* \leq \bar{\kappa} \), foreign lenders induce cream firms in a domestic pooling equilibrium to undertake larger projects by offering them more competitive contracts for larger projects. They can accomplish this despite their higher cost of screening because of their lower

13 For an example involving banks in India, see Banerjee, Duflo, and Cole (2005). Gormley, Johnson, and Rhee (2011) also provide suggestive evidence that Korean bond holders did not screen their investments in 1998.
marginal cost of funds and the fixed nature of screening costs. This result is stated formally in Proposition 2, and the proof is provided in the Appendix.

Proposition 2. In an economy with both foreign and domestic lenders, where $\kappa > \kappa^*$ and $\kappa' \leq \overline{\kappa}$, foreign entry causes a switch from a pooling equilibrium to a separating equilibrium in which all cream firms accept large screened contracts of size $\lambda$ offered by foreign lenders. If $\kappa' > \overline{\kappa}$, only a pooling equilibrium exists.

The entry of foreign lenders and a switch from a pooling equilibrium to a separating equilibrium benefits cream firms with more lucrative contracts and increases their output. The switch away from the pooling equilibrium, however, will not necessarily benefit average firms that only implement projects of size 1 with certain success. Their outcome will be determined by whether it is feasible for either a domestic or foreign lender to finance them in a separating equilibrium.

If average firms are financed in a separating equilibrium, then this will either occur through a screened contract from domestic lenders or an unscreened contract of size 1 from foreign lenders. By assumption (A1), domestic lenders maintain a competitive advantage in screening average firms and can offer the most competitive screening contract to these firms. The only way foreign lenders would finance average firms is if they can offer a more competitive unscreened contract that pools average firms with bad firms. If either of these contracts, the screened contract of size 1 from domestic lenders or the unscreened contract from foreign lenders, is feasible, then the average firms will continue to be financed and equilibrium output unambiguously increases with foreign entry.

It is possible, however, that neither of these contracts will be feasible. If $R - r - \kappa < 0$, then domestic lenders cannot profitably screen average firms in the separating equilibrium. And, if $\theta_b(r^* - \rho R) > \theta_d(R - r^*)$, foreign lenders cannot profitably offer an unscreened contract that pools average and bad firms. The expected profits from average firms, $\theta_d(R - r^*)$, would not be enough to offset the expected losses on bad firms, $\theta_b(r^* - \rho R)$. If both these conditions hold, only cream firms will be financed in the separating equilibrium. Although average firms do have positive NPV
projects, they will not be financed because continuing to pool them with bad firms is no longer profitable, and both domestic and foreign lenders’ find it too costly to screen them.

In a separating equilibrium in which neither average nor bad firms are financed, the overall impact on net output will depend on the relative gains and losses from foreign entry. The entry of foreign lenders will entice cream firms to take on larger projects. This increases net output by 
\[ \lambda(R - r^*) - \kappa^* - (R - r)\theta_c. \]
Additionally, the inability of bad firms to obtain financing through an unscreened contract avoids \((r - pR)\theta_h\) in expected losses, further improving net output. But, the inability of average firms to obtain financing causes a loss in net output of \(\lambda(R - r)\theta_c\). This suggests a possible decline in output, which is described in Proposition 3 and proven in the Appendix.\(^{14}\)

**Proposition 3.** In an economy that switches from the pooling equilibrium with domestic lenders to the separating equilibrium with foreign lenders and no financing of average and bad firms, net output will decline when
\[ (R - r)\theta_c > \left( [\lambda(R - r^*) - \kappa^* - (R - r)]\theta_c + (r - pR)\theta_h. \]

Proposition 3 suggests that a drop in net output following foreign entry is more likely when there is a relatively larger mass of average firms no longer being financed in the separating equilibrium. The drop in net output is also more likely when there is a small mass of cream firms benefitting from foreign entry or when their amount of additional investment, \(\lambda - 1\), is not very large. The drop in net output, however, is less likely if there is a large mass of bad firms no longer financed or the expected losses from financing bad firms, \((r - pR)\), is large.

The potential drop in output can be considerable, as illustrated in the following numerical example: Suppose successful projects yield a 15\% return \((R = 1.15)\) and that cream firms are able to implement projects four times as large \((\lambda = 4)\). Cream firms represent one-fifth of the firms

\(^{14}\) When a decline in net output occurs in the open economy, the separating equilibrium allocation is always constrained inefficient, and the pooling equilibrium is always constrained efficient. Because of this, it is possible to use a mechanism design approach to analyze potential welfare-maximizing policies for economies that experience a decline in net output after additional lender entry. In particular, it is possible to show that there exists a revenue-neutral policy that will improve net output by subsidizing the cost of capital lent for projects in the economy and taxing the returns on these projects. Taxing project returns can be used to implement the constrained efficient pooling equilibrium by providing a relative disincentive for cream firms to accept a larger screened contract.
\( (\theta_c = 1 / 5) \), whereas the other firms are split equally between average and bad \( (\theta_a = \theta_b = 2 / 5) \).

Projects of bad firms only succeed with 75% probability \( (p = 0.75) \). Domestic lenders cost of funds is 3\% \( (r = 1.03) \), whereas foreign lenders cost of funds is only 2\% \( (r^* = 1.02) \). Under this setup, just a small difference in screening costs for the two types of lenders will generate differing comparative advantages and a drop in output. For example, if \( \kappa = 0.48 \) and \( \kappa^* = 0.50 \), foreign entry will cause a shift from a pooling equilibrium to a separating equilibrium, and net output will decline by 20\%.

4. **Comparative Analysis and Implications**

The model provides a relatively simple explanation as to why entry by additional lenders may not necessarily increase overall output. In markets with significant costs to screening projects, lenders may choose to pool risks and cross-subsidize losses on low-return firms with gains on high-return firms rather than invest in costly screening technologies. Whereas new lenders may be even less effective at screening firms, a comparative advantage in funding costs may allow them to offer a more competitive contract to firms capable of investing large amounts of capital. Therefore, their entry can increase output by inducing these firms to take on larger projects, but at the same time, investment may be declining for other borrowers with positive NPV projects if incumbent lenders cannot profitably screen the remaining pool of borrowers that are not targeted by the new lenders. This potential for a decline in credit access and output is not found in existing models of competition between lenders with different comparative advantages in screening; these models find that entry will improve credit access for all firms (Dell’Ariccia and Marquez, 2004; Sengupta, 2007).15

At the same time, the model suggests that the inconclusive evidence pertaining to financial liberalization may also be the consequence of differences in the underlying fundamentals. In the model, two key factors were necessary for additional entry to reduce net output: the inability of

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15 The key reason for this different outcome is their assumption that incumbent lenders have perfect information about borrower types, whereas entering lenders have no information. The importance of these assumptions can be illustrated using a modified version of the model, where, similar to Dell’Ariccia and Marquez (2004), screening is always ineffectual for a fraction \( \alpha \) of the bad and average firms. Versions of Propositions 1–4 will still hold in this modified model, but as \( \kappa \) goes to zero and \( \kappa^* \) goes to infinity, the impact of foreign entry instead resembles that of Dell’Ariccia and Marquez (2004) in that no firm is worse off because of segmentation.
average firms to obtain financing in a separating equilibrium and a relatively small number of cream firms that benefit from entry of the new lender. By analyzing the conditions under which these two factors might hold, the model is able to provide a number of predictions as to when the entry of new lenders will adversely affect net output and when it will not.

4.1 The Exit of Average Firms

The inability of average firms to obtain financing in a separating equilibrium occurs when domestic lenders are unable to profitably screen these firms and it is also unprofitable to pool firms not screened by foreign lenders. In particular, we have the following proposition:

Proposition 4. With foreign entry, net output will increase unless both of the following conditions are true:

(a) \[ \theta_b (r^* - pR) > \theta_A (R - r^*) , \]
(b) \[ r + \kappa > R . \]

Condition (a) of Proposition 4 states that there must be a sufficient number of bad firms seeking credit that it is unprofitable for lenders to pool only the bad and average firms onto an unscreened contract. Condition (b) states that the domestic lending costs, \( r \) and \( \kappa \), must be sufficiently high that domestic lenders also do not find it profitable to screen the average firms.

Condition (a) suggests that the impact of lender entry will depend on the distribution of firms and the expected of losses and gains of financing average and bad firms. A drop in net output and credit access is more likely in markets in which bad entrepreneurs represent a larger fraction of entrepreneurs (i.e., \( \theta_b / \theta_A \) is large), when the expected losses from financing a bad firm, \( r^* - pR , \) is high, or when the expected gain from financing an average firm, \( R - r^* \), is low. This might include industries that represent new product markets, where there are many entrants but only a handful of firms that eventually achieve success. This might also include industries with significant entry costs, where losses on bad investments are likely to be large and the gains from success are small.

Condition (b) suggests that costs for incumbent lenders will also be important. Industries in which it is easier for lenders to assess a borrower’s potential (i.e., low \( \kappa \)), will experience an increase
in net output after additional lender entry. This might include mature industries, industries that rely less heavily on intangible assets, and industries with less uncertain growth prospects. Low screening costs might also be driven by country-level factors. In countries with nontransparent accounting rules or weak auditing enforcement standards, the cost of screening is likely more because lenders cannot place as much confidence in the information contained in firm’s financial statements and must engage in the costly collection of additional information.

4.2 The Extent of Cream Skimming

A second factor that is needed for a decline in net output is that the gain in output from firms taking on larger loans from new lenders be less than the loss in output from firms no longer financed in the separating equilibrium. As shown in Proposition 3, an increase in the number of firms for which entering lenders can offer more competitive contracts, $\theta_c$, and a decrease in the number of firms they cannot, $\theta_A$, would increase the likelihood of net output rising.

Whereas the ratio of these firms is given exogenously in the model, it is implicitly determined by entering lenders’ screening cost, $\kappa^*$, and the distribution of project sizes, $I$. Entering lenders enjoy a comparative advantage when their per unit cost of financing a firm, $r^* + \kappa^* / I$, is less than incumbent lenders’ per unit cost, $r + \kappa / I$, which can be rewritten as $I > (\kappa^* - \kappa) / (r^* - r)$. In a model with a more general distribution of possible investment sizes, $I$, the number of firms that will have projects of sufficient size $I > (\kappa^* - \kappa) / (r^* - r)$ to receive a larger loan from the entering lender will increase as $\kappa^*$ declines. Thus, a lower $\kappa^*$ increases the number for firms that will take on larger loans following additional lender entry and reduces the likelihood that net output declines.

Because $\kappa^*$ may reflect industry- and country-specific factors, we would again expect the impact of additional lender entry on net output to vary across industries and countries. In industries or countries in which it is costly to screen a borrower’s potential, lender entry would be more likely limited to a handful of firms, reducing the likelihood of an increase in net output following entry.
5. Robustness and Extensions

This section will discuss the robustness of the model’s main implications. First, I will extend the model by allowing domestic and foreign lenders to cooperate (i.e., merge) and demonstrate that this will not affect the main findings. Second, I will show that the findings are robust to more general assumptions regarding the distribution of firm types in regard to size and profitability of projects.

5.1 Cooperation among Lenders

If incumbent and entering lenders are able to cooperate, such that entering lenders provide the capital and incumbent lenders provide the screening, the parameter space under which a decline in net output can occur is reduced. In practice, such cooperation might be accomplished through syndicated lending or when new lenders enter the market by acquiring or merging with an incumbent lender. A combination of costs would also occur if incumbent lenders gain access to the lower cost of capital. By combining the cost advantage of each lender, this cooperation minimizes the per unit cost of screening and financing firms, reducing the likelihood that no lender finds it profitable to screen and finance average firms in the separating equilibrium. More specifically, Proposition 4, Condition (b), would now be given by \( r^* + \kappa > R \) instead of \( r + \kappa > R \). Given \( r^* < r \), this new condition, which is necessary for a decline in net output, is less likely to be satisfied for a given combination of the parameters \( \kappa \) and \( R \). Thus, cooperation among lenders would reduce the likelihood that entry causes a decline in net output.

Cooperation among lenders, however, does not eliminate the possibility of a decline in output. None of the parameter restrictions prevent the modified condition (b) of Proposition 4 from holding, and it is easily seen that net output would still decline in the earlier numerical example even if lenders are allowed to combine their costs advantages after entry. In other words, it is not the segmentation on the supply side of the lending market that drives the possible decline in net output; instead, it is introduction of a new lending cost structure that creates this possibility.

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17 This might occur if foreign entry coincides with other reforms that foster domestic lenders’ access to international capital markets or if entry results in a transfer of technology to incumbent lenders, as suggested by Levine (1996).
The potential merger of lender attributes also yields dynamic implications. If the entering lenders’ cost of screening, $\kappa^*$, declines with time (either through mergers or through the accumulation of local knowledge), the set of firms they can profitably screen and offer larger loans to may broaden with time. Eventually, the entering lender may become just as effective as incumbent lenders in screening firms such that $\kappa^* = \kappa$. If $\kappa^*$ eventually falls such that $r^* + \kappa^* \leq R$, then all firms with positive NPV projects will be financed by the new lenders in the long run. Therefore, an initial decline in credit access and net output may be temporary. But again, if $r^* + \kappa > R$, then even if entering lenders become equally effective at screening, such that $\kappa^* = \kappa$, they will still not find it profitable to screen average firms and the initial decline in net output would persist.

5.2 Distribution of Firms and Endogenizing the “Size” of Projects

The basic mechanisms of the model are also robust to allowing for a richer distribution of firms with varying project sizes, $\lambda$, and returns, $R$. In such a model, the screening cost thresholds, $\kappa$ and $\bar{\kappa}$, would simply become firm specific. For instance, a cream firm, $i$, with a project of size $\lambda(i)$ and return $R(i)$, such that $\kappa(i) \geq \kappa$, would be screened and financed fully in the economy without foreign lenders. And, all cream firms with smaller projects or returns, such that $\kappa(i) < \kappa$, will be pooled with average and bad firms. Again, foreign entry has the potential to unravel the pooling equilibrium as foreign lenders’ lower cost of funds might allow them to target a larger set of cream firms and reduce the number of firms pooled by domestic lenders.

The assumption that cream firms can successfully invest larger amounts of capital than average firms can also be generated endogenously in a credit model with ex post moral hazard. In particular, the following assumptions could be added to the model: Firms may now invest capital in any amount $I \in [1, \infty]$, and all firms begin with some nonzero amount of wealth, $W \in (0,1)$, that can be used toward the investment. The assumption that initial wealth is less than one is necessary to ensure that firms still need to borrow to invest. Firms borrowing money will suffer from a moral hazard problem in that they have the ability to abscond with the borrowed money, $I - W$, and their
own wealth, $W'$, rather than invest. Absconding succeeds with probability $\tau$, providing a payoff $I$, and with probability $1-\tau$, they are caught and receive a zero payoff.

With this setup, the financial contracts of lenders, $F$, must now also satisfy the below incentive compatibility constraint of the firm:\hspace{1em}

$$p(i|I) F(RI) + (1-p(i|I)) F(0) > \tau I.$$  

(5)

This condition states that the expected return to firm of type $i$, investing an amount $I$ under a financial contract $F$, needs to exceed to the expected return of absconding. When financial contracts have a debt component, this constraint will endogenously place an upper bound on how levered, $I/W'$, lenders will allow firms to become and hence the amount of capital, $I$, that firms can invest. If a lender allows a firm to borrow too much, the firm will prefer to abscond with the money.

Importantly, the upper bound on $I$ will be increasing in the return, $R$. So, if cream firms generate a higher expected return on their projects, this will endogenously generate a cream firm's ability to invest larger amounts of capital. To see this, the above expression can be rewritten assuming that the lender offers a debt contract with interest rate $r_d$ and the firm's probability of success, $p(i|I)$, equals one. The constraint is now

$$RI - r_d (I - W') > \tau I.$$  

(6)

This constraint can then be rewritten as an upper bound on the amount firms can invest,

$$r_d W' / (\tau - R + r_d),$$

which is increasing the firms initial wealth, $W'$, and expected return, $R$.

6. **Empirical Evidence**

This section discusses the empirical evidence underlying the model's key assumptions about the comparative advantages of foreign and domestic lenders. The section also discusses the model's testable predictions and how they relate to the existing empirical evidence regarding foreign lender

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\footnote{The contracts must also now satisfy a slightly different participation constraint in that a firm's outside option is now their initial wealth, $W'$, rather than zero. This change does not qualitatively affect the model.}

\footnote{This upper bound on $I$ assumes that the per unit expected return of absconding, $\tau$, exceeds the per unit expected return of borrowing for the firm, $R - r_d$.}
entry into LDCs and subsequent changes in local credit and output growth.

6.1 Empirical Support for Assumptions

The key assumption of the model is that foreign lender entry coincides with the arrival of a new lending cost structure that has the potential to break a domestic pooling equilibrium. In the model, this is accomplished through the entry of a foreign lender that is assumed to have a higher cost of screening but a lower marginal cost of funds than the incumbent lenders.

The assumption that screening costs are higher for foreign lenders is widely supported by existing empirical evidence. A greater distance between lender and borrower—where distance is broadly defined to include hierarchical, geographical, and cultural distance—can increase a lenders’ cost of acquiring information and is a key feature of foreign lending (Berger, Klapper, and Udell, 2001). For example, Stein (2002) demonstrates that the greater hierarchical structure of foreign lenders can make it more costly for them to use the “soft information” necessary to screen firms, and Petersen and Rajan (2002) note that the cost of acquiring information about borrowers likely increases with the geographical distance between the lender and borrower. Consistent with informational costs associated with distance being particularly salient for foreign lenders, Mian (2006) finds evidence that distance barriers for foreign banks operating in Pakistan are sufficiently large to exclude them from certain sectors of the economy entirely, and Buch (2005) finds a negative correlation between distance and the international banking activities of banks located in France, Germany, Italy, United Kingdom, and the United States. Recent work on lending relationships and loan prices in Belgium, Italy, and the United States also suggest that greater lending distances are associated with increased transportation and informational costs for lenders (Degryse and Ongena, 2005; Mistrulli and Casolaro, 2008; Agarwal and Hauswald, 2010).

The second assumption that foreign lenders enjoy a lower cost of funds is also supported by existing evidence. Within-country comparisons suggest that foreign banks have, on average, lower interest expenses, overhead costs, and total employment per unit of assets relative to their domestic counterparts, particularly in LDCs (Mian, 2003; Micco, Panizza, and Yañez, 2007). There are a variety
of reasons why foreign banks may enjoy a cost of funds advantage. Foreign lenders are often less beholden to local laws and labor unions than domestic lenders, making it less costly for them to expand operations and raise additional funds in the domestic economy.\textsuperscript{20} Foreign banks might also enjoy a comparative advantage in raising capital. Foreign banks may be able to raise capital locally at a lower cost because investors in LDCs perceive foreign banks as safer because they are backed by a large, foreign affiliate (Mian, 2003) and less likely to make political loans (Micco, Panizza, and Yañez, 2007). Well-developed securities markets and better institutions in the home countries of foreign lenders may also provide them access to cheaper sources of capital.

\subsection*{6.2 Testable Implications and Evidence}

The model generates a number of testable predictions regarding the impact of foreign entry.

(P1) Foreign entry can lead to a segmented credit market in which foreign lenders only target the largest, most profitable, and least-informationally opaque firms.

(P2) Net output can decline when foreign lenders cream skim (i.e., target a small subset of large, profitable firms), and domestic lenders respond by reducing their lending to a broad set of firms, including firms with positive NPV investments (see Proposition 3).

(P3) Cream skimming by foreign lenders (and a decline in net output) is \textit{less} likely to occur when foreign lenders’ screening costs are low (see Section 4.2). In practice, many factors might reduce the screening cost of foreign lenders; examples include

a. an ability to merge with or acquire a domestic lender or time spent (and local knowledge gained) in a country (see Section 5.1), and

b. strong country-level institutions (e.g., countries with transparent accounting rules and strong auditing enforcement standards).

(P4) A broad curtailment of lending by domestic lenders (and a decline in net output) is \textit{less} likely to occur when any of the following conditions hold:

\textsuperscript{20} For example, by sidestepping local unions in India, foreign banks are able to hire fewer workers and pay a lower average wage bill per deposit collected relative to domestic banks (Hanson, 2003). This provides them a competitive advantage in establishing additional branches from which they can raise new deposits.
a. the domestic cost of screening is lower (see Proposition 4b); for example, in
countries with strong institutions or in industries with easier to value assets,
b. ratio of bad to average firms is lower (see Proposition 4a); for example, in older,
more established industries in which the number of likely failures is lower, and
c. expected losses on bad investments are low or expected profits from average (not
cream skimmed) investments are high (see Proposition 4a).

(P5) To obtain a competitive advantage, foreign and domestic lenders will prefer to merge,
and a decline in net output is less likely to occur when mergers occur (see Section 5.1).

Many of these predictions map closely to the broad, existing empirical evidence regarding the
effects of financial liberalization on growth and output, whereas other predictions have yet to be
formally studied. The remainder of this paper discusses this evidence and proposes areas that are
promising directions for future empirical research on financial liberalization.

6.2.1 Evidence on Segmentation and Acquisitions

There is broad empirical support for the model’s prediction that foreign lenders cream skim
the least informationally opaque, largest, and most profitable firms (Prediction P1). Mian (2006) finds
that foreign banks in Pakistan tend to avoid loans that are typically associated with acquiring soft
information, such as loans to small firms and first-time borrowers, whereas Gormley (2010) finds that
foreign banks in India only lent to a small subset of the largest, most profitable firms. In particular,
only the top 10% of firms, in terms of profitability, appear to experience an increase in bank loans
following foreign lender entry in India. Other papers find that foreign banks are less likely to lend to
small, informationally opaque firms in Latin America (Berger, Klapper and Udell, 2001; Clarke, Cull,
Peria, and Sánchez, 2005), that small firms in Eastern Europe appear to benefit less from foreign
entry (Giannetti and Ongena, 2009), and that foreign lenders shy away from lower-quality firms with
past delinquencies (Berger, Klapper, and Udell, 2001).

There is also evidence to support the prediction that, by lowering foreign lenders’ cost of
screening, acquisitions of domestic lenders will be a preferred mode of entry and allow foreign banks
to target a larger share of the lending market (Prediction P3a). Anecdotally, countries that allow foreign banks to acquire domestic banks tend to experience a subsequent wave of acquisitions. For example, Mexico first allowed foreign banks to purchase controlling stakes in its largest banks in 1997, and the foreign ownership of banking assets quickly increased from 16% in 1997 to 82% in 2004 (Haber and Musacchio, 2004). A more limited type of entry tends to occur when countries prohibit such acquisitions. For example, when India allowed the entry of new foreign banks in 1994, entry was largely limited to green field investments, and as of 2009, foreign banks only owned about 5% of the banking assets in India (Gormley, 2010). And consistent with acquisitions lowering the cost of screening and allowing foreign lenders to target more firms, Degryse, Havrylchyk, Jurzyk, and Kozak (2012) find that foreign banks that enter via acquisition finance more informationally-opaque firms relative to foreign banks that enter via greenfield investments.

Cross-country comparisons of foreign bank ownership and the mode of foreign entry further support the potential importance of acquisitions in reducing segmentation of the credit market. To illustrate this, I use the data on bank ownership in 105 LDCs that was compiled by Claessens and van Horen (2012a). In the Claessens and van Horen data, foreign bank entry is observed in 92 of the 103 LDCs by 2003, and entry via acquisition is observed in 63 of those 92 countries. In LDCs in which entry via acquisitions is allowed, foreign banks control, on average, 42.9% of the banking assets between 1995 and 2003, and more than half of these assets were acquired via an acquisition. However, in LDCs in which no acquisitions are observed (and likely not allowed), foreign ownership is considerably less. In these countries, foreign banks only own, on average, 35.9% of the banking

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21 These types of restrictions are often put in place because domestic politicians worry about preserving financial stability and about allowing a majority of the country’s banking assets to be suddenly acquired by foreigners. I thank Stijn Claessens and Neeltje van Horen for providing me a country-year aggregated version of their data. The Claessens and van Horen (2012a) data provides the share of banking assets held by foreign banks for 137 countries between 1995 and 2009, where foreign ownership is further broken down between assets acquired via acquisition and assets acquired by green field investments for the subset of years 1995 through 2003. A bank is defined as foreign-owned if 50% or more of its shares are held by foreign nationals in a given year, and a country is classified as a LDC if it is not an OECD country and not classified as a high-income country by the World Bank in 2000. Further details on how this dataset was constructed can be found in Claessens and van Horen (2012a). Unfortunately, there is no readily available data on which countries explicitly forbade foreign lenders from acquiring a controlling stake in a local lender between 1995 and 2003. For this reason, I just use the absence of any acquisition in the Claessens and van Horen (2012a) data as a proxy for when such acquisitions are likely prohibited.
assets; the difference in ownership levels is statistically significant at the 1% level ($p$-value = 0.004). A lack of acquisitions is also highly correlated with a limited entry by foreign banks. As of 2003, foreign banks control less than 5% of the banking assets in 20% of the LDCs in which no acquisitions are observed, whereas this type of limited entry occurs in just 3% of countries that allow mergers. The difference is statistically significant at the 1% level ($p$-value = 0.007).

6.2.2 Evidence on Heterogeneity of Foreign Entry’s Impact

The model’s prediction regarding the potential negative impact of foreign entry on overall output and growth (Prediction P2) fits well in the context of the existing empirical literature. To date, many studies find no clear impact of foreign lender entry on overall credit, output, and growth (e.g., Rodrik, 1998; Arteta, Eichengreen, and Wyplosz, 2001; Edison, Levine, Ricci, and Slok, 2003) while others find the impact is negative (e.g., Detragiache, Gupta, and Tressel, 2008; Beck and Peria, 2010; Gormley, 2010). Moreover, in country-specific studies in which foreign entry was found to reduce overall credit, the evidence seems to confirm the model’s prediction that this will coincide with cream skimming by foreign lenders and a sharp decline in lending by domestic banks. Analyzing foreign lender entry into India following its liberalization in 1994, Gormley (2010) found that the new foreign banks only lent to a small subset of the most profitable firms and that domestic lenders responded to their entry by sharply curtailing their lending to all firms, not just the most profitable firms targeted by the new foreign lenders. On net, Gormley found there was a decline in overall credit in Indian districts in which foreign bank entry occurred relative to districts in which no entry occurred.

A comparison of foreign lender entry and subsequent economic growth across countries also conforms to the model’s prediction that growth is more likely to decline following liberalization events where the subsequent entry of foreign banks is limited to cream skimming (Prediction P3). To demonstrate this, the following country-level panel specification is estimated:

$$
\text{growth}_{c,t} = \beta_1 \text{entry}_{c,t} + \beta_2 \left( \text{entry}_{c,t} \times \text{segmented}_{c,t} \right) + \alpha_t + \delta_c + \epsilon_{c,t},
$$

(E1)

where $\text{growth}_{c,t}$ is the growth rate (%) of real per capital gross domestic product (GDP) in country $c$ in year $t$; $\text{entry}_{c,t}$ is an indicator that equals one if foreign banks own assets in country $c$ by year $t$; and
*segmented*, is an indicator that equals one if the ownership of banking assets by foreign banks is less than 5% of total assets. Per capita growth is obtained from the World Bank’s DataBank, whereas *entry* and *segmented* are constructed from the Claessens and van Horen database described earlier. The estimation also includes country fixed effects, $\alpha_i$, to control for time-invariant differences in average growth rates across countries, and year fixed effects, $\delta_t$, to control for trends in economic growth over time. The estimation is conducted using data from 1995 through 2009 for LDCs, and the standard errors are clustered at the country level. Table 1 presents the estimates of equation (E1).

Consistent with the model’s prediction, a limited entry via foreign lenders is more likely to be associated with a subsequent decline in economic growth. On average, there is little correlation between foreign bank entry and economic growth; the growth rate of per capita GDP is 0.61 percentage points lower after foreign entry, but the effect is not statistically significant (Table 1, Column 1). This is consistent with other studies that find little evidence of a correlation between foreign bank entry and subsequent growth. However, in countries in which the foreign ownership of banking assets is less than 5% (i.e., as might occur with cream skimming), there is a strong, negative relationship between foreign lender entry and subsequent growth. In particular, the growth rate of per capita GDP is $0.23 + 0.93 = 1.16$ percentage points lower after these limited foreign lender entries, and the decline is statistically significant at the 10% level (Column 2). The findings are qualitatively similar when using other thresholds of limited foreign entry, including 2.5% and 7.5% of assets, and to using the growth rate of overall GDP (Column 6).

Country-specific studies also provide suggestive support to the model’s prediction that mergers between foreign and domestic lenders will increase the probability of positive impact on output and credit (Prediction P5). In a study of foreign lenders’ entry in Eastern Europe, where foreign acquisitions were allowed and widespread, Giannetti and Ongena (2009) found a positive

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*Caution is warranted in interpreting the estimates of Table 1. Whereas the estimations do include both country and year fixed effects, they do not control for any time-varying, confounding factors that might be correlated with foreign lender entry. The correlations here are presented just as suggestive evidence regarding the plausibility of the model’s underlying mechanism. A more rigorous testing of these predictions, along with other predictions of the model, provides a promising avenue for future research. This is discussed further in Section 6.2.4.*
effect on growth, whereas in a study of foreign lender entry in India, where such acquisitions were prohibited, Gormley (2010) found evidence of a decline in credit access for many firms.

A positive relationship between foreign entry via acquisition and subsequent growth also holds across countries. To illustrate this, the following cross-country panel specification is estimated:

\[
growth_{c,t} = \beta_{\text{entry}_{c,t}} + \beta_{\left(\text{entry}_{c,t} \times M \& A\right)} + \alpha_{c} + \delta_{t} + \epsilon_{c,t},
\]

where \( M \& A \) is an indicator that equals one if some of the foreign lender assets in country \( c \) were obtained via an acquisition. Similar to before, country and year fixed effects are included, and standard errors are clustered at the country level. The sample size, however, is smaller than before because the Claessens and van Horen data only breaks down foreign bank ownership between assets obtained by acquisition versus greenfield investments for the years 1995 through 2003. The estimates of equation (E2) are reported in Table 1, Columns 3 and 7.

Consistent with the model’s prediction, foreign lender entry that occurs via acquisition is more likely to be associated with a subsequent increase in growth. On average, the growth rate of per capita GDP is 1.62 percentages lower in countries in which entry occurs without any acquisitions (Table 1, Column 3), but the decline is not statistically significant (\( p \)-value = 0.21). The growth rate is higher, however, in countries in which foreign entry occurs via acquisition. Entry via acquisition is associated with a 4.74 percentage point higher growth rate relative to entry via greenfield investments, and the difference is statistically significant at the 1\% level. And, on net, foreign entry via acquisition is associated with a 3.12 percentage point increase in growth. Again, the findings are robust to instead using the growth of overall GDP (Column 7).

6.2.3 Quality of Local Institutions and Impact of Liberalization

The model’s prediction regarding the importance of local institutions (Predictions P3b and P4a) also has the potential to explain a number of existing empirical patterns regarding the impact of

\[\text{\footnote{Using variation across both industries and countries, Bruno and Hauswald (2011) provide even more evidence regarding the potential importance of acquisitions. Comparing outcomes across industries that are more- and less-dependent on external financing, they find that increases in foreign bank ownership driven by acquisitions are positively related to a relatively larger increase in economic growth in industries more dependent on external financing; increases in ownership driven by greenfield investments are not associated with changes in growth.}}\]
financial liberalization. Capital account liberalization tends to be positively associated with subsequent economic growth in high-income countries, where quality of accounting and auditing standards is likely greater, while negatively related to growth in low-income countries, where accounting standards are likely weaker (e.g., see Quinn, 2000; Edwards, 2001). Likewise, foreign bank entry in low-income countries is often associated with a decline in private credit and lending by domestic institutions (Detragiache, Tressel, and Gupta, 2008; Gormley, 2010).

A number of studies also find that opening capital markets and domestic financial liberalization is only associated with a positive impact on growth in countries with greater law and order traditions or better legal protections for creditors, both of which are likely positively correlated with stronger enforcement of accounting standards (e.g., see Arteta, Eichengreen, and Wyplosz, 2001; Galindo, Micco, and Ordoñez, 2002). A similar correlation also holds between foreign bank entry and economic growth. This is shown in Table 1, Column 4. The per capita GDP growth rate is 1.63 percentages points higher following foreign bank entry in countries with an above average rule of law index measure in 1996, as calculated by the World Bank in its Worldwide Governance Indicators dataset. A similar correlation holds for the growth rate of GDP (Column 8).26

There is also direct evidence regarding the potential importance of accounting standards. In an analysis of equity market liberalizations, Bekaert, Harvey, and Lundblad (2005) find a large increase in economic growth for countries with an above-average accounting quality, but no increase in growth for countries with below average accounting standards.

6.2.4 Scope for Future Empirical Research

Whereas a number of the model’s predictions are consistent with the existing empirical literature, there are other predictions that have yet to be extensively studied.

For example, the model’s prediction that the effect of foreign entry on output may change over time (Prediction 3c) provides a promising avenue for future research on financial liberalization.

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26 There is also evidence that the quality of legal institutions is associated with less segmentation of the credit market following foreign lender entry (Prediction P3b). Foreign bank ownership is 3.4 percentage points higher in LDCs with an above average Rule of Law index (p-value = 0.063).
There is evidence that foreign bank profitability is higher the longer the bank has operated in a country (Claessens and van Horen, 2012b), that cream-skimming-type behavior is less likely to occur when a foreign lender expands its existing operations within a country (Gormley, 2010), and that foreign banks lend to more informationally-opaque borrowers as time passes (Degryse, Havrylchyk, Jurzyk, and Kozak, 2012), but, to the author’s knowledge, there is no direct analysis of whether the impact of foreign lender entry on overall credit, output, and growth changes with time after initial entry occurs.

The model also provides a number of predictions regarding how the effect of liberalization may vary across industries (Predictions P4a and P4b). For example, industries in which it is more difficult to screen the quality of projects or in which the likelihood of failure is greater, such as newer industries or industries with fewer tangible assets, might be more likely to be adversely affected by foreign lender entry. With the exception of Gormley (2010), who found that foreign entry in India was more likely to be associated with a subsequent decline in sales growth for industries with fewer tangible assets, there is very little existing evidence on whether financial liberalization has heterogeneous effects across industries.

7. Concluding Remarks

Emerging economies are often criticized for having financial sectors that seem to “overfinance” low-return projects and “underfinance” high-return projects. For this reason, and many others, it is typically argued that opening capital markets would improve credit access and overall output in these economies. However, the theory developed in this paper suggests that this type of domestic credit allocation may occur when information asymmetries are large and domestic lenders choose to pool risks rather than invest in costly screening technologies.

If true, foreign entry may take the form of cream skimming and adversely affect overall credit access. Foreign lenders’ use their lower cost of funds to offer more competitive financial contracts but only finance firms capable of profitably investing large amounts of capital because of their higher
cost of acquiring information about domestic firms. This type of entry may both redirect credit
toward the largest, most profitable firms in the economy and reduce the credit access of
informationally opaque firms with positive NPV projects that rely solely on domestic lenders. As a
result, the overall net output may decrease after foreign entry when information asymmetries are
sufficiently costly to overcome. The potential decline in output provides new insights to the
inconclusive relation between foreign lender entry and aggregate output.

More generally, the model illustrates a possible dark side to liberalization that has been
suggested by empirical evidence but is not well understood theoretically. The model is also able to
generate predictions of when a new lender’s entry will adversely affect credit access and net output.
The impact of the lender’s entry will depend on the distribution of firms, the comparative advantages
of competing lenders, the severity of information asymmetries, whether lenders are allowed to merge,
and the quality of local institutions. This yields a number of testable hypotheses on how the impact
of lender entry may vary by industry and country. Many of these predictions find substantial support
in the data, whereas others provide interesting avenues for future empirical research. The model also
provides an explanation for why existing empirical studies on the opening of capital markets, which
assume a uniform impact across countries and industries, fail to find consistent evidence.

The implications of the model are potentially quite broad. The findings hold for a very
general set of financial contracts, competitive environments, and distribution of firms. The findings
are also not sensitive to assumptions about lenders’ ability to coordinate so as to capitalize on each
lender’s comparative advantage. The model also broadens the set of scenarios in which increased
competition can facilitate the exit of seemingly more efficient lenders. The model suggests this exit
can occur even in already competitive markets or even when an incumbent lender does not face direct
competition for borrowers for which it enjoys a competitive advantage in financing.
8. Appendix

A – Proof about shape of equilibrium contracts

For all financial contracts where projects are implemented, it is sufficient to consider only contracts with \( F(R) \geq 0 \) and \( F(0) = 0 \) as long as there are many lenders offering identical contracts in equilibrium. This is proven in Lemma 1.

Lemma 1: For all financial contracts of size \( I \in \{1, \lambda \} \) and type \( k \in \{0, A, B, C\} \) it is sufficient to consider only equilibrium contracts with \( F^{i,k}(R) \geq 0 \) and \( F^{i,k}(0) = 0 \) when there are \( n \geq 2 \) lenders offering contracts in equilibrium.

For each financial contract, lenders must provide a non-negative payment in each state of the world when projects are implemented. This implies some payment \( F(R) \geq 0 \) for successful projects and \( F(0) \geq 0 \) for failures.

For financial contracts where \( k \neq 0 \), this yields an expected profit of \( \pi(F^{i,k} | i = k) = p(k | I)F^{i,k}(R) + [1 - p(k | I)]F^{i,k}(0) = \pi \) for the firm and an expected profit of \( \Pi_j(k | F_j^{i,k}) = [p(k | I)R - r(j)]I - \pi(F^{i,k} | k) - \kappa(j) \) for the lender. Since all firms accepting this contract will be of type \( k \), the expected profits can always be replicated for each agent involved by using a contract where \( F^{i,k}(0) = 0 \) and \( F^{i,k}(R) = \pi / p(k | I) \).

For financial contracts where \( k = 0 \) and all borrowers accepting it in equilibrium have the same probability of success, \( \tilde{p}(i | I) \), a similar reasoning holds. A payment of \( F(R) = \pi / \tilde{p}(i | I) \) in success and zero otherwise can always replicate the expected payment of contracts that pay a non-zero amount in failure.

For financial contracts where \( k = 0 \) and all borrowers accepting the contract in equilibrium do not have the same probability of success, \( \tilde{p}(i | I) \), the expected payment for all agents cannot be replicated using a contract with \( F^{i,k}(0) = 0 \). However,
it can be shown that a contract with $F^{l,k}(0) > 0$ cannot exist in equilibrium when $k = 0$ and not all borrowers accepting the contract have the same probability of success. Consider the case where a lender offers a contract with $F^{l,0}(R_l) = G > 0$ and $F^{l,0}(0) = H > 0$. If a continuum $1$ of entrepreneurs accept the contract where a fraction $\alpha$ only succeed with probability $p$, the expected return for this lender is given by $\left[ (1 - \alpha)(1 - p)(R_l - G) - \alpha(1 - p)H - r_l \right]$ and this must equal zero in equilibrium. If another lender offered a contract where $F^{l,0}(R_l) = G + \epsilon$ and $F^{l,0}(0) = 0$ for some $\epsilon \in \left( (1 - p) / p \right) [H, 0]$, however, it would make profits of $(1 - \alpha)(R_l - G - \epsilon - r_l)$ because only firms with probability of success $1$ will take this new contract. And, for $(1 - \alpha)(R_l - G - \epsilon - r_l) > 0$ this contract will be profitable. But, since $[1 - \alpha(1 - p)](R_l - G) - \alpha(1 - p)H - r_l = 0$ in any equilibrium, it must be true that $RI > G + r_l$ when $H > 0$. Therefore, there exists some $\epsilon$ sufficiently small such that $(1 - \alpha)(R_l - G - \epsilon - r_l) > 0$. Therefore, contracts with $k = 0$ and $H > 0$ can never be an equilibrium contract. QED

B – Proof of Proposition 1

Given the setup, there are eight different types of financial contracts that domestic lenders could offer: $F^{l,k}, F^{l,k} : \forall k \in \{0, A, B, C\}$. The proof that the equilibrium of Proposition 1 exists and is the unique allocation will be done in five parts. In parts 1-3, I will show that 5 of the 8 financial contracts cannot be equilibrium contracts. In part 4, I will derive the conditions under which the three remaining financial contracts can co-exist in equilibrium. This will be sufficient to prove the allocation of Proposition 1 exists and is unique when $\kappa > \kappa^*$. Finally, in part 5, I will prove that none of the non-equilibrium contracts can be used to break the equilibrium in Proposition 1.

Part 1 – When there are $n \geq 2$ lenders offering the same contracts in equilibrium, any financial contract $F^{l,k}$ yielding negative expected profits for the lender at $t = 1$ cannot be an
equilibrium contract as any individual lender could increase profits by dropping the contract. This allows me to exclude financial contracts that are ex-ante unprofitable for the lender if any firm were to accept the contract. Those contracts are: \( F^{4-A} \), \( F^{3-B} \), and \( F^{2-B} \). Because contracts take the form of \( F(RI) \geq 0 \) and \( F(0) = 0 \), as shown in Lemma 1, and \( pR < r \), the \( F^{4-A} \), \( F^{3-B} \) and \( F^{2-B} \) contracts always yield a negative return for the lender and cannot be equilibrium contracts.

Part 2 – Suppose that \( F^{4,0} \) was an equilibrium contract. By assumption (A3) and \( pR < r^* \), this contract can only be profitable if cream firms accept it, and will never be profitable if both cream and bad firms accept it. If \( F^{1,0} \) is not also an equilibrium contract, however, then all bad firms will also choose \( F^{4,0} \) since Part 1 proves that \( F^{3,B} \) and \( F^{2,B} \) cannot be equilibrium contracts. Therefore, \( F^{4,0} \) can only exist in equilibrium if \( F^{1,0} \) also exists and bad firms choose it. But if cream firms accept \( F^{4,0} \), then it must be that \( F^{4,0}(R\bar{\lambda}) > F^{1,0}(R) \), which implies that bad firms must also prefer this contract since \( F(0) = 0 \). Therefore, \( F^{4,0} \) can never be an equilibrium contract.

Part 3 – In order for the \( F^{3,C} \) contract to be an equilibrium contract, it must be that lenders receive non-negative profits from offering it, such that \( F^{3,C}(R) \leq R - r - \kappa \), and that cream firms do not prefer any other contract. But by assumption (A2), another lender could always feasibly offer the contract \( F^{3,C}(RI) = \bar{\lambda}(R - r) - \kappa \), and cream firms would prefer the this larger contract since its payout exceeds the maximum possible payout of screened contract for the smaller project, \( F^{1,C} \). Therefore, \( F^{3,C} \) cannot be an equilibrium contract.

Part 4 – From Parts 1-3, we know there are only three possible types of equilibrium contracts: \( F^{1,0} \), \( F^{4,0} \) and \( F^{2,C} \). Therefore, lenders either offer an unscreened contract for small projects, a screened contract for average firms, or a large screened contract for cream borrowers. Moreover, by Lemma 1, it is sufficient to consider only contracts with \( F(RI) \geq 0 \) and \( F(0) = 0 \).

In order for the \( F^{4,A} \) contract to be an equilibrium contract, such that lenders have non-negative profits from offering it, such that \( F^{4,A}(R) \leq R - r - \kappa \). Likewise, it must be that
Therefore, these are the maximum expected profits that these contracts can provide to average and cream firms respectively. Average or cream firms will prefer the pooling contract, $F^{1,0}$, if its payout, $F^{1,0}(R)$, exceeds the maximum payout of $F^{1,A}$ and $F^{1,C}$. Moreover, if cream prefer the pooling contract, $F^{1,0}$, then average firms must also prefer the pooling contract.

If $F^{1,0}$ is an equilibrium contract, then it must be the case that bad borrowers choose it since there is no other contract available to bad firms. In order for the contract to be feasible for lenders when all firms select it, it must be that $F^{1,0}(R) \leq R - r / (1 - (1 - p)\theta_h)$. When $\kappa < \kappa'$, the maximum possible payoff $F^{1,C}$ does not exceed the maximum possible payoff of $F^{1,0}$, and $F^{1,C}$ will not be an equilibrium contract. Likewise, $F^{1,A}$ is not an equilibrium contract. This means that $F^{1,0}$ is the unique possible equilibrium contract when $\kappa > \kappa'$. This contract, however, is only feasible when $r / (1 - (1 - p)\theta_h) \leq R$. Otherwise, lenders can never offer a non-negative payoff to firms, $F^{1,0}(R) \geq 0$, and also make non-negative profits. And, competition and lenders’ zero profit condition ensures that $F^{1,0}(R) = R - r / (1 - (1 - p)\theta_h)$.

Part 5 – To prove this is in fact an equilibrium financial contract, it must now be shown that none of the other non-equilibrium contracts can offer a potential profitable deviation for agents.

Consider the case where $\kappa > \kappa'$, and all firms are pooled on the small project. It can never be a profitable deviation for lenders to offer $F^{1,b}$ contracts since bad firms would still implement their project at a loss and the lender would now take a larger loss because it screens the bad firms. Similarly, it is never profitable to offer $F^{2,A}$ since the contract will always lose money. And, $F^{1,A}$ or $F^{1,C}$ cannot be profitable deviations since a lender since $\kappa > \kappa'$ ensures that neither $F^{1,A}$ or $F^{1,C}$ can be greater than $F^{1,0}$ (i.e. be preferred by average or cream firms) and be a profitable contract for the lender. The $F^{2,b}$ contract will also by unprofitable by assumption (A3) and the fact that bad will always prefer the contract if cream borrowers do. This leaves only $F^{1,C}$. However, $\kappa > \kappa'$ implies that lenders can never profitably induce cream firms to take a larger contract with screening. Therefore, $F^{1,0}$ is an equilibrium contract for $\kappa > \kappa'$ and $r / (1 - (1 - p)\theta_h) < R$. QED
C – Proof of Proposition 2

To differentiate contracts offered by foreign lenders, I will express their contracts as $F_{i,k}^*$. Using the same logic as in parts 1-3 of the proof of Proposition 1, there are only three potential foreign lender contracts that can be equilibrium contracts $F_{i,0}^*$, $F_{i,A}^*$, and $F_{i,C}^*$, and it is sufficient to consider contracts of the form $F_i(R_i) \geq 0$ and $F_i(0) = 0$. In an economy with both domestic and foreign lenders, $F_{i,A}^*$ cannot be an equilibrium contract for foreign lenders because domestic lenders can always offer a higher payoff to average firms with $F_{i,A}^*$ because of assumption (A1). Likewise, the domestic lender contract, $F_{i,C}^*$, can no longer be an equilibrium contract for domestic lenders because of assumption (A2), and $F_{i,0}^*$ cannot be an equilibrium contract since $r^* < r$. Therefore, there are only three possible equilibrium contracts: $F_{i,0}^*$, $F_{i,A}^*$, and $F_{i,C}^*$.

Similar to parts 4-5 of Proposition 1, it can be shown that $F_{i,C}^*$ only exists and is preferred by cream firms over the pooling contract $F_{i,0}^*$ for $\kappa^* \leq \kappa$. Given assumption (A2), the $F_{i,C}^*$ contract is feasible for foreign lenders to offer, and competition among foreign lenders and their zero profit condition will ensure that $F_{i,C}^* (R_A) = \lambda(R - r^*) - \kappa^*$, which exceeds the maximum possible payoff to cream firms with the pooling contract, $F_{i,0}^*$, when $\kappa^* \leq \kappa$. QED

D – Proof of Proposition 3

In the pooling equilibrium with domestic lenders, net output is $(\theta_A + \theta_c)(R - r) - \theta_b(r - pR)$, while in the separating equilibrium where only cream firms accept projects from foreign lenders, the net output is $\theta_c [\lambda(R - r^*) - \kappa^*]$. Thus, a decrease in net output will occur when $(R - r)\theta_A > \left( [\lambda(R - r^*) - \kappa^*] - (R - r) \right) \theta_c + (r - pR) \theta_b$ is true. QED

E – Proof of Proposition 4

When $\kappa^* > \kappa$, the economy continues to exhibit a pooling equilibrium, and the proof of this parallels the proof of Proposition 1. Given this, net output does not decline with foreign entry. In
fact, net output will rise since the cost of funds declines with foreign entry.

When $\kappa^* \leq \bar{R}$, the economy with foreign and domestic lenders will exhibit a separating equilibrium since cream firms will prefer a screened contract, as shown in Proposition 2. As shown in the proof of Proposition 2, there are only two other possible equilibrium contracts in an economy with both foreign and domestic lenders: $F_{s1,0}^*$ and $F_{s1,1}^*$. If $F_{s1,0}^*$ exists, it must be taken by bad firms, since it is the only contract available to them, and it is never feasible if average firms don’t also choose this contract in equilibrium. Given this, $F_{s1,0}^*$ only exists if both bad and average firms take the contract, and the maximum payout that lenders can offer with such a contract is

$$F_{s1,0}^* \leq R - r[(\theta_A + \theta_b)/(\theta_A + p\theta_b)].$$

The maximum payout that domestic lenders can offer for the screened contract is $F_{s1,1}^* \leq R - \kappa$. If both $R - r - \kappa < 0$ and $R - r[(\theta_A + \theta_b)/(\theta_A + p\theta_b)] < 0$, however, then neither contract can provide a positive payoff to firms, and $F_{s2,1,0}$ is the only equilibrium contract. Neither average nor bad firms will receive financing in this separating equilibrium. This allows for a potential drop in net output as shown in Proposition 3.

However, if either $R - r - \kappa < 0$ and $R - r[(\theta_A + \theta_b)/(\theta_A + p\theta_b)] < 0$ is not true, then there will exist an equilibrium contract that is taken by average firms. If $F_{s1,1}^*$ is the equilibrium contract taken by average firms, then the economy achieves the first best allocation and net output unambiguously rises from the pooling equilibrium since bad firms are no longer financed. If $F_{s1,0}^*$ is the equilibrium contract taken by average firms, then net output also rises since the only change is that cream firms begin implementing larger projects while average and bad firms continue to be pooled on the unscreened contract. QED
References


Mistrulli, Paolo Emilio and Luca Casolaro (2008) “Distance, Lending Technologies and Interest Rates” working paper, Bank of Italy.


Table 1
Foreign bank entry and economic growth.

This table reports coefficients from country-panel regressions of per capita GDP growth and GDP growth on an indicator for foreign bank entry (Entry) and its interactions with mode of entry and quality of legal institutions indicators, country-level fixed effects, and year fixed effects. The dependent variable in columns 1—4 is the per capita GDP growth rate, and the dependent variable in columns 5—8 is the GDP growth rate. In columns 2 and 6, Entry is interacted with an indicator that equals one if foreign banks own less than 5% of the assets in the country. In columns 3 and 7, Entry is interacted with an indicator that equals one if a domestic bank in the country is acquired by a foreign bank during the sample period. In columns 4 and 8, Entry is interacted with an indicator that equals one if the country's Rule of Law Index, as measured in 1996 in the World Banks' Worldwide Governance Indicators dataset, is above the sample average. Standard errors, adjusted for clustering at the country level, are reported in parentheses. ***significant at the 1% level; **significant at the 5% level; *significant at 10% level.

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<td>4.48*** (1.46)</td>
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