Information acquisition, foreign bank entry, and credit allocation

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Information Acquisition, Foreign Bank Entry, and Credit Allocation

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Abstract

This paper presents a theoretical framework to understand the impact of foreign bank entry on the access to and the price of credit for different types of firms. A major point of departure from the previous literature is that incumbents' information about firms is endogenous in the model; previous screenings and lending relations of incumbents determine which type(s) of firms they can identify. I show that the incumbents' information is negatively correlated with the quality of borrowers. Moreover, although a priori entrants have a comparative advantage in lending to transparent firms, previous lending relations of incumbents might reverse this relation. In particular, given that transparent firms are the only type screened before the entry and therefore they are the only type distinguishable by incumbents, entrants might have a comparative advantage in lending to opaque firms. The analysis provides new insights into the inconclusive evidence of the literature regarding entrants' credit allocation.

Keywords: Foreign Entry, Credit Allocation, SMEs
JEL Classification: G1

1 Introduction

After about three decades since the progressive liberalization of banking industries, the impact of foreign bank entry on credit allocation, specially for small and medium enterprises (SMEs), is far from well understood. While scholars have addressed the (aggregate) benefits of entry, such as increased supply of credit and/or reduced interest rates due to an increase in competition, critics argue that entrants tend to pick the largest and the most informationally transparent firms (cherry picking), ignoring small and medium enterprises (SMEs) [see Stiglitz (2000)]. As SMEs account for most of employment in the world and because of the evidence that these firms are financially constrained, such a critic is highly relevant and calls for a more careful examination of the process of foreign entry and its impact on different types of firms.[1] Furthermore, although the theoretical literature supports the cherry-picking behavior of entrants, the empirical literature regarding this issue is inconclusive and has failed to establish a consistent inference regarding credit allocation of entrants towards SMEs.[2]

This paper presents a theoretical framework to understand the observed inconsistent behavior of entrants towards opaque and small firms. I show that the level of information asymmetries, resulting from previous relations of the incumbent with firms, and the effect of foreign entry on competitive dynamics in the local credit market provide an answer. In this paper, entrants enjoy an advantage in the cost of funds but a disadvantage in screening firms than incumbents. Within this framework, although 'cherry picking' is one potential outcome of entry, it is possible to identify situations where entrants fund opaque firms, whereas incumbents lend to transparent firms. In other words, the model provides predictions on when entrants can overcome their informational disadvantage and attract opaque firms. Hence, the model provides insights to reconcile the contradictory results of the literature regarding credit allocation of entrants.

The model focuses on the important role of information obtained by incumbents through previous lending relations. The literature on relationship lending suggests that repeated interactions can reduce information asymmetries between banks and borrowers [see references in Boot (2000)]. In this paper, incumbents gain knowledge about borrowers' credit worthiness during the course of a lending relationship in a competitive market. This private information determines the information of incumbents about firms when compet-

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[1] According to Ayyagari, Beck, and Demirguc-Kunt (2007) and Beck and Demirguc-Kunt (2006), SMEs account for close to 60% of manufacturing employment on average across 76 developed and developing countries. Furthermore, studies have found that not only SMEs are more financially constrained but also banks are the main source of external finance for SMEs across countries [Beck, Demirg-Kunt, and Maksimovic (2008)].

[2] For evidence supporting cherry picking behavior of entrants, see Mian (2006), Berger, Klapper, and Udell (2001), and for evidence of funding SMEs by entrants, see de la Torre, Pera, and Schmukler (2010), Beck, Demirg-Kunt, and Martinez Peria (2010), and Haas, Ferreira, and Taci (2010). The empirical literature will be discussed in detail in Section 6.

ing with entrants. The entry and bank competition are then modeled as the competition between incumbents with an informational advantage and entrants with worse information but with a cost of funds' advantage. Dell'Ariccia and Marquez (2004) and Sengupta (2007) demonstrate how information asymmetry and cost of funds' difference between the incumbent and the entrant affect the overall distribution of credit. In both models, the incumbent is *assumed* to have perfect information about (a fraction of) firms, whereas the entrant has no information about them and no chance to obtain information, but has a cost of funds advantage. Under these assumptions, Dell'Ariccia and Marquez (2004) and Sengupta (2007) show that entry induces a segmented credit market; entrants concentrate on the segments characterized by the most transparent and profitable firms. In this paper, similar to Gormley (2011), I assume that incumbents do not have costless access to information about firms and that entrants have the option to invest in costly screening technologies. [3] However, unlike Gormley (2011), the information set of incumbents at the time of foreign entry is derived endogenuously and it depends on the previous screening of domestic banks. In other words, incumbents can *costlessly* distinguish firms that have been already screened but not the others.

While the screening cost of transparent firms is the same for both entrants and incumbents, sorting opaque firms is more expensive for entrants. The reason is that screening of opaque firms, to a large extent, requires soft information gathering and processing, the task at which entrants are disadvantaged.[4] This could be because of greater hierarchical structure of entrants [Stein (2002)], or cultural and geographical distance [Mian (2006)]. However, better legal environments mitigate the entrants' disadvantage in screening opaque firms in that entrants can rely on collateral as a signal to distinguish firms' type[5], whereas a poor legal protection prevents the use of collateral as an effective technology to successfully sort borrowers.[6] Hence, although entrants, compared to incumbents, are always disadvantaged in screening opaque firms, a better legal environment provides more reliable hard information about opaque firms and, as a result, improves entrants' competitiveness in capturing them.

The model is a two-period game. The first period includes only one type of lenders (domestic). The equilibrium prevailing in the first period drives the information of incumbents at the beginning of the second period, when entry happens. Specifically, those types

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[3] See Aleem (1990) for empirical evidence showing that incumbents do not enjoy costless access to firms' information.

[4] Hard information is quantitative and impersonal information, whereas soft information is qualitative and subjective. See Petersen (2004) for more discussion of soft and hard information in financial transactions.

[5] For the works suggestive of the information content in collateral requirements, see Boot and Thakor (1994) and Sharpe (1990).

[6] As another example, entrants can use credit scoring in lending to screen opaque firms, yet a strong legal and institutional framework is critical for establishing and well-functioning of credit bureaus. For a detailed discussion of this issue, see Berger and Udell (2006) and Cre (2007).

of firms screened in the first period will be known to incumbents in the second period. In the first period, different equilibria are shown to exist, implying various levels of information asymmetry between incumbents and entrants in the second period, the time of entry. Three major results are summarized here.

First, in markets characterized by a moderately high proportion of 'bad' firms, transparent firms accept a screening contract (rather than a pooling) to sort themselves out.[7] Profitable opaque firms, however, will not apply for a screening contract as the pooling rate offered to all opaque firms is lowere because the proporsion of bad firms is not too high. Therefore, all opaque firms (profitable and non-profitable) will receive a pooling contract. The acquired information about transparent firms helps incumbents retain all of them (in the second period) while cost efficient entrants attract opaque firms by offering a cheaper pooling contract. In this case, opaque firms benefit from entry through reduced spread, whereas transparent firms are not affected by the entry. Moreover, the loan portfolios of entrants are riskier than those of incumbents in that all non-profitable firms are funded by them. This result that opaque firms are funded by entrants while domestic banks finance transparent firms is new to the literature.

Second, in markets characterized by a high proportion of 'bad' firms, the adverse selection cost of pooling opaque firms is too high so that not only transparent firms but also opaque firms apply for screening contracts. As a result, all profitable firms are screened before entry. In this case, at the time of entry, incumbents can perfectly identify all types of firms. Since the entrants' screening cost of opaque firms is higher, they will have a comparative advantage in picking transparent firms. This result corresponds to what most of the literature has also found and is referred as 'cherry picking' or 'cream-skimming' behavior of entrants. Consistent with the study of Dell'Ariccia and Marquez (2004), the model of this paper indicates that in presence of a very large information asymmetry between the incumbent and the entrant, the former shifts its loan portfolio towards more captured (more opaque) borrowers when faced with cost efficient entrants.

Third, in markets characterized by a relatively high proportion of 'bad' firms and relatively large screening cost of opaque firms (compared to the return on projects), transparent firms are screened and received credit, whereas other types are not funded (before entry). This is a 'credit constrained' situation in which opaque firms including the profitable ones do not have access to credit. Moreover, while having no information about opaque firms, incumbents can costlessly distinguish transparent firms when competing with entrants. In this case, entrants might have a comparative advantage in screening and funding opaque firms if the legal environment of the host country is relatively rich so that the informational disadvantage of entrants is not too large.

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[7]Transparent firms are all assumed to be profitable. Opaque firms, however, could be profitable or not. Non-profitable opaque firms are called "bad" firms.

The most important contribution of this paper is showing how foreign lenders might lend to SMEs in markets where both domestic and foreign lenders are present (the first and third results presented above). Although empirical studies find evidence that entry of large competitors such as foreign banks directly improves access to credit for SMEs [e.g. de la Torre, Pera, and Schmukler (2010), Beck, Demirg-Kunt, and Martinez Peria (2010), De Haas and Naaborg (2006)], theoretical studies have had difficulty generating such an outcome.[8] An exception is Gormley (2011) who implies that SMEs might be funded (together will transparent firms) by entrants but it happens *only* if the entrants prevail the market so that all domestic lenders exit. However, as discussed in Claessens and van Horen (2012), prevailing the domestic market by entrants is not what we observe in the data. Moreover, Beck, Demirg-Kunt, and Martinez Peria (2010) show that SMEs are frequently funded by entrants although domestic lenders have most of the market share. In this paper, I show how previous lending relations of incumbents can change the comparative advantage of entrants and enable them to fund opaque firms while domestic lenders finance transparent firms.

Moreover, I show that there exists a negative correlation between the quality of firms in a sector and the incumbent's information about firms. In other words, incumbents will have more information in sectors characterized by a large proportion of 'bad' firms. The intuition is that, given screening costs, as the average quality of firms gets worse, profitable firms will be more likely to be screened out and funded. Hence, the model provides a micro foundation for the assumption of Dell'Ariccia and Marquez (2004), that incumbents' information and the quality of firms are negatively correlated. In addition, the model generates a novel empirical implication regarding on entrants' credit allocation in different sectors of the economy. Specifically, in sectors (industries) characterized by a relatively low proportion of "bad" firms, we should observe the segmentation of market where entrants lend to SMEs while incumbents focus on transparent firms. This implication remains to be tested.

Works closely related to this paper are Dell'Ariccia and Marquez (2004), Sengupta (2007), Gormley (2011), and Detragiache, Tressel, and Gupta (2008). In Sengupta (2007), the incumbent has perfect information about all types of firms while the entrant does not have any information but enjoys lower cost of funds. Dell'Ariccia and Marquez (2004) assumes that while the entrant cannot distinguish any borrower's type, there is a fraction of borrowers whose type is known to the incumbent. However, the incumbents' information about firms is not unrelated with the firms' type. Therefore, as an extension of their paper, Dell'Ariccia and Marquez (2004) *assume* a negative correlation between incumbent's information and the quality of firms' type. In this paper, the incumbent's information is derived endogenously as a function of firms' quality and profitability of the sector. The

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[8]See Dell'Ariccia and Marquez (2004), Sengupta (2007), and Detragiache, Tressel, and Gupta (2008).

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model shows how the quality and profitability of each market leads to a different credit allocation outcome after entry. This allows to show under which conditions the segmented credit market suggested by Dell'Ariccia and Marquez (2004) and Sengupta (2007) is not the outcome. In particular, the model shows how entranta, despite their informational disadvantage, are likely to focus on funding opaque firms. Moreover, unlike in Dell'Ariccia and Marquez (2004) that entrants are unable to obtain any information about firms, this model allows for entrants' investing in costly screening technologies to identify different types of firms. In this respect, the model is similar to Gormley (2011). However, unlike Gormley (2011) who looks at the impact of entry in a pooling equilibrium, the main focus of this paper is on entry in other equilibrium outcomes. The analysis of this paper shows that pooling equilibrium is an equilibrium before entry only for sectors characterized be a very low proportion of 'bad' firms. Finally, Detragiache, Tressel, and Gupta (2008) also assumes two types of screening technologies where entrants have disadvantage in screening opaque firms. Their model indicates that in equilibrium entrants will focus on transparent firms, cherry-picking behavior. Here, I show that this result could be reversed precisely because the information of incumbents at the time of entry will be determined based on their previous screenings. Specifically, when incumbents have screened transparent firms prior to foreign entry, these firms will be distinguishable costlessly for incumbents and therefore the entrants might have comparative advantage in screening opaque firms.

2 Model

2.1 Agents and Screening Technologies

The model consists of two types of agents: firms and lenders. The agents are risk-neutral and we assume limited liability for firms.

Firms are either opaque or transparent and the proportion of each type is given by μ and $1 - \mu$, respectively. While all transparent firms are profitable, opaque firms are of two types: profitable and non-profitable (bad), whose proportions are denoted by μ_{po} and μ_b so that $\mu_{po} + \mu_b = \mu$. For simplicity I assume that μ, the sum of non-profitable and profitable opaque firms, is constant and what changes is the proportion of these two groups. Hence, in general there are three types of firms, denoted by T (transparent), PO (profitable opaque), and B (bad). Each firm is endowed with a project that requires an initial investment of $I = 1$. If implemented, projects of types T and PO yield revenue $R \geq 1$ with probability 1, while projects of type B pay off R with probability p. The latter have a negative expected return such that $pR < 1$. Firms have no private resources and must find a lender to obtain financing.

The financial sector is perfectly competitive and includes two types of lenders: incumbents and entrants. In the first period incumbents are the only lenders in the market, while in the second period both incumbents and entrants will be present in lending. It should be noted that the market is competitive even at the first period and hence incumbents do not get any rent. The idea in here is to disentangle the impact of increased competition due to the entry of a large and cost efficient entrant from increased competition due to entry of more competitors of the same kind.

Firms' type is private information and lenders will not be able to distinguish firms unless investing in costly screening technologies. Lenders have access to two costly screening technologies to identify a firm's type: T-technology and O-technology. Using T-technology, lenders are able to distinguish firms of type T. However, firms of PO types are not transparent enough to be distinguished using T-technology. Lenders can instead invest in a more expensive screening technology, O-technology, to identify profitable opaque firms. An example of T-technology could be financial statement analysis, while one could think of collateral requirement or soft information gathering (honesty of manager, etc.) as examples of O-technology, which could be used to discover creditworthiness of opaque firms.

There are two types of banks (lenders): incumbents and entrants. Banks differ initially in two counts. First, although both have a perfectly elastic supply of funds, the entrants' cost of funds is lower. In particular, incumbents have access to funds at a constant gross interest rate which is normalized to 1, whereas the entrants' cost of funds is $\rho < 1$. The rationale behind this assumption is that better reputation, more diversification and superior access to international capital markets, either directly or via their parents, makes entrants have a lower cost of funds. This is a standard assumption in the literature. Dell'Ariccia and Marquez (2004), Gormley (2011), and Sengupta (2007) all consider a lower cost of funds for entrants. Of course, if the cost advantage of entrants is very high, they will always prevail in the market. In order not to have such an equilibrium, I assume that the pooling rate the entrant offers can never be less than 1, the minimum amount incumbents can ask firms to pay back if they have perfect information. Hence, we need to have $\frac{\rho}{1-(1-p)\mu_b} < 1$.

The second initial difference between lenders is that although both lenders can screen transparent firm at the cost $c_T > 0$ (cost of T-technology), entrants find it more costly to overcome information asymmetries present in opaque sectors because of distance, cultural, or institutional barriers. Specifically, incumbents can screen opaque firms at cost c_O (cost of O-technology) while entrants must pay c_O/β, where $0 < \beta < 1$. Detragiache, Tressel, and Gupta (2008) also assume two different screening technologies where entrants are disadvantaged in screening small and opaque firms. This assumption that entrants incur higher screening costs is supported by the large literature that finds foreign lenders are disadvantaged, relative to domestic lenders, in terms of collecting and processing of "soft

information".[9] For example, Stein (2002) shows how the greater hierarchical structure of foreign banks relative to domestic banks makes it more costly for foreign banks to lend based on soft information. Moreover, Mian (2006) finds distance (both cultural and geographical) as an important barrier that makes screening more costly for foreign banks in Pakistan. Furthermore, β is interpreted as the institutional quality of the host country; the larger the β, the higher the quality. The rationale is that better legal and institutional environments provide more accessible and more reliable information about opaque firms and hence facilitate screening for entrants. For instance, credit bureaus are one of the main sources of information about the small and opaque firms, yet a strong legal and regulatory framework is critical for establishing and well-functioning of a credit bureau. Another important screening device for entrants to identify opaque firms is collateral requirement, which turns ineffective in an environment of weak contract enforcement in that seizing collateral in case of default might have significant cost and take a long time. Hence, although entrants are always disadvantaged in screening of opaque firms, a better legal environment improves their competitiveness in lending to opaque firms.

It is important to highlight two assumptions related to the outcome of the first period and screenings: First, the outcome of the first period is assumed to be known only to incumbents. This assumption gives incentive to incumbents to screen and firms to reveal their type by accepting screening contracts. Without this assumption, entrants can always free ride and obtain the knowledge acquired by incumbents. Second, "good" firms always have good projects and therefore if they are screened in the first period, their project type in the second period is known to incumbents costlessly. This, however, is for simplicity and is not crucial to the results. In particular, as long as the screening cost in the second time is smaller than the first time a firm is screened, the main results of the paper remain intact.

2.2   Timeline

We have a two period model. Each firm has two projects (one for each period).

The timing of events is as follows:
Period 1:

- $t = 1$: incumbents choose their menu of financial contracts and firms apply for financing. Incumbents then screen applicants (if any) and the successful applicants are funded.

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[9]Soft information is qualitative and subjective (like honesty of the manager), as opposed to hard information, which is quantitative and impersonal information (like financial statement of the firm). See Petersen (2004) for more discussion of soft and hard information in financial transactions.

7

- Interim period: the outcome of the first period is realized. The private information acquired by incumbents through their screening, if any, is incorporated in their knowledge about firms.

Period 2:

- $t = 2$: entry happens. Entrants compete with incumbents in offering credit to firms to fund their second projects. Lenders screen applicants (if any) and the successful applicants are funded. Finally, the outcome of the second period is realized.

As shown in the timeline, there are two periods. In the first period only incumbents are present in the market, but in the second period both incumbents and entrants will be competing. Lenders in each period choose what menu of financial contract they wish to offer. Specifically, lenders offer a menu of financial contract consisting of one or more interest rate/screening strategy combinations. For instance, a bank might offer a pooling rate to all firms without any screening, another interest rate with T-technology (screening of transparent firms), and a third interest rate with O-technology (screening of opaque firms). Firms then approach to lenders and choose one of the available contracts or decline to borrow. If the contract is designated for a specific type of firms, firms' type is verified by using appropriate screening technology and successful applicants are funded and the outcome of the first period is realized.

In the second period, all firms screened by incumbents, if any, are distinguishable by them. That is, incumbents acquire information about firms as a result of screening costs they have paid to sort different types in the first period. For example, if transparent firms have been screened in the first period, incumbents can costlessly sort them out while competing with entrants. Finally, cost efficient entrants compete with incumbents in offering more competitive contracts. Again, firms apply for financing and the successful ones are funded and the outcome is realized.

2.3 Contracts and Strategies

As discussed in the previous section, the menu of contracts consists of three types: a pooling contract, a semi pooling (T-types are screened and the others are pooled), and a separating contract (both types are screened). Lender's strategy is to offer a set of contracts, and firms' strategy is to choose among the offered contract or to choose no contract. The equilibrium concept used is Subgame Perfect, and a strategy configuration will be a competitive equilibrium if each lender and each firm is maximizing its expected profits given the strategies of all other agents. We also know that in equilibrium, all lenders make zero expected profits.

I find equilibrium outcomes using backward induction; given strategies of incumbents and firms in the first stage, I find the equilibrium outcomes of the second stage, when entry happens. Then, I go to the first stage and find the equilibrium of the whole game. In the first period, potentially four equilibrium outcomes might happen: pooling, semi-pooling, separating, and credit constrained. In a pooling equilibrium, all firms are pooled and charged the same. In a semi-pooling equilibrium, transparent firms are screened, while opaque firms receive a pooling contract. In a separating equilibrium, both transparent and opaque firms are screened and funded. Finally, in a credit constrained equilibrium, only transparent firms are screened and funded, while opaque firms will be rationed. Given each of the above strategies, I find the impact of entry, which is a subgame (second period) equilibrium. The main focus of this paper is on equilibrium outcomes in which both banks are present in the market.

3   Equilibrium of the Second Stage: Entry

In the second period, the economy consists of both domestic and foreign banks, and the credit market is competitive. To make sure that lending does happen in equilibrium, I assume that the return of projects is high enough so that at least transparent firms always have access to credit, $1 + c_T < R$. Note that to break even, $1 + c_T$ is the minimum gross rate incumbents can offer to transparent firms. Unless specified otherwise, 'rate' means gross rate throughout the paper.

3.1   Entry in a Pooling Equilibrium

Being in a pooling equilibrium implies that the incumbent has not incurred any screening cost and hence cannot distinguish any type costlessly. In this case, there is *no* equilibrium in which both banks are active in lending and indeed the entrant always prevails in the market. The reason is that the cost of funds for the entrant is lower than that of the incumbent. The incumbent cannot screen and attract profitable firms (offer a lower rate than the pooling rate) either because in that case these firms would have accepted a screening contract in the first period. Hence, Lemma 1 follows.

Lemma 1 *Given a pooling equilibrium in the first period, the entrant always prevails in the market. The outcome of the second period is a pooling equilibrium in which the entrant funds all firms and charges*

$$r_p = \frac{\rho}{1 - (1-p)\mu_b}$$

The proof can be found in Appendix. As shown in the proof, if entry happens in a pooling equilibrium, entrants push incumbents completely out of the market as the cost

of funds for the former is lower. All firms are charged less than they would without entry.

3.2 Entry in a Semi-Pooling Equilibrium

Being in a semi-pooling equilibrium implies that the incumbent can identify transparent types costlessly and offer $r_t = 1$ to them. However, the incumbent cannot compete with the entrant in offering a pooling contract because the entrant enjoys a cost of funds' advantage. The incumbent cannot use O-technology, sort out the profitable opaque types and offer a lower rate than the pooling rate of the entrant either. The reason is that being in a semi-pooling equilibrium before entry implies that the interest rate of a contract that screens opaque firms is larger than the pooling rate the incumbent can offer to them, hence, larger than the pooling rate the entrant offers. In other words, if the incumbent's contract which screens opaque firms has a rate lower than the rate of pooling opaque types, it is impossible to be in a semi-pooling equilibrium in the first period because in that case all profitable opaque firms would apply for a separating contract and 'bad' firms are not funded. Therefore, if the entrant's cost advantage is not too high to dominate in the whole market, i.e., if $\rho + c_T > 1$, and the quality of domestic institutions are not very high (low β), the incumbent can retain its transparent types, while opaque firms are pooled and taken by the entrant. However, there is a threshold for β above which screening of opaque firms becomes relatively cheap for entrants so that they can offer a cheaper screening contract to profitable opaque firms. This case leads to a separating equilibrium, in which case opaque firms are screened and funded by entrants. The formal characterization of the equilibrium outcome of entry in a semi-pooling market is given in Lemma 2.

Lemma 2 *Given that the market is in a semi-pooling equilibrium:*
Let r_{sp} be the pooling rate the entrant can offer, which is equal to $\mu\rho/[\mu - (1-p)\mu_b]$. Then,

  i) *If $\rho > 1 - c_T$ and $\beta < c_O(r_{sp} - \rho)$, the equilibrium outcome of entry is a semi-pooling. Transparent firms are charged $r_t = 1$ and funded by the incumbent, whereas the entrant pools opaque firms with the rate $r_{sp} = \mu\rho/[\mu - (1 - p)\mu_b]$.*

  ii) *If $\rho > 1 - c_T$ and $\beta > c_O(r_{sp} - \rho)$, the equilibrium outcome of entry is a separating. Transparent firms are charged $r_t = 1$ and funded by the incumbent, whereas the entrant screens opaque firms and fund the profitable ones with the rate $\rho + c_O/\beta$.*

The proof can be found in the appendix. The intuition is very straightforward. While the informational advantage of incumbents about transparent types, obtained through previous stage screening, helps them retain this type of borrowers, entrants will always be able to offer a more attractive pooling contract to opaque firms because of their cost of funds' advantage. In addition, when the quality of domestic institutions are high enough, the cost of screening opaque firms by entrants are relatively low so that they might even be able to sort out profitable opaque firms rather than pooling all of them together.

3.3 Entry in a Separating Equilibrium

Being in a separating equilibrium before entry implies that the incumbent has used both T- and O-technologies to screen transparent and opaque firms. Therefore, when competing with the entrant, the incumbent can perfectly distinguish all types of firms. As a result, the incumbent can offer $r_t = r_{po} = 1$ to both transparent and profitable opaque firms. In this case, if $\rho + c_T > 1$, entry does not happen because every contract the entrant offers has a rate more than 1, and none of profitable firms would accept it. On the other hand, if $\rho + c_O/\beta < 1$, the entrant can provide screening contracts, offer a rate lower than 1, and attract all firms. In the unique equilibrium with both banks present in the market, when $1 - c_O/\beta < \rho < 1 - c_T$, the entrant picks transparent types because of lower screening cost, whereas the incumbent retains its opaque borrowers due to the informational advantage.

Formal characterization of this equilibrium is given in Lemma 3.

Lemma 3 *Given that the credit market is in a separating equilibrium, if $1 - c_O/\beta < \rho < 1 - c_T$, the equilibrium outcome is separating. The entrant screens transparent firms and funds them at the rate $r_t = \rho + c_T$, whereas the incumbent lends to profitable opaque firms at the rate $r_{po} = 1$.*

A proof of Lemma 3 is found in Appendix, but the intuition is as follows. When entrants enjoy a huge cost advantage, the whole market can be captured by them; incumbents cannot compete as the cost of funds' advantage of entrants enables them to screen all types and offer a rate less than 1, the minimum rate the incumbent can offer to break even. In contrast, when entrants have a very low cost advantage, incumbents prevail in the whole market. In other words, with a relatively small cost advantage entrants cannot compete with incumbents who have perfect information about all types. However, for a moderately high cost of funds' advantage, if the screening cost of transparent firms is relatively low compared to that of opaque firms, the entrant can screen transparent firms and offer a rate lower than 1. The incumbent cannot offer a more attractive contract to transparent firms, yet the incumbent's informational advantage makes it more competitive in sorting profitable opaque types and funding them.

3.4 Entry in a Credit Constrained Equilibrium

Being in a credit constrained equilibrium implies that the incumbent can identify only transparent types as in the previous equilibrium this type of firms have been screened and now they are distinguishable costlessly. So, the incumbent can offer $r_t = 1$ to transparent firms.

Again, in case the entrant enjoys a substantial cost of funds' advantage, the incumbent

cannot compete and the whole market will be captured by the entrant. In other words, despite the incumbent's informational advantage regarding transparent firm, if $\rho + c_T < 1$, the entrant can offer a screening contract for transparent firms with a rate lower than 1 and dominate in the whole market. This type of equilibria with one bank present in the market, as discussed before, is not the focus of this paper. Hence, we would like to evaluate the situation when $\rho + c_T > 1$. In this case, entrants are not able to offer a more attractive contract to transparent firms and prevail in the market. But, could it be the case that the entrant lends to opaque firms despite the fact that the screening cost of opaque types is larger for the entrant? The answer is "yes". In this case, the entrants' disadvantage in lending to transparent firms and opaque firms are c_T and $[1/\beta - 1]c_O$, respectively.[10] The comparative advantage of entrants will be dependent on β. For a relatively high amount of β, entrants have a comparative advantage in screening and lending to opaque firms. This result is formally shown in the following Lemma.

Lemma 4 *For $\rho > 1 - c_T$, If $\beta > c_O/(c_O + c_T)$, there exists a separating equilibrium in which transparent types are funded by the incumbent and charged $r_t = 1$, while opaque firms are screened and funded by the entrant at the rate $r_{po} = \rho + c_O/\beta$. In this equilibrium $R \geq \rho + c_O/\beta$.*

The proof of Lemma 4 is found in Appendix. The lemma implies that the perfect knowledge of the incumbent about transparent types could make the disadvantage of the entrant in attracting transparent firms larger than its disadvantage in screening opaque firms, enabling the entrant to offer a more competitive rate to opaque firms.

4   Equilibrium of the Whole Game

In the previous section, I found equilibrium outcomes and the rate each firm will be charged, given their choice of contract in the first period. Now, I find equilibrium of the first period. In the first period, the economy consists of only domestic lenders (incumbents) and the credit market is competitive so that lenders make zero expected profit. Firms could apply for any contract in the menu offered by incumbents; in equilibrium the chosen contract is the one which maximizes firms' profit over the two period.

For incumbents not to make negative profits, the pooling (gross) rate must be $\frac{1}{1-(1-p)\mu_b}$. Contracts that screen transparent and opaque firms have a gross rate of $1 + c_T$ and $1 + c_O$, respectively. Finally, a contract pooling opaque firms should have a rate of $\frac{\mu}{\mu-(1-p)\mu_b}$.[11]

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[10]Note that transparent types are known to incumbents while entrants have to spend c_T to distinguish them. On the other hand, opaque firms are not known to either lender. Incumbents have to spend c_O while entrants must pay c_O/β to screen opaque types.

[11]These are rates at which incumbents break even. For details on how these rates are derived, refer to the proof of Proposition 1 and 2.

In this section, I will show that depending on the proportion of 'bad' firms in the economy and the outcome of projects (compared to screening costs), the game might have four different equilibrium outcomes. Again, depending on the entrants' cost of funds, we might have many different equilibrium outcomes, yet I restrict the focus to the ones where both banks are present in the market.

If the proportion of 'bad' types is very low, all firms will apply for a pooling contract. Note that profitable firms have two options: accepting a pooling contract for both period, or accepting a screening contract in the first period and revealing their type for the second period so that they get a low rate for the next period. Obviously pooling rates depend on the fraction of 'bad' firms because for the lenders to break even, the pooling rate must rise as the fraction of 'bad' firms increases. For a very low fraction of NPV-negative firms, the cost of adverse selection is relatively low compared to the screening cost. In this case, all firms apply and receive a pooling contract in the first and second period. The formal characteristics of such an equilibrium is given in the following proposition.

Proposition 1 *If*
$$\mu_b < \underline{\mu_b} = \frac{(2 + c_T) - (1 + \rho)}{(2 + c_T)(1 - p)}$$
the equilibrium outcome is pooling. All firms receive a lower rate following entry.

A Proof of this proposition is provided in Appendix. When the quality of borrowers is really good in a sector, profitable firms might not have incentive to reveal their type. In other words, the cross subsidization cost that profitable firms pay is relatively low compared to the cost they have to pay for a screening contract, c_T. In this case, incumbents will not engage in any screening and they will have minimum information about types of firms.

However, at a higher levels of 'bad' firms, the incumbent faces a relatively high adverse selection resulting from lending to non-profitable firms in the pool. As a result, the pooling rate exceeds the rate of a screening contract for transparent types, and hence, firms of this type will be better off applying for a screening contract and sort themselves out. If the proportion of 'bad' firms is not too large, profitable opaque firms may not apply for a screening contract if the screening cost (c_O) is relatively high compared to the cost of adverse selection. Hence, opaque firms prefer a pooling contract and if the pooling rate is less than the return on the project (participation constraint of firms), the equilibrium will be a semi-pooling one, in which transparent types are identified and funded while opaque firms are pooled. In the second period, incumbents distinguish transparent firms costlessly and retain them, whereas entrants attract the pool of opaque firms, as found in Lemma 2. To formulate the equilibrium, we need the following two thresholds for μ_b.

$$\overline{\mu_b} = \frac{(2 + c_O) - \mu(1 + \rho)}{(2 + c_O)(1 - p)} \quad \mu_b^p = \frac{\mu(R - 1)}{(1 - p)R}$$

$\overline{\mu_b}$ is the threshold below which opaque firms will not apply for a screening contract. μ_b^p is a threshold below which the offered pooling rate of opaque firms is not higher than the return of the project, i.e, participation constraint of opaque firms is not violated. Refer to the proof of Proposition 2 for details about calculation of the thresholds. The following proposition formulates the semi-pooling equilibrium.

Proposition 2 *If $\underline{\mu_b} < \mu_b < \min\{\overline{\mu_b}, \mu_b^p\}$ and $\rho > 1 - c_T$, the equilibrium is semi-pooling. Incumbents can distinguish and attract transparent firm, while opaque firms are pooled by entrants. Opaque firms enjoy a lower rate following the entry.*

A proof of the proposition can be found in Appendix. The outcome is that while transparent firms are not affected by foreign entry in a semi-pooling, opaque firms pay a lower rate on the credit they receive. The total credit and outcome remain unaffected and all firms including non profitable types are funded. In this case, because incumbents can distinguish transparent types and since the entrant is more competitive in offering a pooling contract, transparent firms apply for financing from incumbents. The pool of opaque firms, however, are offered a lower rate from the entrant. As a result, the proportion of defaulted loans in the incumbent's portfolio declines. In other words, in this case, the portfolio of the entrant is riskier than that of the incumbent.

Haselmann and Wachtel (2010) and Claessens, Demirg-Kunt, and Huizinga (2001) provide evidence that foreign banks in more developed countries have riskier borrowers and record lower profits. These evidence could be rationalized by the result discussed in here. A developed country could be characterized as the country in which the fraction of 'bad' firms is not too high and the return on projects is not too low. In such an economy, it was shown that the domestic credit market will be in a semi-pooling equilibrium in which transparent firms get a separating contract while opaque firms are pooled and charged a higher rate. In this case, when faced with cost efficient competitors, the incumbents retain all their transparent clients while the opaque types leave incumbents and accept the lower pooling rate offered by entrants. Hence, as all opaque firms including the ones with NPV negative projects are funded by entrants while incumbents keep their transparent borrowers, the portfolio of entrants will be riskier than that of incumbents.

When the proportion of 'bad' types is too high, however, the rate at which opaque firms could be pooled exceeds the rate of a contract that screens opaque firms and funds the profitable ones. In this case, if the screening cost needed to sort the profitable opaque firms (c_O) is not too high, both profitable types are identified and funded. This separating equilibrium is characterized as follows.

Proposition 3 *If $\mu_b > \overline{\mu_b}$, $1 - c_O/\beta < \rho < 1 - c_T$, and $R > 1 + c_O$, the equilibrium is separating. Entrants pick the transparent types, whereas incumbents shift their portfolio towards opaque firms. Transparent firms enjoy a lower rate following the entry.*

The proof is found in the appendix. In sectors characterized by a very bad pool of borrowers but a high profitability conditional on being successful (high R), incumbents manage to screen all firms in the first period. As a result, in the second period, incumbents have perfect information about all types of firms. Following entry in a separating equilibrium, given that both the incumbent and the entrant are active in the market, it cannot be the case that opaque firms are funded by the entrant. The reason is that if the entrant is able to offer a more appealing contract to opaque firms (an offered rate less than 1), it can also attract transparent firms. In other words, as the incumbent has perfect information about all types, and the entrant's screening cost of opaque firms is larger than that of transparent firms, the entrant has comparative advantage in lending to transparent firms. Therefore, the only equilibrium with the presence of both banks is the one where the entrant screens and picks transparent types, while the incumbent funds opaque firms.

Entry does not improve the situation for opaque firms, while transparent firms are always charged less following the entry. This equilibrium corresponds to what is called cherry-picking behavior of entrants in the literature. As the incumbent has perfect information about all firms (because of information acquisition through past screenings), and the screening cost of transparent firms is lower than that of opaque firms, the entrant's comparative advantage is to lend to transparent firms. Hence, in equilibrium the entrant picks the most informationally transparent firms and pushes the incumbent away from transparent types. This induces a market segmentation in which entrants focus in lending to large and transparent firms, whereas incumbents have no choice but shifting all their portfolio towards opaque firms.

Finally, the last possible equilibrium outcome realizes if the adverse selection is too hight so that the rate of the contract pooling opaque firms is more than the return of their projects, and the screening cost of opaque firms is also too high that for incumbents it is impossible to sort profitable opaque. In this case, the equilibrium outcome of first period will be a credit constrained in which only transparent firms have access to credit. In the second period, as shown in Lemma 4, a separating equilibrium exists, in which opaque firms are funded by entrants.

Proposition 4 *If $\mu_b \geq \max\left\{\underline{\mu_b}, \mu_b^p\right\}$ and $\rho + c_O/\beta \leq R < 1 + c_O$, the equilibrium of the first period is a credit constrained in which opaque firms are not funded. In the second period, there exists a separating equilibrium in which profitable opaque firms are screened and funded by entrants, whereas incumbents retain their transparent borrowers. To have*

such an equilibrium, we need to have

$$\beta > \frac{c_O}{c_T + c_O}$$

In this case, opaque firms enjoy increased access to credit following foreign bank entry.

The proofs can be found in Appendix. The intuition is that in sectors where incumbents face a relatively bad pool of borrowers together with low return on projects, only transparent firms are distinguished and funded, while the large adverse selection cost and high cost of screening opaque firms make it impossible for incumbents to successfully provide credit to opaque firms. In the second period, assuming that the entrant does not have a huge cost advantage so that it prevails in the whole market, for low levels of β, there will be no entry in the market. The reason is that when β is low, screening of opaque firms by entrants is very expensive and given that incumbents can costlessly distinguish transparent firms, entrants will be incompetent to offer any better contract than incumbents. However, for a relatively high level of β, when the economy has relatively rich institutions, entrants will have more access to hard information useful for screening opaque firms. As a result, the entrants disadvantage in screening opaque firms might become less than their disadvantage in identifying transparent firms, in that transparent firms are perfectly identifiable by incumbents. The only group of firms that are better off after entry is the opaque firms because of their increased access to credit.

Figure 1 illustrates all four equilibrium outcomes described above. As discussed before and can be seen in the figure, the higher the proportion of 'bad' firm in a sector, the more likely incumbents engage in screening and, hence, the more the information of incumbents about the firms. In other words, there is a negative relation between the quality of borrowers in a sector and incumbents' information; if the pool has a very high quality, incumbents do not bother screening, whereas when the adverse selection gets severe, they have to start screening and collecting information. In sectors with the highest information asymmetry between incumbents and entrants, where the equilibrium is separating, entrants cherry pick informationally transparent borrowers. This, however, is not the case when the equilibrium is semi-pooling or credit constrained. In these situations, while competing with entrants, incumbents can perfectly identify transparent firms but not opaque types, and as a result the entrants might be able to fund opaque firms.
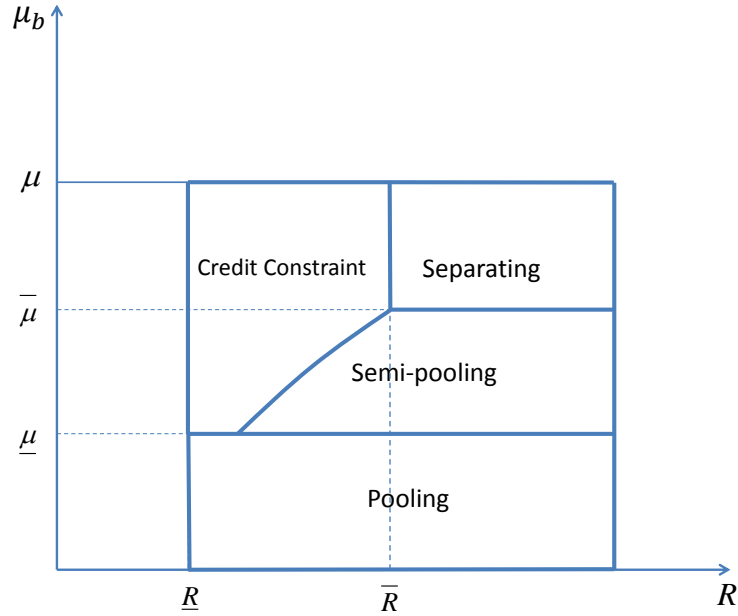
Figure 1: Equilibrium of the first period

This figure describes the equilibrium of the first period as a function of the proportion of 'bad' firms and the outcome of projects. If the proportion of bad firms is very low, incumbents pool all firms together (pooling). At a moderately higher level of bad firms, the potential loss from lending to them, if pooled, is too high that it is optimal to sort transparent types and pool opaque firms together with a higher rate (semi-pooling). If the quality of the pool is really low, the rate of pooling opaque firms exceeds the rate at which profitable opaque firms could be distinguished. So, the bank find it optimal to sort and fund all profitable firms (separating) but not the 'bad' firms.. Finally, if the return of project is not large enough to cover the cost of adverse selection resulting from pooling of opaque firms and the cost of screening opaque types, only transparent firms will have access to credit (credit constrained).

5   Further Discussion of the Model

5.1   Entry of New Firms

The model does not allow for entry of new firms. Specifically, firms existing in the second period are exactly the same as those in the first period. This is obviously not realistic; in the real world, in each period new firms enter the market. How does relaxing this assumption change the results of the model? To answer this question properly, one need to write down a dynamic model and have assumptions related to the rate of entry of each type of firms in the economy and the evolution of screenig abilities of foreign lenders. However, in the most simplistic case with no additional assumption, new transparent firms will be funded

by foreign lenders whereas domestic lenders will finance new opaque and small firms. This is intuitive since in case of new firms, those who have not been screened before, foreign lenders always have comparative advantage in lending to transparent firms. This result has an implication that is consistent with the empirical evidence. In particular, lets assume the equilibrium in which foreign lenders finance opaque firms whereas domestic lenders focus on transparent firms. Allowing new entry of firms in the subsequent periods implies that the portfolio of foreign (domestic) banks will go from being only opaque (transparent) firms to a mix of opaque and transparent firms. In other words, the portfolios converge to each other in the middle term. This is consistent with Jurzyk, Degryse, Havrylchyk, and Kozak (2009) who show that "There is significant convergence between foreign and domestic banks in terms of groups of borrowers they lend to."

However, as mentioned above, what really happens will also depend on the evolution of foreign lenders in screening technologies. The main reason, foreigners are assumed to be disadvantaged is that they are entering into a new market. As they stay in the market and lend to, for example, opaque firms they might be able to screen the future opaque firms will a much lower cost. Therefore, even in the long term with a slightly modified (and more realistic) version of the model, the share of trnasparent firms in entrants' portfolio does not go towards 1.

5.2   Why Focusing on Equilibria with Both Lenders?

In solving the model, the focus of the paper was on equilibrium outcomes with the presence of both domestic and foreign lenders. The idea is to restrict our attention to arguably more realistic and therefore more interesting cases. The empirical evidence on foreign bank entry does support the idea that foreign banks do *not* force domestic banks completely out of the market. In particular, Claessens and van Horen (2012) introduce a new and comprehensive database on bank ownership covering 137 countries. The data shows that foreign banks are far from prevailing the domestic markets they enter. For example, in 2009, the share of foreign banks in terms of the number was 20% in aggregate. Looking separately at different income groups (OECD, other high-income groups, emerging markets, developing countries) and different regions (East Asia and Pacific, Eastern Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub Saharan Africa) show that in none of the cases from 1995 to 2009 the share of foreign banks have been more than 50%. These figures are similar when one looks at the share of foreign bank loans to total loans. Foreign banks do not have more than 50% share of loans across differnet country groups. Even when looking at individual countries and some of the extreme cases, we still observe that domestic banks are *not* completely forced out of the market. For example, Mexico is famous for being dominated by foreign banks. The data

shows that the percentage of foreign bank assets among total bank assets has been less than 83% and the share of foreign banks in total number of banks has been less than 50%. This is not to say that there is absolutely no possibility of foreign banks prevailing in the whole market, but as far as the data shows the presence of both domestic and foreign banks is by far the most common pattern following foreign entry. Therefore, focusing on only equilibria with the presence of both lenders reduces the analyses to cases that seems to be more realistic. In addition, the main contribution of this paper is presenting equilibrium outcomes with both banks being present in the market rather than showing numerous equilibria where domestic banks leave the market. For the results when only entrants stay in the market, we refer the reeader to other papers such as Gormley (2011).

5.3   Information Acquisition

The model assumes that unless screening firms, domestic banks receive no information about firms' types. More specifically, if in the first period domestic banks offer a pooling contract to opaque firms, even at the end of the period when the outcome of the projects are realized, lenders will receive no information about firms. One could think of this assumption as follows: a pooling equilibrium resembles a situation where banks invest in a financial product that is a mixure of the outcome of all opaque firms. In this case, banks only receive the aggregate outcome but do not get any signal on the outcome of specific projects or firms' type.

However, relaxing this assumption will not affect the main results of the paper. First, in case where domestic lenders screen transparent firms and only fund them in the first period, the results will be intact because there is no pooling. Second, when we have semi-pooling equilibrium in the first period, the information set of domestic lenders will be slightly different at the beginning of the second period because those firms with failed projects could only be "bad" firms. Therefore, domestic banks could exclude the proportion of "bad" firms whose project failed and therefore the pooling rate that domestic lenders will offer would be slightly lower. Specifically, remember that the pooling rate incumbents could offer was $\frac{1}{1-(1-p)\mu_b}$ and therefore if the proportion of bad firms (μ_b) go down, they can offer a lower interest rate to the pool of opaque firms. This, however, only affect the threshold for cost of funds' advantage of entrants above which they could offer a better pooling contract to opaque firms. Note that in the original model of the paper, entrants can always offer a better pooling contract than domestic lenders as their cost of fund is assumed to be lower. When domestic lenders can distinguish some "bad" firm, entrants still will be able to offer a more competitive pooling contract if their cost of funds is low enough. Overall, while simplifying the analyses, relaxing the assumption on how information about firms is acquired does not affect the main results of the paper.

5.4 Screening Costs

One assumption of the model is that domestic lenders can costlessly distinguish firms that they have already screened in the first period. The zero screening cost in the second period, however, is not a crucial assumption and it is only for simplicity. The crucial assumption is that the screening cost of firms that have already been screened should be lower that the cost of distinguishing them for the first time. More formallly, lets assume that the second time screening costs are $0 < \epsilon_O < c_O$ (or $0 < \epsilon_T < c_T$) rather than zero. In this case, all the results of the paper will be the same except that the thresholds will include ϵ in them. This is intuitive as the mechanism through which the model works in not the cost of screening being zero but the idea that after screening for the first time it will be *easier* for domestic lender to sort out those firms. The derivation of new thresholds for Proposition 1 and 2 assuming non-zero cost of screening is provided in the appendix.

5.5 Mode of Entry

In practice, foreign banks could enter to domestic markets in two different modes: greenfield or takeover. The model of this paper abstracts from takeover as a mode of entry and implicitely assumes that foreign banks use greenfield investment-establish new wholly owned subsidiary. Indeed, this is what most of the literature has done so far [see Dell'Ariccia and Marquez (2004), Sengupta (2007),Gormley (2011) and Detragiache, Tressel, and Gupta (2008)]. Claeys and Hainz (forthcoming) is an exception that model the mode of entry and investigate its effects on lending rates. Having said this, there are other interesting questions regarding the modes of entry that remain open. For instance, what are determinants of entry mode? In which countries does libralization come with restrictions on the modes of entry? Why exactly do governments put these restrictions? What are the effects of entry restrictions on outcomes such as the size of credit or the real output? The setup of this model, we believe, is suitable to be developed in a way to answer at least some of the above questions. We think this is a promising area for future research.

6   Implications and Empirical Evidence

In this section, I discuss the main theoretical results and their empirical implications and compare them with the empirical evidence regarding foreign entry into credit markets.

6.1 Domestic welfare

The model shows that foreign entry benefits domestic countries through increased access to credit or reduced spread (see Tables 1 and 2 for a summary of the results). This is consistent with the existing theoretical and empirical literature [e.g., see theoretical papers of Dell'Ariccia and Marquez (2004) and Sengupta (2007), and empirical works of Clarke, Cull, and Pera (2006), Giannetti and Ongena (2012), and Giannetti and Ongena (2009) among others]. In addition, the model has predictions on which types of firms benefit from the entry and how. In particular, when the average quality of borrowers in the sector is very low but the successful projects pay off relatively well, all firms will be screened and the sector will be in a separating equilibrium. Entry in such a sector benefits only transparent firms. The benefit comes from reduced interest rates the entrant, due to its cost of funds' advantage, can offer to transparent firms. However, when the quality of borrowers' pool is relatively good, either semi-pooling or credit constrained equilibrium will occur, depending on the return on projects. Consequently, the entry benefits opaque firms via reduced interest rate or increased credit access, respectively. It should be noted that we have assumed a competitive market before entry and so the reduction in spread occurs, if any, not because of lowering monopolistic power of the incumbent in absence of the entrant but because of differences in screening technologies and the cost of funds between incumbents and entrants. We acknowledge that despite the fact that most of the empirical studies find support for the positive impact of foreign entry, there is also some evidence on the negative impact of bank entry on domestic credit markets [see Gormley (2010) and Detragiache, Tressel, and Gupta (2008)] that this paper is not intended to explain.[12] Other theoretical studies have specifically tried to explain this phenomenon [see Gormley (2011) and Detragiache, Tressel, and Gupta (2008)].

6.2 Foreign banks, cherry-picking and SMEs lending

The empirical evidence regarding the impact of foreign entry on access to credit for SMEs is inconclusive. A considerable empirical literature finds cherry picking behavior of foreign banks, i.e, picking the largest and the most transparent firms and leaving smaller and opaque firms to the incumbent [e.g. see Mian (2006), Berger, Klapper, and Udell (2001), Berger, Miller, Petersen, Rajan, and Stein (2005), and Detragiache, Tressel, and Gupta (2008)]. Therefore, it is not surprising that critics of financial liberalization raise this as one of the most important drawbacks of opening up the financial market [e.g., see Stiglitz (2000)]. However, several empirical studies find evidence supporting the direct

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[12]As will be explained in Section 6.3, the model could generate the same result found in Gormley (2011) that entry reduces the aggregate credit in the economy. However, that only occurss when entry happens in the pooling equilibrium and the entrant dominate the whole market, which was not the focus of this paper.

impact of the entrants on SMEs, i.e, entrants' lending to SMEs. For instance, de la Torre, Pera, and Schmukler (2010) provide evidence from developed and developing countries that foreign and large banks increasingly use special technologies such as credit scoring, which allow them to lend to opaque firms. In addition, based on a survey of 91 banks in 45 countries Beck, Demirg-Kunt, and Martinez Peria (2010) find that different lending technologies and organizational structures are associated with similar outcomes in terms of SMEs lending. They find no evidence that foreign banks are less willing to lend to SMEs than the other banks but in lending to SMEs they are less likely to use soft information and they use arms-length technologies such as credit scoring. Even though Beck, Demirg-Kunt, and Martinez Peria (2010) find differences in the lending technologies and organizational structures used across bank ownership types, they find almost no differences across bank types in the extent, type and pricing of SME finance. Indeed, they suggest that the evidence does not support that SMEs lending is just based on soft information and find further evidence that differences in the extent, type and pricing of SME loans across countries is driven by differences in institutional and legal environment.[13] Finally, looking at 220 banks in 20 transition countries, Haas, Ferreira, and Taci (2010) find no evidence that foreign banks lend less to SMEs. In fact, they find that foreign banks compared to private domestic banks lend significantly *less* to large firms.[14]

These different treatments of SMEs by entrants are not easily understood in the context of existing models that study how foreign bank entry affects credit allocation. This paper suggests an explanation on why and in which cases entrants lend to SMEs, and in which situations they cherry pick the most transparent firms. In particular, if the economy (before entry) is in a separating equilibrium, in which incumbents screen all firms and therefore have perfect information about them at the time of entry, the entrant's comparative advantage is on lending to transparent firms and SMEs are funded by the incumbent. This is what is usually referred as cherry-picking or cream-skimming behavior of entrants. To have a separating equilibrium before entry, the fraction of non-profitable firms in the market needs to be high and the screening cost of opaque firms should be relatively low (compared to the return on projects). It should be noted that based on the results of this paper, cherry picking behavior of entrants is not necessarily harmful for SMEs as they keep getting funded by incumbents.

Nevertheless, I show that entry in other types of equilibria does not support the cherry-

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[13]Variables they use as legal environments are *cost of enforcing contracts*, *cost of registering property* that can be used as collateral, *availability and richness of credit history information*, and *protection of property rights* in a country.

[14]The reviewed empirical evidence is by no mean exhaustive. As another example, using bank-level data for four Latin American countries during the mid-1990s, Clarke, Cull, Martinez Peria, and Sanchez (2005) find that large foreign banks often surpass large domestic banks in their share and growth of lending to small businesses. In addition, De Haas and Naaborg (2006), based on interview with managers of foreign banks in Central and Eastern Europe, document that foreign banks expanded into SMEs and retail markets.

picking behavior. Specifically, given that the economy (before entry) is in a semi-pooling or a credit constrained equilibrium, the only possible equilibrium in which both banks are present in the market is the one where the entrant attracts SMEs and the incumbent lends to transparent firms. While in the former case SMEs are paying lower spreads on their loans (compared to their spread before entry), in the latter their access to credit increases. The model has also some predictions regarding SMEs funding of entrants in different sectors. Because semi-pooling and credit constrained equilibria are the relevant outcomes before entry in relatively low profitable sectors (compared to the screening cost of opaque firms) and relatively low proportion of 'bad' firms (relative to separating equilibrium), the prediction of the model is that SMEs funded by the entrant are the ones in segments with relatively low profitability and relatively low proportion of 'bad' firms (perhaps mature industries). Overall, the results suggest two situations where allowing foreign entry will leads to SMEs financing by entrants: entry in relatively low profitable sectors of the economy or where the proportion of bad firms is relatively low. This has implication on which sectors should government allow and encourage foreign banks to enter in case the aim of the policy is to increase access to credit for SMEs.

6.3   Institutions and foreign lending

A growing literature suggests that a country's institutions affect financial development [Beck and Levine (2005)]. The theoretical model of Sengupta (2007) shows how improvement in a country's legal environment facilitates the entry of low cost, outside competitors and enhances the efficiency of the country's financial market. Berger and Udell (2006) argue how large and foreign banks could use transaction technologies, based on hard information, such as small business credit scoring or asset-based lending to overcome their informational disadvantage and lend to SMEs.

In this model, I show how the legal and institutional environment not only affect the size of credit market [see La Porta, Lopez-De-Silanes, Shleifer, and Vishny (1997), La Porta, de Silanes, Shleifer, and Vishny (1998) and Djankov, McLiesh, and Shleifer (2007)] by facilitating the entry of large outside competitors, but also affect the composition of firms being funded and the composition of different banks' portfolios.[15] In fact, by reducing the entrant's screening cost of opaque firms (SMEs), the host country's institutions might help the entrant to overcome the informational disadvantage and successfully attract small and opaque firms. More precisely, given that before entry the economy is in a credit constrained equilibrium, foreign entry can greatly increase access to credit for SMEs if domestic institutions are developed enough so that the entrant can obtain required hard information with a moderate cost to screen opaque firms. This is one of equilibria that

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[15]Note that in a credit constrained economy, if the level of institutional quality is lower than the threshold specified in Proposition 4, the entry might not happen.

does not support cherry-picking behavior of the entrant. However, entry in a credit constrained economy with a poor institutional environment either does not happen or leads to entrant's prevailing in the market by picking the transparent clients of incumbents and pushing them out of the market. Hence, the policy implication is that for a credit constrained economy with the lack of suitable institutions, credit market liberalization would not necessarily be successful. Haber (2005) explains in detail how the banking liberalization in Mexico turns unsuccessful due to the lack of proper institutions. Note that in the context of this paper's model, better institutions are those that facilitate screening of opaque firms by foreign lenders. One examples of such an institution would be credit bureaus. Credit bureaus have been shown to reduce the cost and time to process loans [Miller (2003)]. Another example would be strengthening creditor rights, which encourage entrants to expand to small and less known firms as new lenders are more protected by law. Berger and Udell (2006) provide a detailed discussion of different types of institutions that will help entrants to screen opaque firms.

6.4 Indirect impacts of foreign entry

There is a literature suggesting that foreign entry *indirectly* benefits SMEs. Dell'Ariccia and Marquez (2004) show that following liberalization since domestic lenders reallocate their portfolios towards more captive borrowers, clients who in the aftermath of liberalization do not obtain access to foreign lending should still benefit from the reform. Giannetti and Ongena (2012) provide empirical support for such an indirect benefit that SMEs gain following foreign entry. The model discussed here shows that foreign entry in a competitive credit market with unlimited supply of funds of domestic lenders cannot generate such an indirect effect. Relaxing these assumptions, it can easily be shown how entry is indirectly beneficial for small and opaque firms. For example, in case of limited amount of the incumbent's funds, even if the entrant lends to transparent firms, SMEs will also benefit through an increase in the *availability* of credit. Suppose the incumbent has limited access to funds so that it is impossible to lend to all credit worthy borrowers. In this case, the incumbent chooses to sort transparent firms as they are distinguishable with a lower cost and the opaque firms will not be funded due to the fund's constraint. This is similar to the credit constrained equilibrium described before. In such a situation, even if the entrant cherry picks transparent firms, the incumbent shifts its portfolio towards opaque firms (SMEs) because the reason they were not funded before was not their credit worthiness or adverse selection but the lack of funds and since the transparent firms are now funded by the entrant, there are funds available to lend to SMEs.

Another situation where SMEs may indirectly benefit from foreign entry is when the domestic credit market before entry is not competitive. In this case even if the entrant

does not fund SMEs, the incumbent has to reduce the rates for them because of increased competition. For instance, in case of a separating equilibrium before entry, which leads the entrant to pick the transparent firms, SMEs also benefit because in absence of the entrant, the incumbent could charge them $r_{po} \in [1, R]$, while entry pushes down the upper limit to $\rho + c_O/\beta$. Hence, the model sheds light on when and how foreign entry is capable of benefiting SMEs indirectly. That is, assuming no limitation of funds for domestic banks, which is a standard assumption, the indirect benefit of foreign entry is decreasing with competitiveness of domestic credit market and in the extreme case when the domestic market is perfectly competitive, the only positive impact foreign lenders could have on SMEs is the direct effect.

7   Concluding Remarks

A concern among policymakers and economists, particularly in emerging markets, is that foreign entrants "cherry-pick" the most transparent firms, leaving opaque borrowers to incumbents. Although this view is supported by all existing theoretical literature, the empirical evidence is inconclusive and suggests that entrants do expand to SMEs. This paper presents a more complete theoretical framework in which the incumbent's information about firms is derived endogenously, as opposed to the previous literature that the incumbent's information is an assumption. The incumbent's information is shown to be dependent on the fraction of non profitable firms in the economy (sector) and the cost of screening of firms. I show that although 'cherry-picking' by entrants is a possible outcome of foreign entry, this is not always the case. In particular, if opaque firms are not screened before entry, comparative advantage of banks in screening different types of firms might reverse since transparent firms are the only type distinguishable costlessly by incumbents. For each cost of funds' advantage of entrants, there exists a threshold of quality of legal institutions, above which entrants can attract opaque but not transparent firms. Hence, the paper reconciles the contradicting results of the literature and provides insights on when entrants are likely to fund small and opaque firms.

8   Appendix

8.1   Tables

Table 1: Changes in Variables after Entry

This table presents the changes in values of observable variables following entry in different domestic market equilibria. Entry in a semi-pooling or a separating equilibrium does not change the total credit, as all firms are funded before and after entry. However, in the former, opaque firms will have access to credit with a lower price, whereas in the latter, transparent firms will benefit from the entry by paying lower rates. Entry in a credit constrained increases total credit in the economy and benefits opaque firms by having more access to credit.

	Semi-Pooling	**Separating**	**Credit Constrained**
Total credit	constant	constant	increase
Winner	opaque firms	transparent firms	opaque firms
Why winner	reduced interest	reduced interest	increased credit

Table 2: Equilibrium Values of Observable Variables after Entry

This table presents the equilibrium values of observable variables following entry in different domestic market equilibria.

	Semi-Pooling	Separating	Credit Constrained
Total output	$R(\mu_t + \mu_{po} + p\mu_b)$	$R(\mu_t + \mu_{po})$	$R(\mu_t + \mu_{po} + p\mu_b)$ $R(\mu_t + \mu_{po})$
Total credit	1	$\mu_t + \mu_{po}$	1 $\mu_t + \mu_{po}$
Credit/Output	$\dfrac{1}{R(\mu_t + \mu_{po} + p\mu_b)}$	$\dfrac{1}{R}$	$\dfrac{1}{R(\mu_t + \mu_{po} + p\mu_b)}$ $\dfrac{1}{R}$
Foreign/Total assets	$\mu_{po} + \mu_b$	$\dfrac{\mu_t}{\mu_t + \mu_{po}}$	$\mu_{po} + \mu_b$ $\dfrac{\mu_{po}}{\mu_t + \mu_{po}}$

8.2 Proofs

Proof of Lemma 1. The pooling rate the entrant can offer is:

$$[p\mu_b + \mu_{po} + \mu_t]\, r_p = \rho \quad \Rightarrow \quad r_p = \frac{\rho}{p\mu_b + \mu_{po} + \mu_t}$$

To simplify we use the fact that $\mu_{po} = 1 - \mu_b - \mu_t$. Plugging in the above expression, we have

$$r_p = \frac{\rho}{1 - (1-p)\mu_b}$$

Note that this is less than the pooling rate the incumbent can offer (look at the Proof of Proposition 1 for calculation of the incumbent's pooling rate). Hence, the incumbent will be pushed out of the market. Note that incumbents cannot offer any screening contract and charge firms less than the pooling rate of entrants. The minimum screening rate for transparent firms that incumbents can offer is $1 + c_T$, while entrants can offer $\rho + c_T$, which is less. The rate of a contract screening opaque firms must be higher than the pooling rate incumbents can offer. Otherwise, the first period equilibrium will not be a pooling equilibrium in that profitable opaque firms apply for a screening contract, which has a lower rate in the first period and in the second period their type will be known to incumbents, thereby receiving a lower rate. ∎

Proof of Lemma 2. Since transparent types are screened in a semi-pooling equilibrium, incumbents can perfectly distinguish them in the second period. We know that incumbents can never compete with entrants in offering a more attractive pooling contract as the latter has a cost of funds' advantage. Specifically, provided breaking even, incumbents can offer a pooling rate of $r_{sp} = \mu/[\mu - (1-p)\mu_b]$ to opaque firms, while entrants offer $r_{sp} = \mu\rho/[\mu - (1-p)\mu_b]$, which is strictly lower than the incumbents' rate. Hence, opaque firms are always captured by entrants.

On the other hand, in a competitive market, since transparent types are distinguishable by incumbents, they can receive credit at a rate of $r_t = 1$. Of course, if entrants have a huge cost of funds' advantage, despite their informational disadvantage they might be able to offer a lower rate to transparent firms and prevail in the market. In particular, entrants can offer a contract that sort transparent firms with the rate $r = \rho + c_T$. So, if $r = \rho + c_T < 1$, entrants could push incumbents out of market. Therefore, we need to have $r = \rho + c_T > 1$ to avoid the situation where the entrant prevails in the market. Now there might be two situations: one is that opaque firms are pooled by the entrant and the other is that the entrant offer a screening contract to opaque firms. When the pooling rate that make entrants break even is lower than the screening rate they can offer, all opaque firms will apply for the pooling contract. This condition gives us an upper bound for β below

which entrants will pool opaque firms. Formally,

$$\rho + c_O/\beta > r_{sp} \quad \Rightarrow \quad \beta < C_O(r_{sp} - \rho)$$

Therefore, for low values of β, the outcome of entry is a semi-pooling equilibrium where transparent firms are funded by incumbents while opaque firms are pooled by entrants. On the other hand, when $\beta > C_O(r_{sp} - \rho)$, the screening contract is cheaper than the pooling contract and profitable opaque firms would apply for the screening contract. Therefore, the outcome of entry would be a separating contract where transparent firms are retained by incumbents while profitable opaque firms are screened and funded by entrants. ∎

Proof of Lemma 3. As all firms are distinguishable by incumbents, and entrants have more difficulty identifying opaque firms, comparative advantage of entrants is in lending to transparent borrowers. We know that incumbents can offer $r = 1$ to all profitable firms. The rate of a screening contract that entrants can offer to opaque firms is $\rho + c_O/\beta$. If this rate is less than 1, entrants will dominate in the whole market. Hence, in order not to have one bank in the market, we need to have $\rho > 1 - c_O/\beta$. On the other hand, in order for entry to happen, we need to have $\rho < 1 - c_T$. Otherwise, entrants cannot attract any firms. Hence, if $1 - c_O/\beta < \rho < 1 - c_T$, the unique equilibrium with both banks arises. It is a separating equilibrium where entrants lend to transparent types while profitable opaque firms are funded by incumbents. Transparent firms charge $r_t = \rho + c_T < 1$, and opaque firms receive a credit at the rate $r_{po} = 1$.

∎

Proof of Lemma 4. Given that the economy of the first period is in a credit constrained, we know that in the second period transparent firms (the only firms screened and funded in the first stage) will be distinguishable by incumbents. Assuming that the entrants cost advantage is not too high so that it can dominate in the whole market, i.e, $\rho > 1 - c_T$, the entrant might be able to overcome its informational disadvantage and attract opaque firms. This is the case if $\rho + c_O/\beta < 1 + c_O$, which implies that $\rho < 1 - [1/\beta - 1]c_O$. Hence, for all $1 - c_T < \rho < 1 - [1/\beta - 1]c_O$, we have a separating contract in which entrants screen and fund opaque firms. However, for such an equilibrium to exist, we need to have

$$1 - c_T < 1 - [1/\beta - 1]c_O \quad \Rightarrow \quad \beta > \frac{c_O}{c_T + c_O}$$

So, under these conditions, for all projects with $R \geq \rho + c_O/\beta$, there exists a separating equilibrium in which the incumbent funds transparent firms, while the entrant screens and funds profitable opaque firms.

∎

Proof of Proposition 1.

First, I find the pooling (gross) interest rate the incumbent can offer. Note that the proportion of T-types is denoted by μ_t in the proof.

$$[p\mu_b + \mu_{po} + \mu_t]\, r_p = 1 \quad \Rightarrow \quad r_p = \frac{1}{p\mu_b + \mu_{po} + \mu_t} \quad \Rightarrow \quad r_p = \frac{1}{1 - (1-p)\mu_b}$$

Similarly, the pooling rate entrants can offer would be: $r_p = \rho/[1-(1-p)\mu_b]$. In order to have a pooling equilibrium, transparent firms should not have an incentive to accept the screening contract that reveals their type for the second period. Hence, the sum of two pooling rate should be less than the screening rate of the first period ($r_T = 1 + c_T$) plus the rate of the next period when incumbents can distinguish transparent types ($r_T = 1$). Hence,

$$\frac{1}{1 - (1-p)\mu_b} + \frac{\rho}{1 - (1-p)\mu_b} \leq 1 + c_T + 1 \quad \Rightarrow \quad \mu_b \leq \frac{(2+c_T) - (1+\rho)}{(2+c_T)(1-p)} = \underline{\mu_b} \quad (1)$$

∎

Proof of Proposition 2. We have shown in the Proposition 1 that when $\mu_b > \underline{\mu_b}$, transparent firms will prefer a screening contract. However, opaque firms still might apply for a pooling contract if μ_b is not too high that they face a very large adverse selection. In other words, the profitable opaque firms might not want to bear the cost of screening in order to signal their type and in the second period receive a low rate. Hence, if the sum of pooling rates they pay for the first and second period is lower than the rate they have to pay if they receive the screening contract, opaque firms will apply for a pooling contract. Using this logic, I find the threshold of μ_b below which opaque firms prefer pooling to separating.

The pooling rate that incumbents offer to opaque firms is calculated as the following:

$$\left[\frac{\mu_{po}}{\mu_b + \mu_{po}} + \frac{p\mu_b}{\mu_b + \mu_{po}} \right] r_{sp} = 1 \quad \Rightarrow \quad r_{sp} = \frac{\mu}{\mu - (1-p)\mu_b}$$

We have found the next period equilibrium (in Lemma 2) and the rate that opaque firms will get if they are pooled in the first period. Hence, opaque firms will prefer a pooling contract compared to a separating if:

$$\frac{\mu}{\mu - (1-p)\mu_b} + \frac{\mu\rho}{\mu - (1-p)\mu_b} \leq 1 + c_O + 1 \quad \Rightarrow \quad \mu_b \leq \frac{(2+c_O) - \mu(1+\rho)}{(2+c_O)(1-p)} = \overline{\mu_b} \quad (2)$$

The participation constraint of opaque firms need to be satisfied to have a semi-pooling equilibrium. That is, the pooling rate that lender offer to break even should not exceed the return on projects. Otherwise, no profitable opaque firm would apply for a pooling contract, as it generates negative profits.

$$\frac{\mu}{p\mu_b + \mu_{po}} \leq R \quad \Rightarrow \quad \frac{\mu}{\mu - (1-p)\mu_b} \leq R \quad \Rightarrow \quad \mu_b \leq \frac{\mu(R-1)}{(1-p)R} = \mu_b^p$$

∎

Proof of Proposition 3.

We know from Proposition 2 that when $\mu_b > \overline{\mu_b}$, profitable opaque firms prefer a separating contract than a pooling, as the degree of adverse selection is too hight in the pool. However, the screening cost should not be too hight so that the participation constraint of firms is not violated, i.e, we need to have $R > 1 + c_O$.

∎

Proof of Proposition 4. Using the results of Proposition 2, we know that if $\mu_b > \mu_b^p$, participation constraint of profitable opaque firms is violated if receiving a pooling contract. Moreover, from the Proposition 3, if $R < 1 + c_O$, there cannot be a separating contract under which banks break even, hence, there would not be any separating equilibrium. In this case, if $\mu_b > \underline{\mu_b}$, only transparent firms apply for a screening contract and obtain credit, whereas opaque firms do not have access to credit and are rationed.

In the second period, as shown in Lemma 4, entry happens if $\beta > c_O/(c_O + c_T)$ and entrants will have a comparative advantage in screening opaque firms as $\rho + c_O/\beta < 1 + c_O$. To be a feasible equilibrium, the must be that $R \geq \rho + c_O/\beta$. ∎

Deriving Thresholds with Non-Zero Screening.

Here I assume that the screening cost of firms for the second time is ϵ rather than 0. As explained also in the main text, what will change is only the thresholds and the main results and propositions remain similar. As an example I derive the new thresholds for Proposition 1 and Proposition 2. As it will be shown, the derivation will be straightforward and it is obvious to see that all other results will survive with the same logic.

I start with deriving the threshold (μ_b) in Proposition 1. As before, the condition is that the pooling rates should not be larger than the rates with screening in order to have a pooling equilibrium. The only thing that will differ, therefore, is the screening rate domestic firms can offer in the second period for those who were screened in the first period. Specifically, the last term in right hand side of the first inequality will be $1 + \epsilon$

instead of 1. Thus, the Equation 1 will be modified to:

$$\frac{1}{1-(1-p)\mu_b} + \frac{\rho}{1-(1-p)\mu_b} \leq 1 + c_T + 1 + \epsilon \quad \Rightarrow \quad \mu_b \leq \frac{(2+c_T+\epsilon)-(1+\rho)}{(2+c_T+\epsilon)(1-p)} = \underline{\mu_b}$$

In Proposition 2, the threshold that will change is the one in Equation 2. Using a similar argument as above, to find the threshold above which opaque firms prefer a pooling as opposed to a separating contract, Equation 2 will be modified as follows:

$$\frac{\mu}{\mu-(1-p)\mu_b} + \frac{\mu\rho}{\mu-(1-p)\mu_b} \leq 1 + c_O + 1 + \epsilon \quad \Rightarrow \quad \mu_b \leq \frac{(2+c_O+\epsilon)-\mu(1+\rho)}{(2+c_O+\epsilon)(1-p)} = \overline{\mu_b}$$

To sum up, what really would change when assuming that the second period screening cost is ϵ rather than 0 is replcaing the rate that incumbents can offer to already being screened firms, which was 1, to a new rate that is $1+\epsilon$. Now, it is obvious how similar argument and derivation hold for other results.

■

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