ESSAYS IN FINANCIAL MARKET IMPERFECTIONS

By

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CHAPTER I

INTRODUCTION

This dissertation is comprised of three essays on financial market imperfections.

The first essay analyzes the effect of foreign entry on domestic banking markets. This phenomenon is of interest to both regulators and academics. Previous empirical studies have shown that the effect of foreign entry is very different in developed versus developing countries. For example, Claessens et al. (2001) find that foreign banks have lower profits than domestic banks in developed countries, but the opposite is true in developing countries. An important concern in this context is the possibility that foreign banks have difficulty in extending loans to small firms. This evidence, which appears stronger in emerging markets, has led some policymakers to believe that foreign banks "cherry pick", leaving the worst risks to the domestic banks. This essay provides an integrated theoretical framework in which to examine these issues and their implications for policy and institutions. Foreign entry and bank competition are modeled as the interaction between asymmetrically informed principals: the entrant uses collateral as a screening device to contest the incumbent's informational advantage. Both better information *ex ante* and stronger legal protection *ex post* are shown to facilitate the entry of low-cost outside competitors into credit markets. The entrant's success in gaining borrowers of higher quality by offering cheaper loans increases with its efficiency (cost) advantage. The model allows us to explore the impact of entry and bank competition on firms' access to credit. In particular, this model rationalizes the perceived bias that foreign banks lend more to large firms, thereby neglecting small enterprises. At the same time, it also explains why better informed domestic and local banks continue to find a market among such small firms. Lastly, it shows why this bias can be stronger in developing countries.

Banks deny loan applications of borrowers after learning that they are not cred-

itworthy. These bad-risk borrowers can apply to loans from an entrant even if they are denied credit by the incumbent. The second essay extends the model presented in the first chapter to include such bad-risk types. It shows how an incumbent bank's knowledge about the creditworthiness of its (previous) customers, in addition to that of its existing clients, affects the behavior of entrants into credit markets. An important result here is that despite having a cost advantage over its rival, an entrant's ability to gain market share first decreases, and then increases with increases in the (average) quality of the borrower population. If the proportion of high risks is neither sufficiently large that they can be pooled with bad-risk types, nor sufficiently small so that they can be pooled with low-risk types, pooling contracts may no longer be feasible. In particular, if it is also the case that the entrant cannot screen the high-risk types, then the incumbent dominates despite the entrant's cost advantage. Thus, for low cost advantages, the entrant gains market share if the proportion of high risks is either low or high, while the incumbent dominates for intermediate values.

The third essay (joint with Mara Faccio) is an empirical study analyzing corporate responses to an economy-wide crisis. We concentrate on five economies—Indonesia, Malaysia, the Philippines, South Korea and Thailand—that were hit by the Asian financial crisis of 1997-1998. Using data collected from a wide range of sources, this study investigates the ways in which firms tried to avoid bankruptcy through restructuring their assets and liabilities during the crisis. We analyze four types of response: workouts, asset sales, mergers and liquidations. In addition, we consider firms that do not undertake any visible form of restructuring. We find the restructuring of liabilities to be the most common type of response. On the other hand, we argue that firms may be reluctant to engage in major asset sales due to substantial price discounts that need to be applied to these transactions during the crisis. In fact, we document that transaction multiples dropped by 40% during the crisis, compared to a pre-crisis period. We contrast financial and corporate governance considerations

and find strong support for the notion that, during a crisis, financial constraints have a large impact on the restructuring choice. However, we find that the explanatory power of corporate governance (e.g., control) variables is at best, marginal.

CHAPTER II

FOREIGN ENTRY AND BANK COMPETITION

Introduction

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

The purpose of this essay is to understand how this problem affects foreign entry and lending behavior in credit markets.[1] Banks are modeled as asymmetrically informed principals: the incumbent has complete information about borrower credit-risk, but the entrant does not.[2] This relies on the notion that much of the information

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

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

regarding a borrower's *unobservable* risk can only be obtained in the process of lending (Boot and Thakor 1994, 2000). This essay studies competition between an entrant bank (uninformed lender) that faces *observationally identical* borrowers, who can be one of two types (high-risk or low-risk), and an incumbent (informed lender) that can distinguish between these borrower types.

In addition, banks may require the borrower to secure loans with collateral. Interestingly, both theoretical and empirical findings have shown that collateral requirements fall over the duration of the bank-borrower relationship (Boot and Thakor, 1994; Petersen and Rajan, 1994; Berger and Udell 1995; Harhoff and Körting, 1998). This contrast between secured lending for new borrowers and unsecured lending for established ones is suggestive of the information content in collateral requirements (Sharpe, 1990; Boot and Thakor, 1994). Relevant to the discussion here is the implication that this role of secured credit assumes greater importance for an entrant seeking to create new relationships than for an incumbent lending to its established clients. Accordingly, this paper uses a screening model, based on Besanko and Thakor (1987a, hereafter B-T), to examine the entrant's use of collateral as a screening device to contest the incumbent's informational advantage.

The results indicate that both ex ante better information and ex post stronger legal protection can facilitate the entry of low-cost outside competitors into credit markets. Market segments characterized by a greater proportion of high-risk borrowers frustrate the entrant's ability to pool borrowers. On the other hand, poor legal protection can prevent the use of collateral as an effective means to successfully sort borrowers. In this model, both pooling and separating equilibria are shown to exist. Importantly, the entrant's success in gaining borrowers of higher quality (lower risk) by offering cheaper loans increases with its cost advantage. Three major results are summarized here. First, for small cost advantages, the entrant cannot attract both risk types either by pooling or by sorting. Consequently, it succeeds in

capturing high-risk borrowers but not the low-risk ones. Second, both the entrant's success in pooling borrowers and its profits from such pooling contracts are increasing in its cost advantage. Therefore, even with a moderate cost advantage, the entrant can successfully pool all borrowers, but only in market segments characterized by a higher fraction of low-risk borrowers. This result of the model helps in understanding the differences in observed lending behavior of entrants and incumbents in different market segments. It indicates how incumbents are likely to retain clients in riskier segments of the market when faced with more efficient outside competitors that can provide cheaper loans. Third, entry into sectors characterized by stronger information asymmetries requires a sufficiently large cost advantage, so that the entrant can successfully sort borrowers. The magnitude of this cost advantage is shown to depend on the legal and institutional features of the host country. As discussed below, this result formalizes a link between financial development and the legal and informational environment in which lenders and borrowers operate.

The theoretical results obtained here find support in empirical findings on entry into credit markets both across states within the US (Jayaratne and Strahan, 1998) and across countries of the world (Claessens et al. 2001; Beck et al. 2004). The model developed here also offers a new insight for analyzing some of the evidence that has received wide attention in recent empirical studies on (foreign) entry in banking. Claessens et al. (2001) show that the effect of foreign entry is very different in developed versus developing countries. An important concern in this context is the evidence suggestive of the possibility that foreign (and large national) banks have difficulty extending loans to informationally opaque small firms (Stiglitz, 2000; Berger et al. 2001, 2005). This evidence, which appears stronger in emerging markets, has led some policymakers to believe that foreign banks "cream skim" or "cherry pick", leaving the worst risks to the domestic banks.[3] This essay provides an integrated

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

theoretical framework to examine these issues and their implications for policy and institutions (see Section 4 for details).

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

The work most closely related to this paper is Dell'Ariccia and Marquez (2004, hereafter D-M), in which an entrant becomes a victim of the "winner's curse" because of the incumbent's informational advantage. The entrant is unable to distinguish between "lemons" rejected by the incumbent and *new* borrowers shopping around for lower interest rates (Broecker, 1990; Dell'Ariccia et al. 1999). An interesting feature of these models is that the incumbent successfully retains all of its creditworthy clients, and therefore, the entrant effectively competes for new borrowers only.[5] Yet, at any given time, the number of new entrepreneurs seeking credit may be small when compared to the number of existing firms in the market. As a result, the

cherry-picking their clients."

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

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

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

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

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

[7]Indeed Cetorelli and Strahan (2004, p. 26) assert that recent empirical evidence on this debate is unambiguous, "While theory does not paint a clear picture about how competition in banking

financial systems must account for entry barriers to new financial institutions.

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

Before describing the details of this model, I sketch the intuition. Interestingly, theoretical studies that demonstrate collateral use as a screening device also assume that collateral is costly (Bester, 1985; Besanko and Thakor, 1987a, b; Boot et al., 1991). Banks incur a dissipative cost in taking possession of and liquidating collateral. Consequently, the lender valuation of collateral is typically lower than that of the borrower (Barro, 1976). Given that collateral is costly for a bank, better information on borrower credit-risk (gained in the course of a bank-borrower relationship)

ought to affect the firm-size distribution, the empirical work does. Comparing industry structure across local markets within the U.S., or comparing structure across a large number of countries (both developed and developing), one reaches the same conclusion. ... banks with market power erect an important financial barrier to entry to the detriment of the entrepreneurial sector of the economy, perhaps in part to protect the profitability of their existing borrowers."

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

reduces a bank's incentive to secure loans with collateral. This is consistent with the findings that collateral requirements fall over the duration of the bank-borrower relationship. It also implies that in markets with poorer borrower quality overall, collateral assumes greater importance for entrants than for incumbents. Stronger legal protection reduces the deadweight losses of seizing and liquidating collateral and this enables an entrant to bid more aggressively by screening the incumbent's clients. In contrast, weak legal protection discriminates against the uninformed entrant because it reduces the efficacy of collateral use. The model formalizes how variations in law and its enforcement are central to the efficiency and growth of financial markets in general (La Porta et al. 1997, 2000), and the banking sector in particular (Levine 1998, 1999).

The Model

I consider a risk-neutral economy in which each entrepreneur has unconstrained access to collateral.[9] The entrepreneur can borrow \$1 from a bank and invest in a project that yields revenue x with probability $(1-\theta)$ and zero with probability θ. Following B-T (1987a), a debt contract specifies a repayment R to the lender if the project is successful, and an amount of collateral $C(\geq 0)$ to be paid to the lender if the project fails; this contract is denoted as (R, C). As in Barro (1976), I assume a disparity in collateral valuation between borrower and lender by defining the lender's valuation of collateral as βC, where $0 \leq \beta < 1$. The project involves a fixed non-monetary cost U^0 for the entrepreneur (the opportunity cost of her time). Lenders are assumed to have a perfectly elastic supply of funds and I denote the bank's cost of these funds by ρ. The entrepreneur's expected utility is U^0 if she does not borrow,

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

and $U(R, C, \theta) = (1 - \theta)(x - R) - \theta C$ if she borrows under the contract (R, C). The bank's payoff from contract (R, C) is given by $\pi(R, C, \theta) = (1 - \theta)R + \beta\theta C - \rho$ if it lends and 0 otherwise. The surplus generated from a loan contract (R, C) is $[(1 - \theta)x - \rho - U^0] - (1 - \beta)\theta C$. Accordingly, when a bank uses a contract with a positive collateral requirement $C(> 0)$, there is a deadweight loss of social surplus in the order of $(1 - \beta)\theta C$. Banks face a fixed pool of borrowers consisting of two types: fraction ν of borrowers are high-risk $(\theta = \theta_h)$ and fraction $1 - \nu$ are low-risk types $(\theta = \theta_l)$, with $0 < \theta_l < \theta_h < 1$. I assume $(1 - \theta_h)x > \rho + U^0$ to ensure that all (zero-collateral) loan contracts generate positive social surplus.

Using the setup described above, I model competition between an entrant bank (Bank E) and an incumbent that (pre-entry) is a price setting monopolist (Bank I). These banks differ on two counts. First, they have different costs of funds; Bank E's cost of funds is ρ^E, while Bank I's cost of funds is ρ^I. I assume that these differences in the banks' cost of funds arise because the two banks differ in their efficiencies of converting deposits to loans (Freixas and Rochet, 1997, p. 51). Second, they are asymmetrically informed about borrower types; Bank I can distinguish between a high-risk and a low-risk borrower, while Bank E cannot.[10] Stated differently, the information asymmetry in this model arises from the assumption that entrepreneurs have private information about θ, which can only be obtained by banks in the course of a lending relationship. Like Dell'Ariccia et al. (1999, p. 515.), I "have in mind a situation where the existing banks (i.e., "incumbent") in a market have

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

an informational advantage over other potential lenders (i.e., "entrant") by virtue of their established relationships with borrowers seeking credit...". In short, this model studies bank competition as competition between asymmetrically informed non-identical principals.[11] The information asymmetry discussed here is only restricted to distinguishing between borrower types. The payoff functions of banks (their cost of funds, ρ^E and ρ^I) and the distribution of borrower types in the population (the value of ν) are common knowledge. If one denotes a bank's profits from loan (R, C) to borrower k by $\pi_k(R, C) \equiv \pi(R, C, \theta_k)$, and Bank j's offer to borrower k by (R_k^j, C_k^j) where $j = I, E$ and $k = h, l$, then one can write Bank j's overall profits as $\Pi^j \equiv \nu\pi_h^j(R_h^j, C_h^j) + (1-\nu)\pi_l^j(R_l^j, C_l^j)$. Also, borrower k's utility from loan (R, C) can be written as $U_k(R, C) \equiv U(R, C, \theta_k)$, $k = h, l$.

I begin with a discussion of a single bank. A monopolist bank never requires a borrower to secure a loan with collateral. Under both complete and incomplete information, collateral is an inefficient sorting device for a single bank, and is optimally set to zero (B-T, 1987a). The key to a monopolist bank using collateral to sort borrowers lies in relaxing the assumption that borrowers' reservation utilities are type-independent. Freixas and Rochet (1997) consider a situation of *countervailing incentives* where borrowers' *exogenous* reservation utilities are type-dependent–the opportunity cost of the efficient (low-risk) agent U_l^0 is sufficiently higher than that of

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

the inefficient (high-risk) agent U_h^0, such that

$$\frac{U_l^0}{1-\theta_l} > \frac{U_h^0}{1-\theta_h}. \tag{1}$$

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

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

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

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

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

Banks as asymmetrically informed principals

Turning to the characterization of banks as asymmetrically informed principals, one observes that Bank I's information advantage allows it to charge borrower k any repayment in $[\underline{R}_k^I(\rho^I), \bar{R}_k]$ and still break even (or better). However, Bank E cannot charge any repayment in $[\underline{R}_k^E(\rho^E), \bar{R}_k]$ because it cannot identify borrower types. For example, Bank E's expected profits from its offer $(\underline{R}_l^E(\rho^E), 0)$ to low-risks would always be negative because it cannot prevent high-risks from borrowing under this contract. Therefore, offering contract $(\underline{R}_l^E(\rho^E), 0)$ is a dominated strategy for Bank E.

I start by eliminating contracts for each bank that are strictly dominated. In doing so, I describe the sets of contracts that each bank can offer in competition. For the incumbent bank, let $Z_k^I(\rho^I)$ denote the set of these contracts (R_k^I, C_k^I), one for each borrower type, $k = h, l$. Similarly, the set $Z^E(\rho^E)$ consists of the entrant's offers. This set includes both the set of pooling contracts (R_P^E, C_P^E) (subscript P for "pooling"), denoted by $Z_P^E(\rho^E)$, and the set of separating contracts $[(R_h^E, C_h^E); (R_l^E, C_l^E)]$, denoted by $Z_S^E(\rho^E)$ (subscript S for "separating"). Finally, I characterize the equilibrium for

all possible values of ρ^I and ρ^E.[12] All proofs are given in Appendix.

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

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

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

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

Entrant Bank Bank E faces borrowers whose participation constraints are deter-

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

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

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

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

Lemma 2 *The entrant's offer of a pooling contract is from the set* $Z_P^E(\rho^E) =$

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

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

[15] A separating contract $[(R_h^E, C_h^E);\ (R_l^E, C_l^E)]$ is strictly dominated by the menu $[(\hat{R}_h^E, 0);\ (R_l^E, C_l^E)]$, where $U_h(\hat{R}_h^E, 0) = U_h(R_h^E, C_h^E)$. Similarly, a pooling contract (R_P^E, C_P^E) is strictly dominated by the menu $[(\hat{R}_h^E, 0);\ (R_P^E, C_P^E)]$, where $U_h(\hat{R}_h^E, 0) = U_h(R_P^E, C_P^E)$. Note that our assertion in footnote 13 holds true.

$\{\left(R_P^E, 0\right) : R_P^E \in [R_P^{\min}(\rho^E), \bar{R}_h]\}$ *where* $R_P^{\min}(\rho^E)$ *is the minimum the entrant can charge in a pooling contract subject to breaking even.*

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

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

(a) *high-risk borrower's incentive constraint* (IC_h) *binds,* $U_h(R_h^E, 0) = U_h(R_l^E, C_l^E)$;

(b) *overall expected profits are non-negative,* $\Pi^E[\left(R_h^E, 0\right); (R_l^E, C_l^E)] \geq 0$;

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

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

Bank competition

The timing of events is as follows. Nature selects borrower types and while Bank I

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

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

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

To derive a complete characterization of equilibria, I hold the entrant's cost of funds constant at ρ^E and vary the incumbent's cost of funds ρ^I. In what follows, I will describe the equilibria for situations where entrant has the cost advantage, that is, $\rho^I > \rho^E$; first, for the entrant's offer of a separating contract (Proposition 1) and then for its offer of a pooling contract (Proposition 2). Details of the equilibria for

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

$\rho^I \leq \rho^E$, along with all the proofs, are provided in the Appendix A. Finally, this section concludes with a summary of the characterization of equilibria (see Table 1 and Figure 2).

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

Bank E can successfully sort all borrowers only if its incentive scheme yields at least as much utility as contracts offered by Bank I. Consequently, Bank E faces borrowers whose reservation utilities are determined by the maximum utility that Bank I can offer borrowers, that is, $\bar{U}_k^I(\rho^I)$. From (12), it follows that $\frac{\bar{U}_l^I}{1-\theta_l} > \frac{\bar{U}_h^I}{1-\theta_h}$. This inequality holds for all ρ^I, given the earlier assumption $\rho^I < (1-\theta_h)x - U^0$. Stated differently, Bank E's optimization problem can be viewed as that of a monopolist facing borrowers with type-dependent reservation utilities $\bar{U}_k^I(\rho^I)$ that satisfy countervailing incentives.[18] Appendix B provides the solution to this optimization problem. Note that the solution is built on the premise that the entrant is able to dominate the incumbent.[19] Evidently, this does not hold true for all values of $\rho^I > \rho^E$. The

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

[19] *Domination* by a principal implies that it can attract all agent types away from its rival (Biglaiser

equilibria in such cases are discussed in Proposition 1(b) given below.

Proposition 1 (a) *If* $\rho^I \geq \tilde{\rho}_S^{h,l} > \rho^E$ *and* $\nu > \nu_1$, *where* $\tilde{\rho}_S^{h,l} \equiv \frac{\rho^E}{1-(1-\beta)\theta_l}$ *and* $\nu_1 \equiv \frac{(1-\beta)\theta_l(1-\theta_l)}{(\theta_h-\beta\theta_l)-(1-\beta)\theta_l^2}$, *then the incumbent offers* $(\underline{R}_h^I, 0)$ *to high-risks and* $(\underline{R}_l^I, 0)$ *to low-risks. The entrant offers* $[(\underline{R}_h^I, 0); (R_l^E, C_l^E)]$ *where* $U_h(R_l^E, C_l^E) = U_h(\underline{R}_h^I, 0)$ *and* $U_l(R_l^E, C_l^E) = U_l(\underline{R}_l^I, 0)$. *If* $\rho^I > \tilde{\rho}_S^{h,l}$, *the entrant captures all borrowers and its expected profits from all loans are strictly positive. If* $\rho^I = \tilde{\rho}_S^{h,l}$, *low-risks borrow from either bank but high-risks borrow only from the entrant. Expected profits from loans to low-risks are zero but the entrant's profits from loans to high-risks are strictly positive.*

(b) *If* $\tilde{\rho}_S^{h,l} > \rho^I > \rho^E$, *the entrant offers* $[(\underline{R}_h^I, 0); (R_l^E, C_l^E)]$ *where* $U_h(R_l^E, C_l^E) = U_h(\underline{R}_h^I, 0)$ *and* $\pi_l^E(R_l^E, C_l^E) = 0$. *The incumbent offers* $(\underline{R}_h^I, 0)$ *to high-risks and* $\left(R_l^I, 0\right)$ *to low-risks where* $U_l\left(R_l^I, 0\right) = U_l(R_l^E, C_l^E)$. *High-risks go to the entrant but the incumbent retains the low-risks. Banks' expected profits from loans disbursed are strictly positive.*

The equilibrium in Proposition 1(a) provides a cut-off $\tilde{\rho}_S^{h,l} \equiv \frac{\rho^E}{1-(1-\beta)\theta_l}$ such that, when $\rho^I > \tilde{\rho}_S^{h,l}$, the entrant can capture all borrowers by offering a separating contract. How does the entrant's cost advantage help in competing with its informed rival? Clearly, a bank with lower cost generates a greater surplus from loans to borrowers than its rival. Thus, it is able to provide a borrower the maximum surplus that its rival can generate (from loans to the same borrower) and still retain a part of the surplus for itself. Providing this surplus is easy when the lender can distinguish borrower type but more difficult when the lender has to sort borrowers. As noted

and Mezzetti, 1993).

earlier, sorting borrowers with a positive collateral requirement $C(>0)$ is costly because it implies a deadweight loss of $(1-\beta)\theta C$. In Appendix B it is shown that, in a separating equilibrium where the entrant captures the low-risks, it requires the low-risks to secure loans with collateral $C_l^E = \rho^I$. But, in the event of failure (which occurs with probability θ_l), the entrant gets only $\beta\rho^I$ after liquidation: an expected loss of $(1-\beta)\theta_l\rho^I$. Since the entrant factors in such *ex post* deadweight losses in calculating profits *ex ante,* a simple cost advantage $\rho^E < \rho^I$ is insufficient to capture low-risks. A greater cost advantage is needed to overcome this informational disadvantage; the condition under which the entrant dominates the incumbent is given by $\rho^E < \rho^I - (1-\beta)\theta_l\rho^I$ (Proposition 1a).

When the entrant dominates the incumbent by using a separating contract, it gives borrowers two options: the first merely matches the incumbent's offer to high-risks, but the second offers a cheaper loan rate than the incumbent's offer to low-risks. However, among borrowers with indistinguishable risk, the entrant offers the second to only those who pledge collateral. Note that, since $C_l^E = \rho^I$, this collateral requirement increases with the entrant's cost advantage (recall that the model assumes that all entrepreneurs have unconstrained access to collateral). In the next section, these results are used to explain why foreign banks tend to lend less to smaller firms.

The equilibrium described in Proposition 1(b) holds for all values of ν. Strictly speaking, Proposition 1(b) characterizes a candidate equilibrium; if there is no pooling contract that does better for the entrant, then this candidate will be the equilibrium. Figure 1 illustrates the (candidate) equilibrium in Proposition 1(b) in (R, C) space. Borrowers' payoffs increase as one moves southwest, while lenders' profits increase

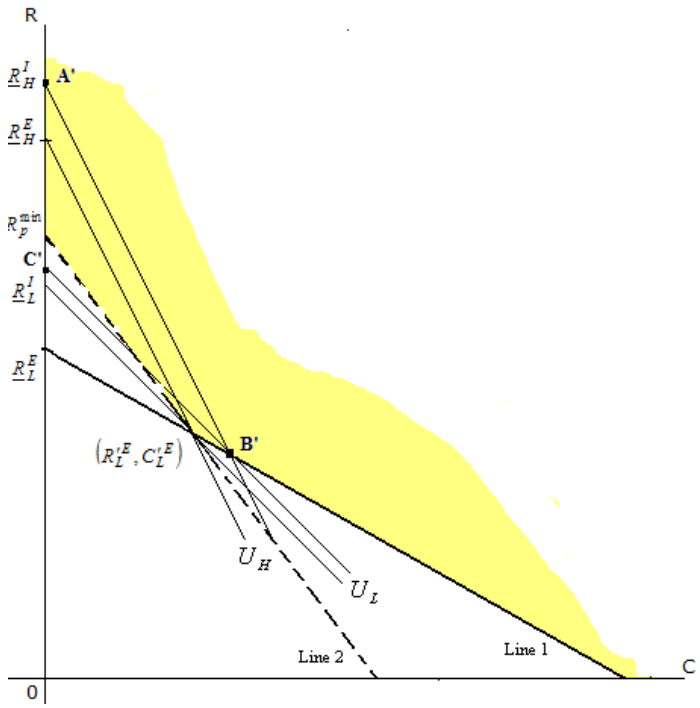

Figure 1: Equilibrium when banks split the market in (R, C) space: Equilibrium for the case $\tilde{\rho} > \rho^I > \rho^E$. Bank I offers A' to the H-types and C' to the L-types. Bank E offers the menu $(A';\ B')$. Here Bank E's profits from the contract B' are zero, but Bank I makes positive profits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

going northeast. Indifference curves for borrowers (indicated by U_h and U_l) are given by the pairs of thin lines: high-risks have steeper indifference curves than low-risks (single-crossing property). Line 1 (in bold) passing through $(\underline{R}_l^E, 0)$ is the entrant's zero-profit line for l-types. Note that it is flatter than the indifference curves for l-types. The broken line 2 passing through $(R_P^{\min}, 0)$ is the locus of (R_l^E, C_l^E) such that $U_h\left(R_h^E, 0\right) = U_h(R_l^E, C_l^E)$ (Lemma 3a) and $\Pi^E[\left(R_h^E, 0\right); (R_l^E, C_l^E)] = 0$. This line passes through $(\acute{R}_l^E, \acute{C}_l^E)$ and the entrant offering menu $[(\underline{R}_h^E, 0); (\acute{R}_l^E, \acute{C}_l^E)]$ makes zero profits from both h-types and l-types. Clearly, the entrant's offers in $Z^E(\rho^E)$ lie in the shaded region, bounded from below by lines 1 and 2. Bank I offers $\mathbf{A}'$ to the h-types

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

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

Figure 2 characterizes two non-linear bounds for the entrant's pooling contracts, $\tilde{\rho}_P^1(\nu)$ and $\tilde{\rho}_P^2(\nu)$ that are both strictly increasing and strictly convex in ν. The first bound $\tilde{\rho}_P^1(\nu) \equiv (\frac{1-\theta_l}{1-E\theta})\rho^E$, characterizes a feasibility condition for the entrant's pooling contracts; the entrant can successfully pool borrowers only if $\rho^I > \tilde{\rho}_P^1(\nu)$. First, note that for $\rho^I \leq \tilde{\rho}_P^1(\nu)$, the entrant fails to pool borrowers because the incumbent undercuts the entrant's offer to capture low-risk types. Second, this bound is increasing in ν, indicating that a higher cost advantage is required to pool borrowers

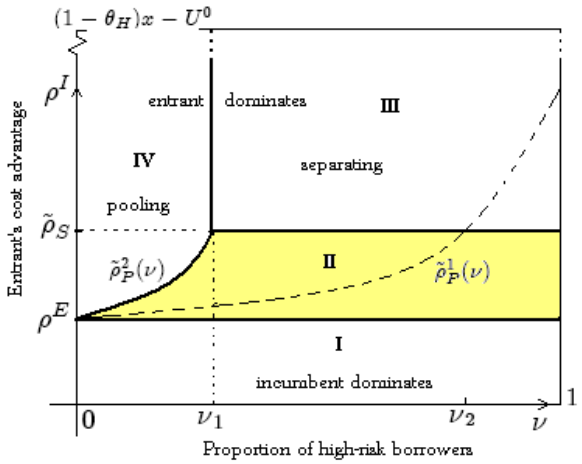

Figure 2: A complete characterization of the equilibria: The entrant's cost is fixed at ρ^E and the figure describes equilibria for varying levels of the incumbent's cost ρ^I. The shaded region II shows the equilibrium described in Proposition 1 (b). The incumbent dominates in region I, while the entrant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

in markets characterized by stronger information asymmetries. Finally, for all such pooling contracts, the entrant's profits from loans to low-risks are always greater than that from loans to high-risks. In fact, if entrant's cost advantage is not too large, it subsidizes losses from high-risks with profits from low-risk borrowers. Consequently, the entrant's choice of a pooling contract is optimal only if the proportion of high-risks in the borrower population is sufficiently small ($\nu \leq \nu_1$).

This gives a second bound, $\tilde{\rho}_P^2(\nu)$ (for $\nu \leq \nu_1$), which characterizes an optimality condition for the entrant's pooling contracts; if $\rho^I > \tilde{\rho}_P^2(\nu)$ and $\nu \leq \nu_1$, the entrant's optimal strategy is to pool all borrowers. This second bound determines the entrant's choice between its pooling option (Proposition 2) and its offer of a contract that captures high-risk borrowers only (Proposition 1b). Notice that when $\tilde{\rho}_P^2(\nu) \geq \rho^I > \tilde{\rho}_P^1(\nu)$ and $\nu \leq \nu_1$, the entrant can pool all borrowers cross subsidizing high-risks with 0profits from low-risk types. Instead, it offers a separating contract

as given in Proposition 1(b). Although this contract captures high-risk borrowers but not low-risk ones, it yields higher profits than the entrant's pooling option. The converse is true for $\rho^I > \tilde{\rho}_P^2(\nu)$ and $\nu \leq \nu_1$. This second bound is increasing in ν, showing that a higher cost advantage is required to offset the subsidies to a larger proportion of high-risks in the population. Note that when $\nu = \nu_1$, $\tilde{\rho}_P^2(\nu) = \tilde{\rho}_S^{h,l}$.

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

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

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

it follows that $\underline{R}_l^I = \underline{R}_l^E$; and although the incumbent can always offer $(\underline{R}_l^I(\rho^I), 0)$ to low-risks, the entrant cannot match this offer with contract $(\underline{R}_l^E(\rho^E), 0)$. This characterization of equilibria for $\rho^I \leq \rho^E$ is given by region I in Figure 2.

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

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

Table 1. Characterization of Equilibria

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

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

Implications of the model

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

Domestic welfare

A simple prediction of this model is that the removal of entry barriers lowers the rates at which credit is available to borrowers. Note that even when the incumbent has both cost and information advantage, relaxing entry restrictions means that it can no longer extract the entire surplus generated from loans. The threat of entry forces the incumbent (contestable monopolist) to provide borrowers the surplus that a potential competitor could provide in such situations. Thus, the removal of entry barriers in

credit markets significantly raises borrower payoffs. This initial result agrees with empirical studies like Jayaratne and Strahan (1996, 1998) that find declines in average loan prices of about 40 basis points following branching deregulation in the US.

Interestingly, a rise in profits for the foreign entrant is matched by a corresponding decline in profits for its domestic rival (incumbent). Does foreign entry in banking hurt the domestic economy? Two key features of the model can help answer this question. First, poaching the incumbent's clients is possible only if the entrant provides them the surplus that the incumbent can generate from loans. From a domestic country perspective, the entry of foreign banks redistributes the surplus from domestic banks to borrowers. Second, the entrant can successfully attract borrowers only when it has the cost advantage. By virtue of its lower cost of funds, the entrant bank generates a greater surplus from a loan contract than the incumbent. These expected efficiency gains can be passed on to the borrowers. For instance, when the entrant offers a pooling contract, high-risks obtain a strictly greater yield than that provided by the domestic bank. To summarize, under no equilibrium are domestic agents (banks and borrowers) worse off in aggregate.

Small business lending, cream skimming and foreign banks

Claessens et al. (2001) show that the effect of foreign entry is very different in developed versus developing countries. First, they find that foreign banks have lower profits than domestic banks in developed countries, but the opposite is true in developing countries. Second, their estimation results suggest that an increased presence of foreign banks leads to a lower profitability for domestic banks. Not surprisingly,

a concern among policymakers and economists, particularly in emerging markets, is that foreign banks "cream skim" or "cherry pick", leaving the worst risks to the domestic banks. A related issue is that foreign banks (and large domestic banks) tend to lend more to large firms, thereby neglecting small and medium enterprises (SMEs) (Stiglitz, 2000; Berger et al. 2001, 2005; Clarke et al. 2001). Evidence in favor of this bias exists for the US (Berger and Udell, 1995; Berger et al. 2005) and for developing countries like Argentina (Berger et al. 2001). Clarke et al. (2001) find that foreign bank entry improves financing conditions for enterprises of all sizes, although larger firms benefit more. However, their study does not distinguish whether foreign banks provide credit to both large firms and SMEs, or foreign bank competition for large customers leads domestic banks to increase SME credit.[21]

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

In contrast, the entrant's cost advantage in developing countries is likely to be higher. Depending on how large this efficiency advantage is, the theory points to two

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

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

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

This stylized result has two important implications. First, it helps provide an interpretation of the policymakers' concern about foreign banks "cream-skimming"

domestic borrowers.[22] If "cream-skimming" is interpreted as dominance over better-quality market segments, then the entrant bank's ability to capture all borrowers in high quality (low ν) market segments can be viewed as cream-skimming. On the other hand, if cream skimming is interpreted as the entrant's ability to capture only the low-risk types, then the results show that it is not possible for the entrant to cream-skim domestic borrowers.[23] Second, the result can also explain the perceived lending bias of foreign banks against SMEs. As is well known, small business lending is based on "soft information" and is characterized by a larger proportion of borrowers that are high-risk (in terms of this model, a high ν). On the other hand, the large-firm market segment can be characterized by a larger proportion of borrowers that low risk (i.e., characterized by low ν). With a moderately high cost advantage, the entrant captures all borrowers in this market. However, in markets characterized by a high ν (as is true for SMEs), the incumbent, despite its cost disadvantage, retains the low-risk types. Whereas the entrant gains all borrowers in the large-firm market segment, it succeeds in attracting only a fraction of the borrower population in the small-firm segment, accounting for the observed bias in lending.

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

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

Legal protection

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

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

The entrant's success in gaining borrowers of higher quality by offering cheaper loans is sufficiently enhanced by increasing the efficiency of collateral use. In a recent study on how legal changes affect lending behavior, Haselmann et al. (2005) find that lending volume increases subsequent to legal changes facilitating the use of collateral,

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

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

and that foreign greenfield banks extend their lending volume substantially more than domestic banks. Markets where creditor rights provide stronger protection to lenders will witness lower deadweight losses both in the repossession and in the liquidation of collateral; this, in turn, will promote entry of low-cost competitors. The argument above summarizes how an efficient legal framework helps in building an efficient financial market by promoting entry of low-cost competitors. It provides a theoretical underpinning for empirical findings on the legal determinants of the development of financial intermediaries like banks (Levine 1998, 1999).

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

Borrowers with collateral constraints

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

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

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

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

those willing to pledge collateral. This result gives another prediction of this model:

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

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

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

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

Conclusion

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

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

Second, as shown in the previous section, the results in this chapter find support in empirical work related to foreign entry in banking. Furthermore, the model makes two testable predictions. First, *ceteris paribus*, countries with bankruptcy codes that reduce the cost for seizing and liquidating collateral should witness greater foreign bank lending, particularly to SMEs. Second, the model predicts that in lending to

observably riskier borrowers (like small firms) entrants to a credit market are likely to provide cheaper loans only to borrowers pledging more collateral. As mentioned earlier, these predictions on collateral use depend on borrowers' unobservable risk characteristics as opposed to previous studies that discuss observable risk.

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

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

Appendix

Proofs

The outlines of the proofs for Lemmas 1-3, Propositions 1-2, and the description of equilibria for situations where $\rho^I \leq \rho^E$ are given below.

Proof of Lemma 1 Let us consider two contracts M and N offered by the

incumbent, where $U_k^M = U_k^N$ with $R_k^M > R_k^N$, $C_k^M < C_k^N$ and $k = h, l$. With $U_k^M = U_k^N$, one obtains $(1-\theta_k)(R_k^M - R_k^N) = \theta_k(C_k^N - C_k^M)$. Hence, $\pi_k^M - \pi_k^N = \theta_k(1-\beta)(C_k^N - C_k^M) > 0$. Therefore, it must be true that $\pi_k^M > \pi_k^N$. Bank I will always choose a contract that sets its collateral requirement to zero. It is easy to show that $\pi_k^I \geq 0$, $k = h, l$ for all such contracts.

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

Proof of Lemma 3 (i) Suppose not. Let us consider the menu $[(R_h^E, 0);\ (R_l^E, C_l^E)]$ such that IC_h is slack. One can find another menu $[(R_h^E, 0); (\hat{R}_l^E, \hat{C}_l^E)]$ where $\hat{R}_l^E > \tilde{R}_l^E$ and $\hat{C}_l^E < \tilde{C}_l^E$ such that $U_l(R_l^E, C_l^E) = U_l(\hat{R}_l^E, \hat{C}_l^E)$ and IC_h binds. Replacing menu $[(R_h^E, 0); (R_l^E, C_l^E)]$ with menu $[(R_h^E, 0); (\hat{R}_l^E, \hat{C}_l^E)]$ results in higher profits for Bank E (see Extended Appendix for details). (ii) holds because Bank E can always choose to stay out. (iii). From (ii) it follows that if $\pi_l^E < 0$, then $\pi_h^E > 0$. Removing contract (R_l^E, C_l^E) means that l-types either go to the incumbent or they choose the contract $(R_h^E, 0)$ originally selected by the h-types. In both cases Bank

E's profits are higher.

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

When the entrant dominates, one can focus attention on contracts in $Z_S^E(\rho^E)$ such that $U_l(R_l^E, C_l^E) = U_l(\underline{\mathrm{R}}_l^I, 0)$.For all such contract offers, increasing entrant's profits from high-risks (by raising R_h^E) implies lowering profits from low-risks (lowering R_l^E and raising C_l^E). Thus the entrant's choice of optimal contract depends on ν.

Consider two such menus $[(\breve{R}_h^E, 0); (\breve{R}_l^E, \breve{C}_l^E)]$ and $[(\hat{R}_h^E, 0); (\hat{R}_l^E, \hat{C}_l^E)]$ such that $\breve{R}_l^E < \hat{R}_l^E$, $\breve{C}_l^E > \hat{C}_l^E$. It follows that $\breve{R}_h^E > \hat{R}_h^E$. From $U_l(\breve{R}_l^E, \breve{C}_l^E) = U_l(\hat{R}_l^E, \hat{C}_l^E)$, one gets

$$(1 - \theta_l)(\breve{R}_l^E - \hat{R}_l^E) = \theta_l(\hat{C}_l^E - \breve{C}_l^E).$$

Also, $U_h(\hat{R}_l^E, \hat{C}_l^E) = U_h(\hat{R}_h^E, 0)$ with $U_h(\breve{R}_l^E, \breve{C}_l^E) = U_h(\breve{R}_h^E, 0)$ implies

$$(1-\theta_h)(\breve{R}_h^E - \hat{R}_h^E) = (1-\theta_h)(\breve{R}_l^E - \hat{R}_l^E) + \theta_h(\breve{C}_l^E - \hat{C}_l^E).$$

Hence, $\Pi[(\breve{R}_h^E, 0); (\breve{R}_l^E, \breve{C}_l^E)] - \Pi[(\hat{R}_h^E, 0); (\hat{R}_l^E, \hat{C}_l^E)] = [\nu(\frac{\theta_h - \theta_l}{1-\theta_l}) - (1-\nu)(1-\beta)\theta_l](\breve{C}_l^E - \hat{C}_l^E)$.

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

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

Proof of Proposition 2 First, for a pooling contract $\left(R_P^E, 0\right)$ to hold, the entrant has to ensure that it can capture the low-risk borrowers. Therefore, it must be true

that $\underline{\mathrm{R}}_l^I > R_P^{\min}$, that is $\rho^I > (\frac{1-\theta}{1-E\theta})\rho^E \equiv \tilde{\rho}_P^1(\nu)$. For a pooling contract $\left(R_P^E, 0\right)$, wherein Bank E captures all borrowers, one can show that $R_P^E = \underline{\mathrm{R}}_l^I$. For $R_P^E > \underline{\mathrm{R}}_l^I$, Bank I can always undercut Bank E's offer to low-risks and for $R_P^E < \underline{\mathrm{R}}_l^I$, Bank E can increase profits by pooling at $(\underline{\mathrm{R}}_l^I, 0)$. The entrant makes strictly positive profits from all borrowers when $\underline{\mathrm{R}}_l^I > \underline{\mathrm{R}}_h^E$. Conversely, if $\rho^I \leq (\frac{1-\theta_l}{1-\theta_h})\rho^E$, the entrant covers expected losses from high-risks with profits from low-risks. Comparing the entrant's profits from pooling and separating contracts, one can show that the entrant chooses the pooling contract only when $\nu \leq \nu_1$ (see (12) in Appendix B). Note that, for $\rho^I \leq \tilde{\rho}_S^{h,l}$, the entrant gets the high-risk borrower only. Here comparing profits, gives us the second cutoff $\tilde{\rho}_P^2(\nu) \equiv \frac{\rho^E}{1-(\frac{\nu}{1-\nu})(\frac{\theta_h-\theta_l}{1-\theta_l})}$, such that if $\rho^I > \tilde{\rho}_P^2(\nu)$, the entrant pools all borrowers. Note when $\nu = \nu_1$, $\tilde{\rho}_P^2(\nu) = \tilde{\rho}_S^{h,l}$.

Equilibria where the incumbent dominates

When $\rho^I \leq \rho^E$, an equilibrium of the game has Bank E offering the menu $[(\underline{\mathrm{R}}_h^I, 0); (R_l^E, C_l^E)]$ in $Z_S^E(\rho^E)$ where $\pi_l^E(R_l^E, C_l^E) = 0$. The incumbent's offers $(\underline{\mathrm{R}}_h^I, 0)$ to Borrower-h and $\left(R_l^I, 0\right)$ to Borrower-l such that $U_l\left(R_l^I, 0\right) = U_l(R_l^E, C_l^E)$. Note that if $\rho^I < \rho^E$, the incumbent captures all borrowers but if $\rho^I = \rho^E$, Borrower-h borrows from either bank but Borrower-l borrows from the incumbent only.

Equilibria where the entrant screens all borrowers

Bank E's problem can be viewed as a principal facing agents under incomplete information where the agents' outside opportunities are determined by the max. utilities that Bank I can provide. Borrower goes to Bank E only if it offers an incentive

scheme yielding at least, maximum utility, $\bar{U}_k^I$, i.e., reservation utility in borrower's IR constraint is now $\bar{U}_k^I$.

$$\text{Max} \quad \nu[(1-\theta_h)R_h^E + \beta\theta_h C_h^E - \rho^E] + (1-\nu)[(1-\theta_l)R_l^E + \beta\theta_l C_l^E - \rho^E] \tag{7}$$

$$\text{subject to} \quad (1-\theta_h)(x - R_h^E) - \theta_h C_h^E \geq \bar{U}_h^I, \tag{8}$$

$$(1-\theta_l)(x - R_l^E) - \theta_l C_l^E \geq \bar{U}_l^I, \tag{9}$$

$$(1-\theta_h)(x - R_h^E) - \theta_h C_h^E \geq (1-\theta_h)(x - R_l^E) - \theta_h C_l^E, \tag{10}$$

$$(1-\theta_l)(x - R_l^E) - \theta_l C_l^E \geq (1-\theta_l)(x - R_h^E) - \theta_l C_h^E \tag{11}$$

The following results hold in equilibrium (i) the h-types are not required to put down any collateral, $C_h^E = 0$; (ii) IC_h (10) must bind and (iii) IR_h (8) must bind. Now, the constraints in (7) can be written in terms of a single constraint in C_l^E as follows

$$0 \leq C_l \leq \frac{\frac{\bar{U}_l^I}{1-\theta_l} - \frac{\bar{U}_h^I}{1-\theta_h}}{\frac{\theta_h}{1-\theta_h} - \frac{\theta L}{1-\theta_l}} = \rho^I.$$

This gives the optimal separating contracts for the entrant as

$$R_{h,S}^E = \frac{\rho^I}{1-\theta_h} = R_h^I,\ C_{h,S}^E = 0; \text{ and } R_{l,S}^E = \rho^I,\ C_{l,S}^E = \rho^I.$$

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

$(\pi_l^E)$are given by

$$\pi_h^E = \rho^I - \rho^E \text{ and } \pi_l^E = [1-(1-\beta)\theta_l]\,\rho^I - \rho^E.$$

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

$$R_P^E = \frac{\rho^I}{1-\theta_l} = \underline{R}_l^I,\, C_P^E = 0.$$

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

$$\pi_{l,P}^E = \rho^I - \rho^E \text{ and } \pi_{h,P}^E = (\frac{1-\theta_h}{1-\theta_l})\rho^I - \rho^E.$$

Bank E makes strictly positive profits from all borrowers when $(\frac{1-\theta_h}{1-\theta_l})\rho^I > \rho^E$, i.e. when $\underline{R}_l^I > \underline{R}_h^E$. Bank E chooses the pooling contract when $\Pi_P^E(R_l^I, 0) \geq \Pi_S^E[(\underline{R}_h^I, 0); (R_l^E, C_l^E)]$, that is, when

$$\nu \leq \frac{(1-\beta)\theta_l\,(1-\theta_l)}{(\theta_h - \beta\theta_l) - (1-\beta)\theta_l^2}.$$

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

CHAPTER III

PROBLEM OF ENTRANT BANKS IN AVOIDING BAD RISKS

Introduction

Banks obtain information during their relationships with borrowers that helps them distinguish creditworthy customers from non-creditworthy ones. Consequently, they may offer prohibitively expensive terms or simply refuse to re-lend to the non-creditworthy borrowers after learning that they are bad risks. While this implies that such borrowers are likely to be denied loans from their current banks, they may choose to apply for loans from other (new) banks in the future.

This has important implications for entry into credit markets. Incumbent banks gain knowledge about borrower quality from previous lending relationships. So their lending rates to existing customers are adjusted according to the customer's credit risk. In addition, incumbents are likely to have identified a section of the borrower population as "bad-risk" borrowers whose likelihood of default is so high that it is not profitable to lend to them at any rate.[26] The previous chapter examined a problem of entry in which the entrant and the incumbent compete over the incumbent's clients. Accordingly, for both incumbent and entrant, all borrowers are known to be creditworthy. The entrant bank uses collateral as a screening device to sort creditworthy borrowers of high-quality from those of low-quality.

[26] I classify uncreditworthy borrowers as "bad-risks" as opposed to "good-risk" borrowers that are creditworthy. Within the category of good-risk borrowers, I then classify borrowers as high-quality (or "low-risk") and low quality (or "high-risk") just like in the previous chapter.

In this chapter, I examine a similar problem of competition between entrant and incumbent banks, in which the incumbent's information advantage extends to non-creditworthy borrowers as well. Accordingly, I assume that the incumbent also has knowledge about "prospective" non-creditworthy borrowers from previous transactions. Thus, not only does the entrant have to sort creditworthy borrowers of different risk quality, it also has to avoid lending to non-creditworthy borrowers. Here, too, the entrant uses collateral to screen out bad risks and to sort high-risk borrowers from low-risk ones.[27] The uninformed lender offers different loan contracts by varying repayment and collateral requirements on the loan. Borrowers that belong to a superior type select loans with a higher collateral requirement in exchange for a lower repayment because they have a lower probability of defaulting on the loan.

The results of this "extended" model are discussed in reference to the "benchmark" model in the previous chapter.[28] An important feature of the benchmark model is that the ability of the entrant to gain borrowers of superior quality increases with (1) its cost advantage over the incumbent and (2) the average quality of borrowers in the pool. The first result follows from the fact that the entrant can screen high-quality (low-risk) borrowers only if it has a sufficiently large cost advantage over its rival. The second result follows from the fact that the entrant can pool borrowers in markets of superior average quality (higher proportion of low risks in the population).

[27] It is important to mention that the mechanism of screening is the same for all borrowers. Banerjee (2005) distinguishes between the two forms of screening technology: a bank's ability to screen in creditworthy projects and a bank's ability to screen out unproductive projects as being non-creditworthy.

[28] For the sake of brevity, I will refer to the model in the previous chapter as the "benchmark" model and the model presented here as the "extended" model.

With the introduction of bad-risk types, both results can change. Firstly, note that even if the entrant can screen high risks from low risks (within the category of creditworthy borrowers); it may fail to screen the non-creditworthy borrowers from those that are creditworthy. Consequently, if the proportion of bad risks in the population is large enough, the entrant may not break even from a menu of contracts that simply sort high risks from low-risk types.

Secondly, in the benchmark model, the relation between the (average) quality of the borrower-pool and the entrant's ability to attract borrowers of higher quality is monotonic. A greater proportion of low risks (and therefore, an increase in the average quality) increases the entrant's ability to capture them by pooling them with high-risk types. With the introduction of bad risks in the population, this relationship turns out to be non-monotonic (as in the extended model given below). For a given level of bad risks, if the proportion of the high risks is small, the entrant can pool them with low risks. On the other hand, if a large proportion of borrowers are high risks, they can be pooled with bad risks. In contrast, if the proportion of high risks is neither too large nor too small, pooling contracts may no longer be feasible. In particular, if it is also the case that the entrant cannot screen the high-risk types, then the incumbent dominates despite the entrant's cost advantage. Thus, for low cost advantages, the entrant gains market share if the proportion of high risks is either low or high, while the incumbent dominates for intermediate values. Accordingly, the entrant's ability to gain market share, first declines and then rises with increases in average borrower-quality.

Non-monotonicity results in extending the number of agent types to three is not uncommon in asymmetric information setups. Feltovich et. al (2002) show that in signalling environments, while medium types choose to distinguish themselves from low-types, high-types may choose not to signal or "countersignal" to distinguish themselves from medium-types. An important feature of their model is that the signal is not the only information available on types: information is available from other "noisy" signals. The noise in such signals compel the mediocre to signal and differentiate themselves from the low. But the high choose not to signal out of the concern that doing so would only reveal them as mediocre. In this model however, the non-monotonicity result arises due to variations in the proportions of types in the model. In the absence of a screening (or signalling) mechanism, a principal can pool agents (and thereby gain market share) if the proportion of the medium type in the pool is either sufficiently high or sufficiently low. However for intermediate ranges of the medium type, the principal loses market share because it fails to bunch them either with the high or with the low-types.

Preliminaries

The basic setup is similar to the benchmark model. Entrepreneurs (also called borrowers) with unlimited access to collateral can borrow a dollar from a bank and invest in a project. The project returns x if it succeeds (with probability $1-\theta$) and zero if it fails (with probability θ). Banks' loan contracts consist of a repayment R and a collateral requirement C. Borrowers' reservation utility and lenders' cost of funds are denoted by U^0 and ρ, respectively. A lender can recover only a fraction β

of the collateral which the borrower loses when he/she defaults on the loan. Thus, the parameter β is a measure of the disparity in the borrower and lender valuation of collateral. Both lenders and borrowers are risk neutral. Banks' profits from the loan contract (R, C) is given by $\pi(R, C, \theta) = (1 - \theta)R + \beta\theta C - \rho$ while a borrowers payoffs under the same contract is $U(R, C, \theta) = (1 - \theta)(x - R) - \theta C$. Therefore, a loan contract (R, C) generates a social surplus of $[(1-\theta)x-\rho-U^0]-(1-\beta)\theta C$. Note that a strictly positive collateral requirement entails a deadweight loss of $(1 - \beta)\theta C$ implying that *ceteris paribus*, zero-collateral loan contracts are first-best.

The model assumes a fixed pool of borrowers indexed by their risk parameter θ, the probability of default. The fraction ν_l of entrepreneurs are low-risk types $(\theta = \theta_l)$, the fraction ν_h of borrowers are high-risk $(\theta = \theta_h)$ and the fraction ν_b are bad-risk types $(\theta = \theta_b)$ with $0 < \theta_l < \theta_h < \theta_b < 1$ and $\nu_h + \nu_l + \nu_b = 1$. In short, this chapter extends the model in Chapter 1 by introducing a third borrower-type: bad-risk. A bad-risk borrower is non-creditworthy in that the surplus generated on loans to him/her is strictly negative (i.e., $(1 - \theta_b)x < \rho + U^0$, for all ρ). Recall that in Chapter 1, both high-risk and low-risk borrowers were creditworthy (or "good"-risk) in that all loan contracts generated a positive social surplus (i.e. $(1-\theta_k)x > \rho + U^0$, where $k = h, l$). Stated differently, a bank with complete information would always extend loans to good risks and deny credit to bad risks.

In this familiar setting, this essay analyzes competition between an incumbent that has complete information about borrower-creditworthiness and an entrant that is unable to distinguish between borrowers' risk-types. The incumbent (or Bank I) is (pre-entry) a price-setting monopolist whose cost of funds is ρ^I. The entrant (or

Bank E) is an outside bank whose cost of funds is ρ^E. As mentioned before, the key difference between the setup here and that in the previous chapter is that the incumbent's private information here extends not only to its existing (and therefore) creditworthy clients but also to other "prospective" non-creditworthy borrowers that the entrant would like to avoid. Bank j's offer to borrower k is denoted by (R_k^j, C_k^j) where $j = I, E$ and $k = b, h, l$. The bank's profits from this offer are given by π_k^j $=(1-\theta_k)R_k^j+\beta\theta_k C_k^j-\rho^j$ if the borrower accepts the loan contract and zero otherwise. Thus its overall profit is written as $\Pi^j \equiv \nu_b\pi_b^j + \nu_h\pi_h^j + \nu_l\pi_l^j$.

After eliminating a set of dominated strategies for each bank, I describe the set of contracts that each bank can offer in equilibrium. For the incumbent bank the result is stated in the following lemma:

Lemma *For borrowers of type $k = b$, the incumbent bank denies credit. For borrowers of type $k = h, l$ the incumbent offers a contract from the set $Z_k^I(\rho^I) = \{(R_k^I, 0) : R_k^I \in [\underline{R}_k^I(\rho^I), \bar{R}_k]\}$ where $\underline{R}_k^I(\rho^I) = \frac{\rho^I}{1-\theta_k}$ and $\bar{R}_k = x - \frac{U^0}{1-\theta_k}$ are the first-best (zero-collateral) minimum and maximum repayments respectively.*

Since the entrant denies credit to all bad risks, they continue to receive their reservation payoff U^0. Also, the contract $(\underline{R}_k^I(\rho^I), 0)$ yields borrower k the maximum utility Bank I can provide, denoted $\bar{U}_k^I(\rho^I)$, and is defined by

$$\bar{U}_k^I(\rho^I) \equiv (1-\theta_k)x - \rho^I,\ k = h, l. \tag{12}$$

The entrant bank faces borrowers with two different types of participation constraints. For good risks ($k = (h, l)$), the participation constraints are determined by the payoffs that the borrowers receive from loan contracts offered by the incumbent (i.e.,U_k^I) . For bad risks however, the participation constraint is given by U^0, the reservation utility of the borrower (the opportunity cost of his/her time). The entrant's offers can be summarized in terms of the following Lemma.

Result *(a) The entrant does not require the bad-risk borrower to secure loans with collateral, i.e., $C_b = 0$. Therefore, contracts that pool bad risks with other borrower-types are zero-collateral contracts. (b) Contracts that sort adjacent borrower types require that the local incentive constraints of the inferior type bind in equilibrium. (c) Overall expected profits from contract offers are non-negative. Finally, expected profits from loans to low-risk types are non-negative.*

Result (a) is standard in the principal agent literature. Result (b) follows from the fact that (under competition) inferior types try to mimic superior types and the uninformed principal will always choose to offer incentive schemes that are just as good as their outside alternative. Finally (c) follows from (b) because the low-risk type is the best quality borrower. If profits from a contract to low risks are negative, the entrant can remove this contract offer without affecting the incentive constraints for other types.

The timing of the game is similar to the model in Chapter 1. I focus exclusively on pure strategy equilibria. To derive a characterization of equilibria, I hold the entrant's cost of funds constant at ρ^E and vary the incumbent's cost of funds ρ^I.

As is standard in the principal-agent literature, I will assume that if the borrower is indifferent between two loan contracts *offered by the same bank*, she chooses the one that the bank prefers. Also, if a borrower is indifferent between contracts offered by the incumbent and the entrant, in equilibrium she borrows from the bank that makes higher profits from the contract.

Candidate Equilibria

This section begins with a description of the candidate equilibrium for a particular case of this problem, namely the situation in which the entrant bank screens all borrowers. Following this, I describe other candidate equilibria of the model. As will be evident, it is difficult to provide an analytical solution to this model. Therefore, in the next section, numerical examples are used to determine the conditions under which the candidates (described below) emerge as the equilibria of the model.

Bank E can successfully sort all borrowers only if its incentive scheme yields each borrower at least as much utility as contracts offered by Bank I. Consequently, Bank E faces borrowers whose reservation utilities are determined by the maximum utility that Bank I can offer borrowers. These reservation utilities for the high- and low-risk borrower, namely $\bar{U}_h^I$ and $\bar{U}_l^I$, are shown by the indifference curves through $(\underline{R}_h^I, 0)$ and $(\underline{R}_l^I, 0)$ in Figure 3. Figure 3 illustrates the (candidate) equilibria in (R, C) space. Borrowers' payoffs increase as one moves southwest, while lenders' profits increase going northeast. Note that since the incumbent denies credit to the bad risks, their reservation utility is U^0 (i.e., $\bar{U}_b^I = U^0$). This is shown in Figure 3 by the (bold) indifference curve through $(\bar{R}_b, 0)$, where $\bar{R}_b = x - \frac{U^0}{1-\theta_b}$, is the minimum repayment

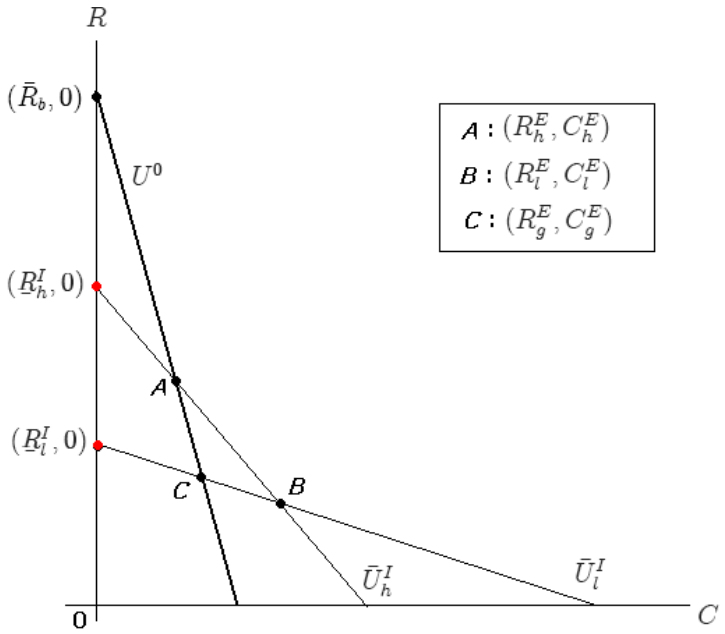

Figure 3: Entrant's offers under different equilibria in (R, C) space: Borrowers' payoffs increase as one moves southwest, while lenders' profits increase going northeast. The entrant offers $(\underline{R}_l^I, 0)$ and $(\underline{R}_h^I, 0)$ in Pool-1 and Pool-2 respectively. For Hybrid-1, the entrant pools bad-risks and high-risks at $(\underline{R}_h^I, 0)$ and sorts low-risks at (R_l^E, C_l^E). For Hybrid-2, the entrant screens out bad-risks at $(\bar{R}_b, 0)$ and pools good-risks at (R_g^E, C_g^E). Finally, the entrant screens high-risk at (R_h^E, C_h^E) for Screen-1 and low-risks at (R_l^E, C_l^E) for Screen-2.

at which the bad-risk types reject the entrant's offer.

A *first candidate (screening) equilibrium*, denoted as *Screen-1*, is one where the entrant screens all borrower types. The entrant offers contract menu $\{(\bar{R}_b, 0); (R_h^E, C_h^E); (R_l^E, C_l^E)\}$. The incumbent offers $(\underline{R}_h^I, 0)$ to high risks, $(\underline{R}_l^I, 0)$ to low risks and denies credit to bad-risk types. The bad-risk borrowers reject the entrant's offer of $(\bar{R}_b, 0)$. The good-risk types (both h and l) borrow from the entrant, accepting loan contracts with strictly positive collateral requirements. The contract offers to high- and low risks are shown as points **A** and **B** in Figure 3: the contract for low-risk borrowers have a lower repayment and a higher collateral requirement than that for high-risk borrowers. Note that *local* incentive constraints (i.e., incentive constraints for adjacent types)

bind in equilibrium. Thus $U_b(\bar{R}_b, 0) = U_b(R_h^E, C_h^E)$ and $U_h(R_h^E, C_h^E) = U_h(R_l^E, C_l^E)$ in a screening equilibrium.

More important, this candidate equilibrium is feasible only if the entrant's cost of funds is sufficiently large so that two screening cutoffs (one for each pair of adjacent types) are satisfied. The first cutoff is $\tilde{\rho}_S^{b,h}$ for screening the bad-risk types from the high-risk types and the second is $\tilde{\rho}_S^{h,l}$ for screening the high-risk types from the low-risk types. Evidently, the second cutoff is identical to the screening cutoff discussed in Chapter 1. Furthermore, as shown in the appendix, the screening cutoffs are independent of the distribution of borrower types in the population and are given by

$$\begin{aligned}
\tilde{\rho}_S^{h,l} &= \frac{1}{1-(1-\beta)\theta_l}\rho^E \\
\tilde{\rho}_S^{b,h} &= \frac{\theta_b - \theta_h}{\theta_b(1-\theta_h) - \beta\theta_h(1-\theta_b)}\rho^E + \frac{(1-\beta)\theta_h(1-\theta_h)}{\theta_b(1-\theta_h) - \beta\theta_h(1-\theta_b)}[(1-\theta_b)x - U^0]
\end{aligned}$$

Therefore, to screen all borrower types the entrant's cost advantage needs to be sufficiently large, that is, it must be true that $\rho^I > \max(\tilde{\rho}_S^{b,h}, \tilde{\rho}_S^{h,l})$.

However if $\tilde{\rho}_S^{h,l} > \rho^I \geq \tilde{\rho}_S^{b,h}$, the entrant cannot screen low-risk types. But the entrant can still screen the high risks from bad risks. This gives us a *second candidate (screening) equilibrium* denoted as *Screen-2*, where the entrant screens only high risks. Here, the entrant's offer is given by $\{(\bar{R}_b, 0); (R_h^E, C_h^E); (R_l^1, C_l^1)\}$ where $\pi_l^E(R_l^1, C_l^1) = 0$. The incumbent denies loans to bad risks and offers $(\underline{R}_h^I, 0)$ and $(R_l^I, 0)\}$ to high- and low risks respectively, such that $U_l(R_l^1, C_l^1) = U_l(R_l^I, 0)$. Except for low-risk types, the equilibrium behavior of agents in *Screen-2* is similar to that in *Screen-1.* In *Screen-2,* low risks borrow from the incumbent whose profits from low-risk types

are strictly positive.

Alternatively, if $\tilde{\rho}_S^{b,h} > \rho^I \geq \tilde{\rho}_S^{h,l}$, then neither screening equilibrium described above is feasible. Given that the entrant can still sort the low-risk types, it follows that *a third candidate (hybrid) equilibrium* is possible in this situation, denoted as *Hybrid-1*. In general, a hybrid equilibrium can be described as one in which the uninformed principal pools or bunches offers to adjacent types while screening the other type(s). In *Hybrid-1*, the entrant seeks to pool bad risks with high risks while screening low-risk types. It offers the menu $\{(\underline{R}_h^I, 0); (R_l^E, C_l^E)\}$ while the incumbent's offers are the same as that in *Screen-1*. In equilibrium, all borrowers would go to the entrant whose aggregate profits would depend on the distribution of bad risks in the population. With $\rho^I \geq \tilde{\rho}_S^{h,l}$, its profits from loans to low risks is non-negative. However, by pooling bad risks with high risks, the entrant can no longer ensure strictly positive profits from its offer of $(\underline{R}_h^I, 0)$ unless the proportion of bad risks in the population is sufficiently small. I return to this point below in my discussion of pooling equilibria.

A *fourth candidate (hybrid) equilibrium,* denoted as *Hybrid-2*, involves bunching good risks and screening them from bad risks. Here, the entrant offers $\{(\bar{R}_b, 0); (R_g^E, C_g^E)\}$ where (R_g^E, C_g^E) is shown by the point **C** in Figure 3. Note that $U_b(\bar{R}_b, 0) = U_b(R_g^E, C_g^E)$ and $U_l(\underline{R}_l^I, 0) = U_l(R_g^E, C_g^E)$. Again, the incumbent's offer are the same as that in *Screen-1*, the bad-risk borrowers reject the entrant's offer of $(\bar{R}_b, 0)$ and the good-risk types (both h and l) borrow from the entrant. Note that the entrant's offer in *Hybrid-2* involves pooling, and therefore is feasible only if the proportion of high risks in the population is sufficiently small. *Hybrid-2* is feasible for the entrant only

if $\rho^I \geq \tilde{\rho}_Y(\nu_h, \nu_l)$, where $\tilde{\rho}_Y(\nu_h, \nu_l)$ denotes the hybrid-cutoff for the entrant.

The last two candidate equilibria involve pooling contracts. In *Pool-1*, the entrant pools all borrowers by offering $(\underline{R}_l^I, 0)$. This cross-subsidizes losses from bad risks and high risks with profits from low risks. Therefore, *Pool-1* is feasible only when the proportion of low risks in the population is high and this is denoted by the cutoff $\tilde{\rho}_P^1(\nu_h, \nu_l)$. The entrant can also pool bad risks with high risks. This is given by *Pool-2*, where the entrant offers $(\underline{R}_h^I, 0)$ and the feasible cutoff for such a contract is given by $\tilde{\rho}_P^2(\nu_b, \nu_h)$. The set of contract offers by the entrant for each of the six candidate equilibria are given in Table 2.

In summary, there are three categories of candidate equilibria: pooling, screening and hybrid. Within each category, the first candidate has a larger number of customer types going to the entrant for loans than the second. For example, in candidate equilibrium *Hybrid-2*, the entrant screens out the bad-risk but in *Hybrid-1* it pools them with high risks. Also, note that if the entrant can screen the low-risk borrower (i.e., if $\rho^I \geq \tilde{\rho}_S^{h,l}$), then the entrant's profits from offers in *Screen-1* dominate those from offers in *Screen-2*. Similarly, the entrant's offers in *Hybrid-1* dominate those in *Pool-2*. Finally, note that the incumbent dominates if ρ^I is strictly lower than all of the break-even cutoffs given in the last column of Table 2.

Table 2. Entrant offers under different candidate equilibria

Candidate Equilibria	Profit	Customer types borrowing from E	Contract menu	Break-even cutoff
Pool-1	Π_P^1	(b,h,l)	$(\underline{\mathrm{R}}_l^I, 0)$	$\tilde{\rho}_P^1$
Pool-2	Π_P^2	(b,h)	$(\underline{\mathrm{R}}_h^I, 0)$	$\tilde{\rho}_P^2$
Screen-1	Π_S^1	$(h);(l)$	$(\bar{R}_b, 0);(R_h^E, C_h^E);(R_l^E, C_l^E)$	$\tilde{\rho}_S^{b,h}$, $\tilde{\rho}_S^{h,l}$
Screen-2	Π_S^2	(h)	$(\bar{R}_b, 0);(R_h^E, C_h^E);(R_l^1, C_l^1)$	$\tilde{\rho}_S^{b,h}$
Hybrid-1	Π_Y^1	$(b,h);(l)$	$(\underline{\mathrm{R}}_h^I, 0);(R_l^E, C_l^E)$	$\tilde{\rho}_P^1$, $\tilde{\rho}_S^{h,l}$
Hybrid-2	Π_Y^2	(h,l)	$(\bar{R}_b, 0);(R_g^E, C_g^E)$	$\tilde{\rho}_Y$

Numerical Examples

In this section, I use numerical examples to solve for the equilibrium using different sets of parameter values. The aim of the exercise is to derive conditions under which the candidates listed in Table 2 emerge as the equilibrium of the model. The entrant's profits are calculated under each candidate equilibrium for each point in the parameter space. The candidate equilibrium in which the entrant maximizes profits emerges as the actual equilibrium (at that point in the parameter space).

Note that for $\nu_b = 0$, the extended model is identical to the benchmark model (Chapter 1). Therefore, I first solve the problem numerically for $\nu_b = 0$ to replicate Figure 4 of Chapter 1. This is shown in Figure 4, where the regions of equilibria are shown in (ν_h, ρ^I) space. Parameter values of $x = 16$, $U^0 = 2$, $\theta_b = 0.7$, $\theta_h = 0.4$, $\theta_l = 0.2$ and $\rho^E = 4.3$ are used to generate Figure 4. This is done for both $\beta = 0.35$ and $\beta = 0.65$ to show how the screening cutoff for low risks $\tilde{\rho}_S^{h,l}$ changes with β. Clearly, the regions are identical to the ones derived in Chapter 1. To simplify exposition,

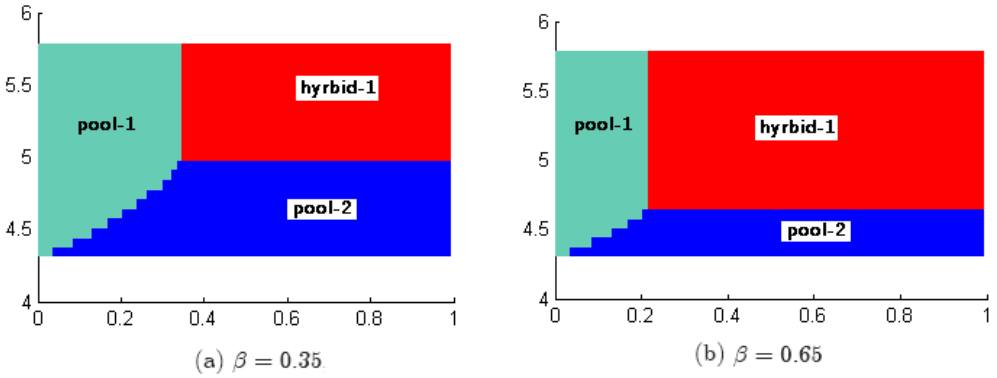

Figure 4: The extended model with no bad-risk types: With no bad-risks ($\nu_b = 0$), the extended model is identical to the benchmark model. The graphs are drawn to parameter values $x = 16$, $U^0 = 2$, $\theta_b = 0.7$, $\theta_h = 0.4$, $\theta_l = 0.2$ for $\nu_b = 0$, $\rho^E = 4.3$ and $\rho^I = [2.8, 5.6]$. Note that for (a) $\beta = 0.35$, $\tilde{\rho}_S^{b,h} = 4.56$, $\tilde{\rho}_S^{h,l} = 4.94$ while for (b) $\beta = 0.65$, $\tilde{\rho}_S^{b,h} = 4.46$, $\tilde{\rho}_S^{h,l} = 4.62$.

this diagram is used as a reference to describe how the equilibrium changes with the introduction of bad risks in the model.

It can be shown that the results in Chapter 1 are fairly robust even with the introduction of the bad risks in the model. Using the same parameter values (as given above), a different set of (four) graphs are generated in Figure 5, for $\nu_b = 0.1$ and for $\nu_b = 0.3$. The results show that even after introducing bad risks, the equilibrium is similar to that in Figure 4. With a high cost-advantage, the entrant either pools high- and low risks (for low ν_h) or it screens all borrowers (for high ν_h). When the entrant's cost advantage is low, it can screen only high risks but not low risks. The difference between this case ($\nu_b > 0$) and the previous case ($\nu_b = 0$) lies in the fact that now the entrant screens out bad risks. Therefore, the equilibrium contracts are now different: in Figure 5, candidates *Screen-1*, *Screen-2* and Hybrid-2 replace Hybrid-1, Pool-2 and Pool-1 respectively, but it is not difficult to see that the new equilibrium has features similar to that in Figure 4.

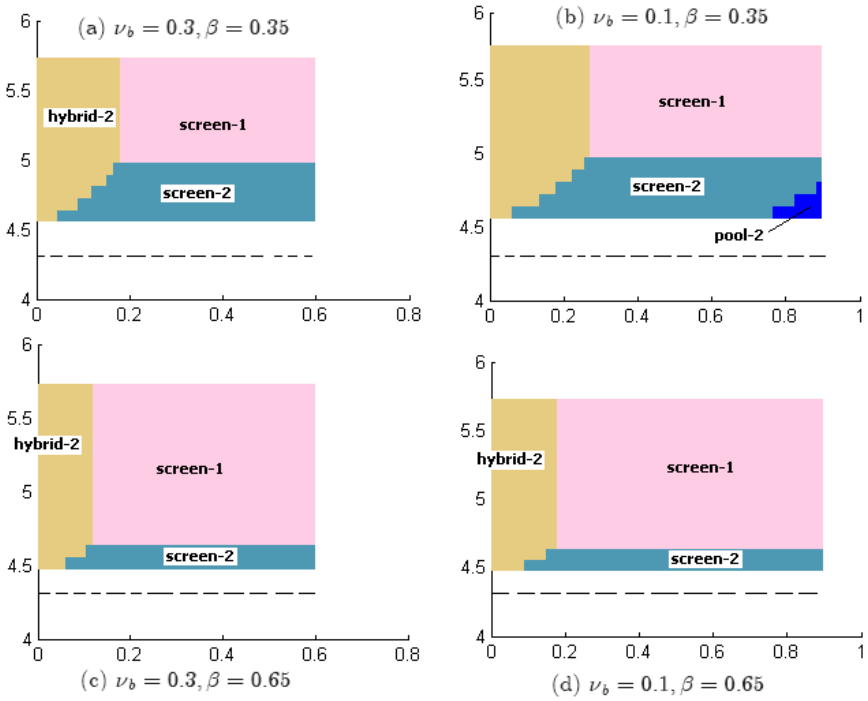

Figure 5: Equilibria (with bad-risk types) similar to the benchmark model: The graphs are drawn to parameter values $x = 16$, $U^0 = 2$, $\theta_b = 0.7$, $\theta_h = 0.4$, $\theta_l = 0.2$ for $\rho^E = 4.3$ and $\rho^I = [2.8, 5.6]$. The value of ν_b varies from 0.1 in (a) to 0.3 in (d). Note that for (a) and (b) $\beta = 0.35$, $\tilde{\rho}_S^{b,h} = 4.56$, $\tilde{\rho}_S^{h,l} = 4.94$ while for (c) and (d) $\beta = 0.65, \tilde{\rho}_S^{b,h} = 4.46$, $\tilde{\rho}_S^{h,l} = 4.62$.

A closer look at the candidate equilibria in Table 2 reveals two types of costs for the entrant. The first type arises from costs of cross-subsidization in pooling different types of borrowers. In contracts where the uninformed principal pools different types, profits from superior types are used to cover losses from inferior ones. Pooling costs increase with the proportion of inferior types in the pool, and therefore, these contracts are used only when the borrower population has a sufficiently large proportion that belong to the superior type. The second type includes screening costs that arise because of the expected deadweight losses in liquidating collateral. This cost increases with decreases in β. Note however that numerically these costs are quite low and the screening cutoffs are not much higher than ρ^E. Therefore screening equilibria dominate in the numerical examples discussed above.

However, important changes in the equilibrium are observed for low numerical values of ρ^E. Low values of ρ^E reduce the costs of pooling and give rise to situations where pooling candidates emerge as the equilibria in the model. One such example is given by the same parameter values as in the previous example, but for $\rho^E = 3.6$. Four subplots of equilibrium regions are shown for $\nu_b = 0.1, 0.15, 0.2$ and 0.3 in Figure 6. The dotted line in the graphs denote the entrant's cost of funds. The regions of the parameter space where the incumbent dominates are shown in white.

A similar subplot of the four equilibrium regions is given in Figure 7 for a different set of parameter values: $x = 21$, $U^0 = 3$, $\theta_b = 0.8$, $\theta_h = 0.4$, $\theta_l = 0.2$ and $\rho^E = 1.4$. The subplots correspond to the same set of values of $\nu_b = 0.1, 0.15, 0.2$ and 0.3. The key difference between Figure 6 and Figure 7 lies in the screening cutoffs: the low-risk screening cutoff ($\tilde{\rho}_S^{h,l}$) is strictly greater than the bad-risk cutoff ($\tilde{\rho}_S^{b,h}$) in Figure 6,

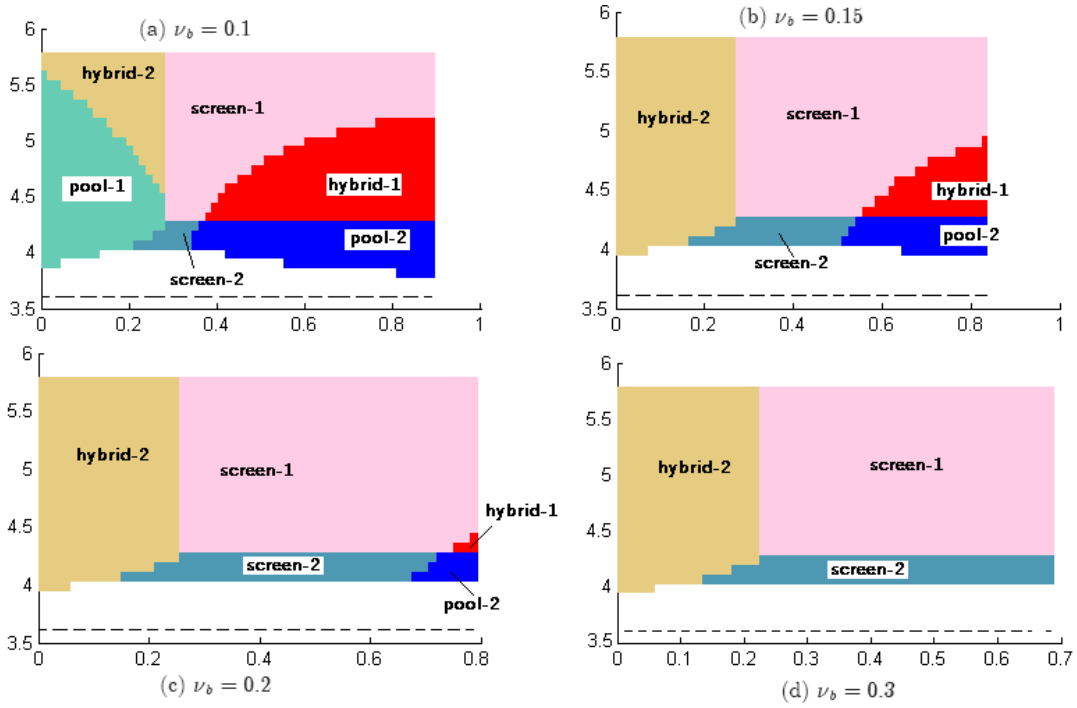

Figure 6: Equilibria when the entrant's cost is small (Case I : $\tilde{\rho}_S^{h,l} > \tilde{\rho}_S^{b,h}$). The graphs are drawn to parameter values $x = 16$, $U^0 = 2$, $\theta_b = 0.7$, $\theta_h = 0.4$, $\theta_l = 0.2$ for $\beta = 0.25$, $\rho^E = 3.6$ and $\rho^I = [2.8, 5.6]$. Note that , $\tilde{\rho}_S^{h,l} = 4.94 > \tilde{\rho}_S^{b,h} = 4.56$, so that Bank E can screen high-risks as in Screen-1. The value of ν_b varies from 0.1 in (a) to 0.3 in (d).

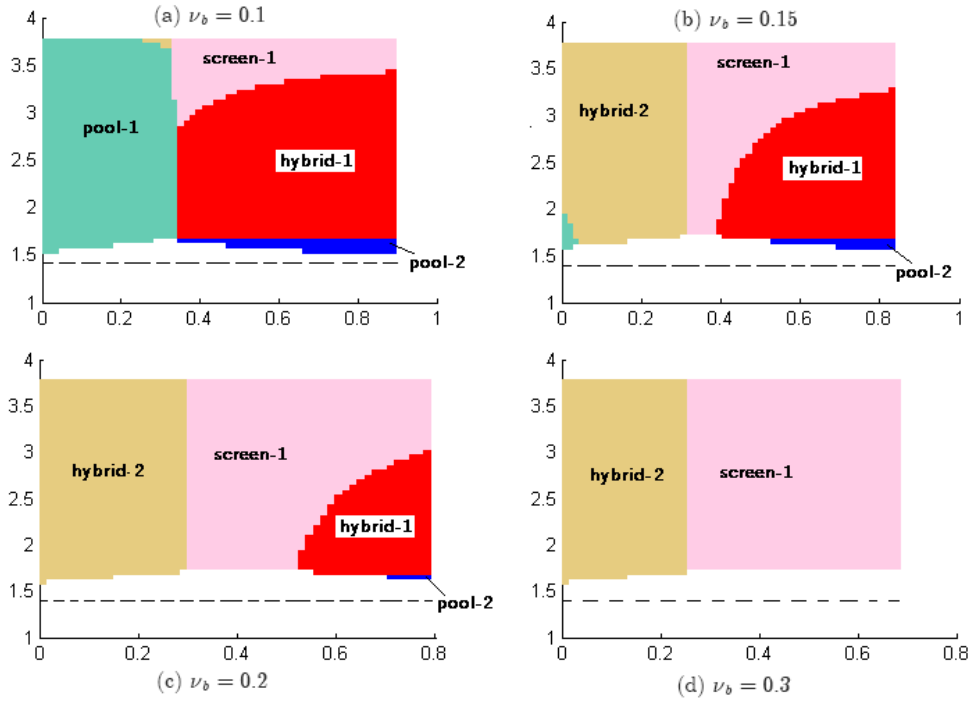

Figure 7: Equilibria when the entrant's cost is small (Case II: $\tilde{\rho}_S^{h,l} < \tilde{\rho}_S^{b,h}$). The graphs are drawn to parameter values $x = 21$, $U^0 = 3$, $\theta_b = 0.8$, $\theta_h = 0.4$, $\theta_l = 0.2$ for $\beta = 0.15$, $\rho^E = 1.4$ and $\rho^I = [1.2, 3.6]$. Note that , $\tilde{\rho}_S^{h,l} = 1.72 > \tilde{\rho}_S^{b,h} = 1.69$, so that Bank E cannot screen high-risks as in Screen-1. The value of ν_b varies from 0.1 in (a) to 0.3 in (d).

while the opposite is true for Figure 7. As discussed below, this leads to differences in the equilibrium behavior of the entrant in these two situations. In what follows, I discuss features of the equilibrium for both Figure 6 and Figure 7 in terms of the four sub-cases given below.

Case (i) $\rho^I < \min\{\tilde{\rho}_S^{b,h}, \tilde{\rho}_S^{h,l}\}$**.** Since the entrant cannot screen any of the good-risk types, the discussion here will focus attention on the following three candidates: *Pool-1*, *Pool-2* and *Hybrid-2*. Importantly, both figures show that the incumbent can dominate in regions even if the entrant has the cost advantage (i.e., regions above the dotted line). This feature departs from the equilibrium in the benchmark case (Figure 4) because, unlike in the previous case, it is costly for the entrant to secure the high-risk borrower. Such pooling costs are prohibitive for (a) very small cost advantages of the entrant and (b) a very high proportion of bad risk types in the population. Thus for either (a) or (b) or both, the entrant dominates as shown in Figures 6 and 7.

However, if the proportion of bad-risk types is sufficiently small (i.e., $\nu_b = 0.1$ or 0.15), pooling contracts are available to the entrant as shown in Figures 6(a)-(b) and 7(a)-(b). For low values of ν_h, the proportion of low risks is large so that the entrant either pools all borrowers or pools the good risks while screening them from bad risks. Thus, one of *Pool-1* and *Hybrid-2* emerges as the equilibrium. The cutoff for *Hybrid-2*, $\tilde{\rho}_Y(\nu_h, \nu_l)$, is increasing and convex in ν_h. A higher cost advantage is needed for pooling a larger proportion of high risks in the population. Candidate *Hybrid-2* dominates *Pool-1* for higher ν_b because a larger proportion of bad risks

implies that it is now more profitable to screen them than it is to pool them with good risks.

On the other hand, if the proportion of high risks in the population is large, the entrant can pool them with bad-risk and *Pool-2* is the equilibrium for large values of ν_h. An interesting feature of the equilibrium in these regions is that, while pooling is feasible for high or low values of ν_h, the incumbent dominates for intermediate values of ν_h. This happens in situations where the proportion of high-risk is neither to large to be pooled with bad risks nor too small to be pooled with low risks. In these regions the entrant would ideally like to screen high risks, but is unable to do so since $\rho^I < \tilde{\rho}_S^{b,h}$.

Case (ii) $\tilde{\rho}_S^{b,h} < \rho^I < \tilde{\rho}_S^{h,l}$**.** This situation arises in Figure 6 but not in Figure 7. For low values of ν_b, the equilibrium is similar to that in the previous case. *Pool-1* and *Hybrid-1* emerge as the equilibrium for low ν_h whereas *Pool-2* is the equilibrium at high ν_h. But whereas earlier the incumbent dominated at intermediate values of ν_h, the entrant can now capture the high-risk market by screening high risks from bad risks. This is shown by the region labeled *Screen-2* in Figure 6. Note that the size of this region increases (at the expense of *Pool-2*) with increases in ν_b because pooling higher proportions of bad risks is no longer profitable as it increases costs of cross-subsidization. Therefore for higher values of ν_b, pooling equilibria are replaced by *Screen-1* (for high ν_h) and *Hybrid-2* (for low ν_h).

Case (iii) $\tilde{\rho}_S^{b,h} > \rho^I > \tilde{\rho}_S^{h,l}$**.** This situation arises in Figure 7 but not in Figure 6. As mentioned earlier, the entrant cannot screen high risks but can now use contracts in *Hybrid-1* where it bunches bad risks with high risks while sorting low-risk types. Note that this contract dominates the entrant's offers in Pool-2 for $\rho^I > \tilde{\rho}_S^{h,l}$. Therefore, for high ν_h, *Hybrid-1* replaces *Pool-2* as shown in Figures 7(a)-(c). Obviously, the region labeled *Hybrid-1* shrinks with increases in ν_b because pooling higher proportions of bad risks increases costs of cross-subsidization. For low ν_h, the equilibrium is given by *Hybrid-2* as in the previous case. However, unlike the previous case, the entrant cannot screen high risks for the intermediate values of ν_h. Nor can it pool high risks, either with low risks or with bad risks. As a result the incumbent continues to dominate in this intermediate region.

Case (iv) $\rho^I > \max(\tilde{\rho}_S^{b,h}, \tilde{\rho}_S^{h,l})$**.** This implies that the complete set of contracts listed in Table 2 yield strictly positive profits to the entrant. Among them, the entrant's offers in Pool-1 and Screen-1 are dominated by those in Hybrid-1 and Screen-2 respectively. Therefore, the entrant can choose between contract offers in the four alternatives: Pool-1, Screen-2, Hybrid-1 and Hybrid-2. Clearly, for high cost advantages of the entrant, Hybrid-2 and Screen-1 dominate because they not only screen out the bad risks but also include low-risk types. Note however, that entrant offers in Hybrid-1 continue to dominate Screen-1 for high ν_h despite the fact that the entrant can now screen high risks from bad risks. This is probably because the cost of cross subsidization are still less than screening costs for high ν_h.

Conclusion

The model presented in this chapter shows how an incumbent bank's knowledge about the (un)creditworthiness of its (previous) customers in addition to that of its existing clients affects the behavior of entrants into credit markets. An important result here is that with a low cost advantage, the entrant's ability to gain market share first decreases, and then increases, with increases in (average) borrower quality. Although the entrant gains market share in high- as well as low-average-quality markets, the incumbent dominates in markets at intermediate levels of (average) borrower quality. The rationale behind this result is simple: the entrant's information disadvantage is less if either low risks or high risks dominate the borrower pool. On the other hand, this disadvantage is very high if there is an equal probability of coming across either creditworthy type. In this situation, the entrant has to engage in costly screening. However, for low-cost advantages, the entrant's screening costs are prohibitive and the incumbent dominates despite its cost disadvantage.

This non-monotonicity result is different from situations in which the entrant can costlessly screen out bad risks, as in the benchmark model. There, the entrant can confirm that any customer coming to it for loans is creditworthy. Therefore, its cost advantage is sufficient to obtain at least the inferior type from among the pool of creditworthy borrowers. And, as average borrower quality increases, the entrant finds that it can pool borrowers of inferior quality with superior ones. Accordingly, the entrant's ability to gain market share increases monotonically with increases in borrower quality.

Appendix

Entrant's offer in Screen-1

The following results are obtained for $\rho^I > \max(\tilde{\rho}_S^{b,h}, \tilde{\rho}_S^{h,l})$. The entrant's optimization problem is given as follows:

$$\max \quad \Pi^E \equiv \nu_b \pi_b^E + \nu_h \pi_h^E + \nu_l \pi_l^E$$

where $\pi_k^E = (1-\theta_k) R_k^E + \beta \theta_k C_k^E - \rho^E$, subject to the following participation constraints

$$U_b(R_b, C_b) \leq U^0 \tag{13}$$

$$U_h(R_h, C_h) \geq U_h^I \tag{14}$$

$$U_l(R_l, C_l) \geq U_l^I \tag{15}$$

and the following incentive compatibility constraints

$$U_b(R_b, C_b) \geq U_b(R_h, C_h) \tag{16}$$

$$U_b(R_b, C_b) \geq U_b(R_l, C_l) \tag{17}$$

$$U_h(R_h, C_h) \geq U_h(R_b, C_b) \tag{18}$$

$$U_h(R_h, C_h) \geq U_h(R_l, C_l) \tag{19}$$

$$U_l(R_l, C_l) \geq U_l(R_b, C_b) \tag{20}$$

$$U_l(R_l, C_l) \geq U_l(R_h, C_h). \tag{21}$$

Claim 1 *In any solution, $C_b = 0$.*

Suppose not. Let $\{(R_b^1, C_b^1), (R_h, C_h), (R_l, C_l)\}$ be a solution. Consider contract (R_b^2, C_b^2) where $R_b^2 > R_b^1$, $C_b^2 < C_b^1$ such that

$$U_b(R_b^1, C_b^1) = U_b(R_b^2, C_b^2). \tag{22}$$

It can be shown that the uninformed lender can increase profits by replacing contract (R_b^1, C_b^1) with contract (R_b^2, C_b^2). Note that since (R_b^1, C_b^1) satisfies (13), (4) and (5), so does (R_b^2, C_b^2). For (R_b^2, C_b^2) to satisfy (7), it needs to be shown that $U_h(R_b^1, C_b^1) \geq U_h(R_b^2, C_b^2)$. That is, $(1-\theta_h)(R_b^2 - R_b^1) \geq \theta_h(C_b^1 - C_b^2)$. Using (22), we get

$$(\frac{1-\theta_h}{\theta_h})(R_b^2 - R_b^1) \geq (C_b^1 - C_b^2) = (\frac{1-\theta_b}{\theta_b})(R_b^2 - R_b^1)$$

which holds true, since $\theta_b > \theta_h$. Similarly, (9) is also satisfied. Moreover,

$$\begin{aligned} \pi_b(R_b^1, C_b^1) - \pi_b(R_b^2, C_b^2) &= (1-\theta_b)(R_b^2 - R_b^1) + \beta\theta_b(C_b^2 - C_b^1) \\ &= (1-\beta)(1-\theta_b)(R_b^2 - R_b^1) > 0. \qquad \text{[using (22)]} \end{aligned}$$

Claim 2 *In any solution, the incentive constraint of the bad-risk w.r.t the high-risk must bind, that is $U_b(R_b, 0) = U_b(R_h, C_h)$.*

Suppose not. Let $\{(R_b, 0), (R_h^1, C_h^1), (R_l, C_l)\}$ be a solution. Consider contract

(R_h^2, C_h^2) where $R_h^2 > R_h^1$, $C_h^2 < C_h^1$ such that

$$U_b(R_b, 0) = U_b(R_h^2, C_h^2) \tag{23}$$

$$U_h(R_h^1, C_h^1) = U_h(R_h^2, C_h^2). \tag{24}$$

It can be shown that the uninformed lender can increase profits by replacing contract (R_h^1, C_h^1) with contract (R_h^2, C_h^2). Note that since (R_b^1, C_b^1) satisfies (2), (7) and (8), so does (R_h^2, C_h^2). For (R_h^2, C_h^2) to satisfy (10), it needs to be shown that $U_l(R_h^1, C_h^1) \geq U_l(R_h^2, C_h^2)$. That is, $(1-\theta_l)(R_h^2 - R_h^1) \geq \theta_l(C_h^1 - C_h^2)$. Using (24), we get

$$(\frac{1-\theta_l}{\theta_l})(R_h^2 - R_h^1) \geq (C_h^1 - C_h^2) = (\frac{1-\theta_h}{\theta_h})(R_h^2 - R_h^1)$$

which holds true, since $\theta_b > \theta_h$. Similarly, (9) is also satisfied. Moreover,

$$\begin{aligned} & \pi_h(R_h^2, C_h^2) - \pi_h(R_h^1, C_h^1) \\ = \; & (1-\theta_h)(R_h^2 - R_h^1) + \beta\theta_h(C_h^2 - C_h^1) \\ = \; & (1-\beta)(1-\theta_h)(R_h^2 - R_h^1) > 0. \qquad \text{[using (24)]} \end{aligned}$$

Claim 3 *In any solution, the incentive constraint of the high-risk w.r.t the low-risk must bind, that is* $U_h(R_h, C_h) = U_h(R_l, C_l)$.

Suppose not. Let $\{(R_b, 0), (R_h, C_h), (R_l^1, C_l^1)\}$ be a solution. Consider contract

(R_l^2, C_l^2) where $R_l^2 > R_l^1$, $C_l^2 < C_l^1$ such that

$$U_h(R_h, C_h) = U_h(R_l^2, C_l^2) \tag{25}$$

$$U_l(R_l^1, C_l^1) = U_l(R_l^2, C_l^2) \tag{26}$$

It can be shown that the uninformed lender can increase profits by replacing contract (R_l^1, C_l^1) with contract (R_l^2, C_l^2). Note that since (R_l^1, C_l^1) satisfies (3), (9) and (10), so does (R_l^2, C_l^2).

It can be shown that (R_l^2, C_l^2) satisfies (5). Suppose not. Then it follows that $U_b(R_b, 0) < U_b(R_l^2, C_l^2)$. Using Remark 2, this implies $U_b(R_l^2, C_l^2) > U_b(R_b, 0) = U_b(R_h, C_h)$. That is, $(1-\theta_b)(R_h - R_l^2) > \theta_b(C_l^2 - C_h)$. From (25),

$$(\frac{1-\theta_b}{\theta_b})(R_h - R_l^2) > (C_l^2 - C_h) = (\frac{1-\theta_h}{\theta_h})(R_h - R_l^2)$$

which is impossible. Hence (5) must be true. Moreover,

$$\begin{aligned} & \pi_l(R_l^2, C_l^2) - \pi_l(R_l^1, C_l^1) \\ = \; & (1-\theta_l)(R_l^2 - R_l^1) + \beta\theta_l(C_l^2 - C_l^1) \\ = \; & (1-\beta)(1-\theta_l)(R_l^2 - R_l^1) > 0. \qquad \text{[using (26)]} \end{aligned}$$

Claim 4 *The participation constraints for both high- and low-risk borrowers must bind.*

Suppose not. Let $\{(R_b, 0), (R_h^1, C_h^1), (R_l^1, C_l^1)\}$ be a candidate solution such that

$U_h(R_h^1, C_h^1) > \bar{U}_h^I$ and $U_l(R_l^1, C_l^1) > \bar{U}_l^I$. The aim here is to show that the solution $\{(R_b, 0), (R_h^2, C_h^2), (R_l^2, C_l^2)\}$ for which

$$U_h(R_h^2, C_h^2) = \bar{U}_h^I \tag{27}$$

$$U_l(R_l^2, C_l^2) = \bar{U}_l^I \tag{28}$$

$$U_b(R_b, 0) = U_b(R_h^2, C_h^2) = U_b(R_h^1, C_h^1) \tag{29}$$

$$U_h(R_h^2, C_h^2) = U_h(R_l^2, C_l^2) \tag{30}$$

satisfies all constraints but gives strictly greater profits for the uninformed lender.

For (R_l^2, C_l^2):

Constraints (3) and (8) are satisfied by construction.

It can be shown that (R_l^2, C_l^2) satisfies (5). Suppose not. Then it follows that $U_b(R_b, 0) < U_b(R_l^2, C_l^2)$. Using Remark 2, this implies $U_b(R_l^2, C_l^2) > U_b(R_b, 0) = U_b(R_h^2, C_h^2)$. That is, $(1 - \theta_b)(R_h^2 - R_l^2) > \theta_b(C_l^2 - C_h^2)$. From (25),

$$(\frac{1 - \theta_b}{\theta_b})(R_h^2 - R_l^2) > (C_l^2 - C_h^2) = (\frac{1 - \theta_h}{\theta_h})(R_h^2 - R_l^2)$$

which is impossible. Hence (5) must hold.

For (9), the proof is by contradiction. If not true, then $U_l(R_b, 0) > U_l(R_l^2, C_l^2)$ holds. That is $\theta_l C_l^2 > (1 - \theta_l)(R_b - R_l^2)$. Also, since (5) holds, it follows that $U_b(R_b, 0) \geq U_b(R_l^2, C_l^2)$. That is $(1 - \theta_b)(R_b - R_l^2) \geq \theta_b C_l^2$. Combining both inequali-

ties,

$$C_l^2 > (\frac{1-\theta_l}{\theta_l})(R_b - R_l^2) > (\frac{1-\theta_b}{\theta_b})(R_b - R_l^2) \geq C_l^2$$

which is impossible. Hence it must be true that $U_l(R_l^2, C_l^2) \geq U_l(R_b, 0)$

For (10), the proof is again by contradiction. If not true, then $U_l(R_h^2, C_h^2) > U_l(R_l^2, C_l^2)$ holds. That is $(1-\theta_l)(R_h^2 - R_l^2) < \theta_l(C_l^2 - C_h^2)$. Also, since (30) holds, it follows that $(1-\theta_h)(R_h^2 - R_l^2) = \theta_h(C_l^2 - C_h^2)$. Combining both,

$$(C_l^2 - C_h^2) > (\frac{1-\theta_l}{\theta_l})(R_h^2 - R_l^2) > (\frac{1-\theta_h}{\theta_h})(R_h^2 - R_l^2) = (C_l^2 - C_h^2)$$

which is impossible. Hence it must be true that $U_l(R_l^2, C_l^2) \geq U_l(R_h^2, C_h^2)$.

For (R_h^2, C_h^2):

Constraints (2), (4) and (8) are satisfied by construction.

For (7), the proof is by contradiction. If not true, then $U_h(R_b, 0) > U_h(R_h^2, C_h^2)$ holds. That is $\theta_h C_h^2 > (1-\theta_h)(R_b - R_h^2)$. Also, since (29) holds, it follows that $U_b(R_b, 0) = U_b(R_h^2, C_h^2)$. That is $(1-\theta_b)(R_b - R_h^2) = \theta_b C_h^2$. Combining both inequalities,

$$C_h^2 > (\frac{1-\theta_h}{\theta_h})(R_b - R_h^2) > (\frac{1-\theta_b}{\theta_b})(R_b - R_h^2) = C_h^2$$

which is impossible. Hence it must be true that $U_h(R_h^2, C_h^2) \geq U_h(R_b, 0)$. Using (30), we can show that (10) holds exactly as before. Thus $\{(R_b, 0), (R_h^2, C_h^2), (R_l^2, C_l^2)\}$

satisfies all constraints. Furthermore,

$$\begin{aligned}
& \pi_h(R_h^2, C_h^2) - \pi_h(R_h^1, C_h^1) \\
= \; & (1-\theta_h)(R_h^2 - R_h^1) + \beta\theta_h(C_h^2 - C_h^1) \\
= \; & (1-\theta_h)(R_h^2 - R_h^1) - \beta\theta_h(\frac{1-\theta_b}{\theta_b})(R_h^2 - R_h^1) \quad \text{[using (29)]} \\
= \; & [\theta_b(1-\theta_h) - \beta\theta_h(1-\theta_b)]\theta_b^{-1}(R_h^2 - R_h^1) > 0.
\end{aligned}$$

Also, note that $U_l(R_l^1, C_l^1) > \bar{U}_l^I$ implies that $(1-\theta_l)(\underline{\mathrm{R}}_l^I - R_l^1) \geq \theta_l C_l^1$. Moreover, $U_l(R_l^2, C_l^2) = \bar{U}_l^I$ implies $(1-\theta_l)(\underline{\mathrm{R}}_l^I - R_l^2) = \theta_l C_l^2$. Combining the two,

$$(1-\theta_l)(R_l^2 - R_l^1) > \theta_l(C_l^1 - C_l^2) > \beta\theta_l(C_l^1 - C_l^2). \tag{31}$$

$$\begin{aligned}
& \text{So} \;\; \pi_l(R_l^2, C_l^2) - \pi_l(R_l^1, C_l^1) \\
= \; & (1-\theta_l)(R_l^2 - R_l^1) + \beta\theta_l(C_l^2 - C_l^1) \\
= \; & (1-\theta_l)(R_l^2 - R_l^1) - \beta\theta_l(C_l^1 - C_l^2) > 0. \qquad \text{[using (31)]}
\end{aligned}$$

Thus, the entrant's maximum profits are given by

$$\Pi_{S-1}^E \equiv \nu_h \pi_h^E + \nu_l \pi_l^E \equiv \nu_h[(1-\theta_h)R_h^E + \beta\theta_h C_h^E - \rho^E] + \nu_l[(1-\theta_l)R_l^E + \beta\theta_l C_l^E - \rho^E]$$

where $R_l^E = C_l^E = \rho^I$, and

$$
\begin{aligned}
R_h^E &= \frac{\theta_b}{\theta_b - \theta_h}\rho^I - \frac{\theta_h}{\theta_b - \theta_h}[(1-\theta_b)x - U^0] \\
C_h^E &= -\frac{1-\theta_b}{\theta_b - \theta_h}\rho^I + \frac{1-\theta_h}{\theta_b - \theta_h}[(1-\theta_b)x - U^0].
\end{aligned}
$$

Entrant's offer in other candidate equilibria

From the previous section, it is easy to see that the entrant's offer to high risks in Screen-2 will be given by (R_h^E,C_h^E). Thus, its payoff is

$$\Pi_{S-2}^E \equiv \nu_h[(1-\theta_h)R_h^E + \beta\theta_h C_h^E - \rho^E].$$

The screening cutoff is given by setting the above profit function to zero.

$$\tilde{\rho}_S^{b,h} = \frac{\theta_b - \theta_h}{\theta_b(1-\theta_h) - \beta\theta_h(1-\theta_b)}\rho^E + \frac{(1-\beta)\theta_h(1-\theta_h)}{\theta_b(1-\theta_h) - \beta\theta_h(1-\theta_b)}[(1-\theta_b)x - U^0].$$

Note that any contract that pools high risks and bad risks is dominated by $(\underline{R}_h^I, 0)$. Similarly, any contract that pools all borrowers is dominated by $(\underline{R}_l^I, 0)$. (For proofs, see Appendix to Chapter 1). Hence, the entrant's offers in the candidate hybrid equilibria follows as in Section 3.

CHAPTER IV

CORPORATE RESPONSE TO DISTRESS: EVIDENCE FROM THE ASIAN FINANCIAL CRISIS

Introduction

In presence of financial distress, a firm cannot typically meet its debt repayment obligations using its liquid assets. Unless there is a sudden recovery of performance, the distressed firm is likely to default on its debt. This could lead to a formal bankruptcy filing, a dismissal of the management, and possibly, liquidation of the firm (see, for example, Gilson, 1989). To avoid this, firms typically respond to financial distress by either restructuring assets (by fire sales, mergers, acquisitions and capital expenditures reductions) or liabilities (by restructuring debt—both bank loans and public debt—and by injections of new capital from outside sources) or both.

Although firms face several restructuring options, most of the literature has focused on individual types of responses to distress (and their costs), primarily for US firms.[29] The only exception is a paper by Asquith, Gertner, and Scharfstein (1994), in which the authors provide a comprehensive analysis of several different forms of financial restructuring. They find that the structure of a company's liabilities is the most important determinant of the type of financial response to distress, while performance-related variables do not have any explanatory power. The focus

[29] These studies include Brown, James and Mooradian's (1993) work on public debt and bank debt restructurings; Gilson (1990) on bank debt restructurings; Brown, James and Mooradian (1994) on asset sales; Erwin and McConnell (1997) on piecemeal voluntary liquidations; Tashjian, Lease and McConnell (1996) on prepackaged bankruptcies; and Ang, Chua and McConnell (1982), Franks and Torous (1989) and Hotchkiss (1994) on bankruptcy filings.

of their paper is corporate responses under firm-specific financial distress as opposed to responses under economy-wide distress.

Despite the macroeconomic implications of an economy-wide financial crisis, there has been no comprehensive study, to the best of our knowledge, that looks into the specific ways in which firms try to avoid liquidation during such a downturn of economic activity, even for the US. This is an important distinction between our paper and other related work on corporate restructurings under financial distress.[30] In particular, we focus on the five countries —Indonesia, Malaysia, the Philippines, South Korea and Thailand— that were hit by the Asian financial crisis of 1997-98. Among other things, this focus allows a direct investigation of Shleifer and Vishny's (1992) insight that, in industries facing a recession, external financing is scarce, and potential buyers (within the industry) cannot obtain external finance to purchase assets from firms under distress. Restructuring through asset sales might therefore become particularly unattractive because of large discounts on the value of the assets being sold.[31] Additionally, this study allows us to compile new evidence on the determinants of different types of responses to an economic (rather than a firm-specific) crisis.

A second important contribution of this study is to contrast two sets of determinants of the type of financial response: governance factors and capital structure/performance considerations. We specifically investigate the role of business

[30] In related work that is different from ours, Claessens, Djankov and Klapper (2003) analyze the likelihood of formal (as opposed to informal) bankruptcy filings during the Asian Crisis. They find that bankruptcy filings are less common for bank-owned and group affiliated firms.

[31] Pulvino (1998) documents that distressed U.S. airlines sell aircrafts at a 14 percent discount relative to their market value. This discount becomes even larger during market downturns.

groups and family ownership, which represent the prevalent form of corporate control outside the Anglo-Saxon systems. In the particular case of East Asia, most large firms are closely held conglomerates—structured as business groups—as opposed to widely held corporations in the US and the UK (La Porta, Lopez-de-Silanes and Shleifer, 1999; Claessens, Djankov and Lang, 2000). Given that the control of corporate assets were concentrated in the hands of a few wealthy families (organized as groups), it would be instructive to know as to whether group affiliation and ownership type had any role to play in the resolution of financial distress for these firms.[32], [33]

An important consideration in the resolution of distress is negotiations between the distressed firm and its creditors. Banks can often be part of business groups. Such banks are known to give preferential access to capital for firms affiliated to the group, particularly for those in distress. This is partly because group-affiliation lessens capital market frictions.[34] This makes bank-led creditor workouts easier for group affiliated firms. Morck, Wolfenzon and Yeung (2005) argue that pyramid firms can also enjoy cheaper access to capital than free-standing firms even when banks are not part of the pyramidal group. This could be either because apex firms of the group can serve as banks or because their superior bargaining power of such conglomerations reduces rent-seeking by "outside" banks.

[32] Earlier work by Lang, Poulsen, and Stulz (1995) shows that, absent financial distress, entrenched US managers engage in sub-optimal divestiture decisions when this allows them to pursue their personal goals.

[33] Faccio, Masulis, and McConnell (2006) show that politically connected (typically family) firms are especially likely to receive a bailout from their home government during the crisis.

[34] The literature on relationship banking documents that asymmetric information problems make it difficult for a firm to initiate a lending relationship with a bank while hold-up problems make it difficult for firms to switch banks. Such problems are mitigated if both bank and firm are part of the same conglomeration.

Moreover, conglomerates often provide sufficient cross-guarantees to bail out troubled members in their group.[35] Group affiliation therefore dilutes the information that is available to an "outside" creditor. In a crisis situation, this opacity may help group-affiliated firms as there is a greater likelihood of being bailed out by creditors. Kim (2004) specifically argues that conglomeration is a device designed by firms to maximize the chance of bailout in the event of a default on their bank loans. His model demonstrates that a bank has more difficulty inferring the quality of members within a business group than that of stand alone firms. This is because inter-group loan guarantees prevent the bank from knowing whether the payment is from the borrower or from other firms in the group. Consequently, the bank is more likely to liquidate a freestanding firm than an otherwise identical group firm. This study provides an opportunity to find out whether this theoretical hypothesis holds true in practice.

With respect to capital structure considerations, it is known that debt has been the primary source of external finance in East Asia and that some corporations were highly leveraged. In a world where bankruptcy costs are not avoidable, characteristics of a firm's capital structure influence the likelihood of bankruptcy as well as the magnitude of the costs incurred (Senbet and Seward, 1995). An additional feature of Asian economies is that firms had incentives to delay debt, operational restructuring and even repayment of loans because of weak foreclosure and bankruptcy laws in the

[35] Friedman, Johnson and Mitton (2003) record instances where controlling shareholders often "prop up" distressed group firms (to the benefit of public shareholders) in order to attract external finance. While Hoshi, Kashyap and Scharfstein (1991) view such inter-firm transfers as enhancing economic efficiency by reducing bankruptcy costs, Morck and Nakamura (1999) present evidence showing that such transactions also include "bailouts" of inefficient firms.

affected countries. Bankruptcy reforms were necessary not only to ensure actual firm failures but also for providing creditors and debtors to reach settlements out-of-court (see Claessens et al. 2001 for details).

Our results can be summarized as follows. Examination of 651 firms from 5 Asian countries hit by the financial crisis shows that firms predominantly respond to the crisis by restructuring their liabilities (18.3% of firms do so). The second-most important form of restructuring are asset sales (which are chosen by 12.3% of firms), and then mergers (10.4% of firms). Liquidations are by far the least option, with less of 4% of companies in the sample falling into this type of restructuring. We find support to the Shleifer and Vishny's (1992) asset fire sale hypothesis by showing that company's reluctance to liquidate assets relates to extremely depressed prices across almost all industries during the crisis. In fact, asset sales that took place during the crisis on average occurred at a 40% price discount relative to sales of similar assets prior to the crisis.

As for the determinants of the type of response to the crisis, we find that firms' financial leverage is by far the most important determinant of workouts and asset sales, followed by market-to-book ratios and firm size. On the other hand, the degree of tangibility of assets (collateral) is important in explaining the likelihood that a firm merges or is taken over. While financial variables have a large impact on the type of response, we find that governance variables matter little if at all. In fact, even when statistically significant, they have marginal economic impact on the choice of financial response. This gives little support to the economic importance of the arguments advanced by Kim (2004). It also indicates that when facing a major economic crisis,

controlling families concerns with maintaining control become less important, and are certainly dominated by the capability of firms to access additional capital.

Data sources and variables definition

Corporate response to financial distress

To identify the resolution of financial distress for each of the companies, we use the Asia Pacific News Archives of the *Troubled Company Reporter* (TCR). The TCR is a publicly available archive of news items on the website of the *Internet Bankruptcy Library* (IBL).[36] This database reports information related to financial distress for publicly traded companies worldwide. The database assembles information from regulatory filings, court pleadings, judicial rulings and press reports. The searches are run for each company over the period February 1, 1998 (the date TCR starts covering distress) to December 31, 2000. The responses are classified under the following four (financial) alternatives available to corporate managers for dealing with distress: (1) debt restructurings, (2) asset sales, (3) mergers and (4) liquidations.

We define debt restructuring (also referred to as a "workout") as an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm. This term includes both public and private loan agreements. Common restructuring methods include exchange offers (debt for equity), covenant modification and maturity extension or interest rate adjustments. The workout variable also includes injections of capital by creditors.[37] In fact, often, debt-

[36] http://www.bankrupt.com/TCRAP_Public/index.html

[37] Some authors, like Senbet and Seward (1995), have treated capital injections by creditors as a separate category.

restructurings were packaged to include a combination of rescheduling, debt-equity swaps and capital injections by creditors.

Asset sales are used frequently by firms to resolve financial distress. Brown et al. (1994) point out that asset sales for distressed firms occur primarily under the pressure of creditors, often to the detriment of stockholders.[38] In particular, they argue that the probability that an asset sale is used to repay debt increases with the firm's debt (leverage) and decreases with the firm's financial condition (operating performance).

Brown et al. (1994) also find that the distinguishing characteristics of firms which sell assets are that they operate multiple divisions and subsidiaries. As a result, diversified groups might be more likely to sell assets than free-standing firms. Moreover, managers that respond favorably to creditor pressure to undertake asset sales are more likely to retain control of the firm. This seems to suggest that firms, in which owners have greater control rights at stake, are more likely to undertake asset sales to retain control. Finally, as argued by Shleifer and Vishny (1992), illiquid asset markets may lead distressed firms to sell assets at significant discounts from their current value use. This consideration is particularly important for asset sales during an economy-wide crisis.

Our measure of asset sales comes from two sources: (1) items in the Troubled Company Reporter, and (2) data from *SDC Platinum*™ (which reports information on the divestitures of subsidiaries). To check the robustness of our results, we use

[38] Lang, Poulsen, and Stulz (1995), however, find that asset sales used to retire debt result in a higher average (positive) abnormal stock return than when sales proceeds are retained by the firm.

a dummy variable that takes the value of one if there is drop in the book value of property, plant and equipment (gross of accumulated depreciation and amortization) that exceeds 15% of the book value of total assets in any given year and zero otherwise. This dummy variable is generated using data from the *Worldscope* database for the period 1997-2000.

Next, we collect data on mergers and acquisitions. We start by collecting data with searches in the *Troubled Company Reporter* and then integrate this data with information from *SDC Platinum*$^{\text{TM}}$, Worldwide Mergers and Acquisitions Database, and finally, keyword searches in *Factiva*. Lastly, the TCR archive was searched for liquidations of companies. This information was also integrated with keyword searches in *Factiva*. Examples of articles for each type of response to financial distress from the TCR archive (IBL web site) are reported in the Appendix.

Governance variables

To capture the influence of the largest shareholder, we control for the ultimate voting stake held by this agent. In general, shareholders who extract substantial control benefits have little incentive to undertake any form of restructuring that involves a sale of assets (especially those in its extreme form, such as liquidations) because this reduces their private benefits of control. Instead, these shareholders prefer debt workouts because this form of restructuring is unlikely to dilute their control. To control for this effect, we include the variable *Largest block-holder concentration* (also referred to as *Control*), which comes from Claessens, Djankov and Lang (2000), and captures the effects of complex control structures. For example, if a family owns 50%

of Firm X that owns 30% of Firm Y, then this family is assumed to control 30% of Firm Y (the weakest link in the chain of control).

The same authors have assembled a number of data sources to identify whether a company is part of a major business *Group*. We use their business group variable to study the impact of conglomeration on the type of response to corporate distress. As mentioned before, Kim (2004) predicts a higher likelihood of a debt workout for a group affiliated firm.

Earlier work by Faccio, Masulis, and McConnell (2006) has shown that many Asian firms were owned by key politicians (or by people close to them) and frequently received government aid during the crisis. Therefore, we control for whether a given company has outstanding political ties. As in their paper, a company is defined as *Politically connected* if at least one of its top directors (CEO, president, vice-president, or secretary) or large shareholders (any blockholder controlling at least 10% of votes) is a member of parliament, or a minister, or is closely related to a top politician or party. If these companies receive indirect aid from the government, we would not only expect a higher incidence of workouts, but also more frequent sales of assets (where buyers are pressured to purchase by government officials). At the very least, these firms are less likely to be liquidated in the event of distress since this would result in a loss of benefits for the politician.

We refine some of these variables further to distinguish between the types of controlling shareholders (e.g., families or governments) as well as to determine whether a company is part of a group that includes a bank. The latter would increase the likelihood of a workout because the company can presumably influence the bank's

lending choices.

We control for affiliation to a group that includes at least one bank by using the indicator variable *Bank in Group*. Information on the members of each business group is compiled based on data from Claessens et al.'s (2000). We also include two ownership indicators. The variable *Family* takes the value of one if the firm is privately held or if the largest shareholder of the company under consideration is a family and zero otherwise. Likewise, *Government* denotes instances in which the largest shareholder is a national government, a local authority, or a government agency.

Financial determinants of the response to distress

In the rest of this section we will define the financial variables employed in the analysis. Unless stated differently, our main data source is the 1997 company financial reports of the *Worldscope* database.

Firstly, Brown et al. (1994) show that the most important predictors of bankruptcy filings are performance and leverage. As proxy for the company's accounting performance, we employ the standard financial ratios like the *Return on Equity* (ROE) and the turnover of assets (ratio of *Sales/Total assets*). For robustness purposes, we also use the *Return on Assets* (ROA) and the *Industry Adjusted EBITDA/Assets* ratio. The latter is defined as the ratio of the company's earnings before interest expense, income taxes, depreciation and amortization (EBITDA), to the book value of its total assets. The ratio is netted out of its industry median (across all countries), where a firm's industry is given by its primary two-digit SIC code.

In addition, Asquith et al. (1994) also point out that a firm's capital structure is an important determinant of the type of financial response. For this reason, we include two proxies to capture "high" leverage. *Leverage* is the ratio of total debt to the sum of book value of equity plus book value of debt. The other proxy for leverage (and related financial distress) is *[(Interest Expense – EBITDA)/ Interest Expense]*; computed as the ratio of the difference between interest expense on debt and EBITDA over the interest expense on debt. Interest expense on debt represents the service charge for the use of capital. EBITDA is defined as above.

We control for market expectations of recovery through the variable *Mkt. Value/ Book Ratio* (MB), computed as the ratio of the market value of equity (ordinary and preferred) plus book value of total debt over the book value of total assets. The latter is defined as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment, and other assets.

Furthermore, the choice for a workout is likely to depend on company size and borrowing capability. In view of this, we also include the variables *Log(mkcapUS$)*, the log of the company's equity market capitalization as of December 31, 1997 measured in thousands of US$ and *Collateral*, calculated as the ratio of property, plant and equipment to total assets.

Finally, following Asquith et al. (1994), we initially test for the Shleifer and Vishny's (1992) idea that market for assets may be illiquid because potential industry buyers (who value assets most) are also distressed by adding the *Industry Median Leverage* and the *Industry Median MB Ratio* to our list of regressors. There variables

are the median ratios of the *Leverage* and MB variables (defined above) computed for firms (across all countries) in the same (two digit SIC) industry.

Summary Statistics

The countries included in this paper are the five countries that were worst affected by the Asian Crisis of 1997-98. Firms in these countries were selected on the basis of three criteria. First, each firm must have financial data reported in the *Worldscope* database which is the primary source for accounting data. Second, each firm must be included in the ownership dataset complied by Claessens, Djankov and Lang (2002). Third, the primary business segment of each firm must not be in financial services, that is, not in the standard industrial classification (SIC) 6000-6999. The sample selection process is outlined in Panel A of Table 3. The final sample consists of 651 firms. In general, the sample is representative of larger firms that trade on the major stock exchanges in each country. As mentioned earlier, we identify the responses to the Asian financial crisis for each of these firms. The details of the responses and their distribution by country are provided in Table 3 and 4.

Several important trends are visible in the data. First, workouts seem to be the most preferred response to distress in East Asia. This gives some preliminary support to the arguments by Shleifer and Vishny (1992): given the large discounts that may need to be applied, forms of restructuring involving the sale of assets might become particularly unattractive. Such discounts clearly are not present when liabilities are being restructured.[39] Interestingly, many firms simply chose to do nothing: a natural

[39] On the contrary, restructurings often occurred with reducing the rates on the loans and even at times (rarely) with the creditor forgiving some part of the principal repayment due.

response when creditors don't approve the restructuring of the firm's liabilities, and the discounts applied to asset fire sales are perceived to be too large.

When forms of restructuring involving the sale of assets (e.g., asset sales, mergers and liquidation) are considered together, they nonetheless add up to a considerable number of cases. However, we need to point out that different forms of asset sales cannot really be pooled together. For example, asset sales (as well as mergers) and liquidations are very different from a managerial perspective. Empirical studies for the US have shown that managers often sell assets to avoid bankruptcy since in Chapter 11 managerial turnover is high (Gilson, 1989; Hotchkiss 1994) and compensation is reduced (Gilson and Vetsuypens, 1993). Moreover, Brown, James and Mooradian (1994) show that managers are less likely to lose their jobs if they repay debt with proceeds from asset sales, since asset sales also reduce the probability of bankruptcy.[40]

Third, when compared to the other types of responses to the crisis, our sample records a small number of liquidations for the period 1998-2000. This supports the conjecture in White (2001) that bankruptcy procedures in countries affected by a systemic crisis are likely to result in very little liquidation. However, this could also be the case because, as mentioned earlier, our sample includes larger firms as opposed to smaller firms that face a higher probability of liquidation.

Panel B compares financial data by firms' response to the distress. Larger firms (size measured here by the mean of total assets) tend to restructure, while smaller firms are more likely not to undertake any visible form of restructuring. There is little

[40]It needs to be mentioned here that large East Asian firms are typically closely held, where the manager is often the largest shareholder. Therefore, it might be difficult to attribute some of the incentives that motivate US managers to operate for those in East Asian firms.

difference between firms that undertake mergers or asset sales in terms of our summary statistics, except for the fact that firms that undergo mergers are on average smaller than those that resort to asset sales. On the other hand, the Panel B shows that firms that are liquidated have by far the worst net performance, with an average of ROE of -73.35%. The second worse performance is found for companies that restructure their liabilities through a workout. Firms that don't restructure, on the other hand, tend to do relatively better: they are in fact the group with the highest average (and median) ROE and ROA. This result contrasts with Asquith et al. (1994) who, in the US, find no evidence that firm with better operating performance deal more successfully with financial distress. Panel B also shows that companies under liquidation, or workout are very highly leveraged (the average *Leverage* is 85% for the workout group and 90% for the liquidations). Firms undertaking asset sales or mergers have lower, although still high, leverage. Once again, firms that do not restructure have relatively better financial conditions, with a leverage of "only" 61%. Firms that don't restructure also seem to have better MB ratios (at least when we look at average values).

An interesting observation here is that Panel B points to a different characteristic between the two responses: Among firms that have successfully dealt with financial distress, a larger fraction of them are affiliated to a business group. Furthermore, the voting stake held by the largest block-holder is significantly higher for firms undergoing a successful response to their distress than those being forced to liquidate. In summary, firms that were successful in restructuring their debt or received injections of capital from outside are more likely to have better financial performance, be larger in size, affiliated to a group and closely held.

Regression results

In our regression analysis, we adopt two approaches to estimate for the determinants of responses. The first approach assumes that the responses of individual firms are independent, while the second relaxes this assumption. Note that, since multiple responses are possible for a single firm, we estimate a multivariate probit model in the second approach. This involves a general system of four equations (one for each response) with correlated disturbances, wherein the error terms are assumed to follow a multivariate normal distribution. We show below that even when we relax the assumptions of independent responses, the results are similar to that in the first approach. Therefore, in our case, using independent (univariate) probit equations for each response is not a restrictive assumption.

Independent Probit Regressions

We will use probit equations to estimate the determinants of firm responses to financial distress. The results of probit equations under different specifications are reported in Tables 6-9. Before discussing the results it is important to point out that each specification includes three types of covariates, namely (i) financial variables, (ii) group affiliation data and (iii) industry performance variables. For operating performance, we use *Return on Equity* in specifications (1), (3) and (5), while *Sales/TA* is used in specifications (2), (4) and (6). For group affiliation data, specifications (1)-(2) use the *Group* dummy variable, specifications (3)-(4) use *Largest Block-holder Concentration* (or *Control*) and specifications (5)-(6) use other group affiliation variables like *Bank in Group*, *Family* and *Government*. For Tables 6-9, we report marginal

effects computed at the means of the independent variables.

We find that four explanatory variables are significantly related to the probability of a workout: *Leverage*, *Mkt. Value/ Book Ratio*, *Log(mkcapUS$)*, and *Control*. *Leverage* is clearly the variable with the largest economic impact: one standard deviation increase in the firm's leverage ratio increases the likelihood of a workout by 0.54. The second most important variable is the *Mkt. Value/ Book Ratio*: One standard deviation increase in this variable reduces the likelihood of a workout by 0.19. The results also show that one standard deviation increase in size (*Log(mkcapUS$)*) increases the probability of restructuring through a workout by 0.09. Thus, companies that chose to restructure their liabilities are predominantly large firms with high leverage and poor growth prospects (as measured by the MB ratio). These results are consistent with the univariate evidence discussed earlier. However, the results strongly contrast with the evidence in Asquith et al. (1994) who only find the leverage ratio to be significant in their models. The variable *Control*, although statistically significant, has a marginal economic impact on the likelihood of a workout. In particular, one standard deviation increase in the percentage of control rights enjoyed by the largest shareholder increases the likelihood of a workout by 0.001. Finally, we find no statistical significance for *Collateral*, *Return on Equity*, industry variables and other group-affiliation variables. Their economic impact is found to be small as well. Importantly, the results on the *Group* and *Family* dummies provide little support for Kim's (2004) arguments.

The variables that significantly explain the choice of selling assets (Table 7) are the same variables that were found to be significant in the case of debt-workouts

(Table 6). As in the previous regression, the control variable, although statistically significant (this time with a negative sign), has a small impact on the likelihood of an asset sale. *Leverage* is once again the variable with the largest economic impact on the restructuring choice. In particular, we find that one standard deviation increase in leverage increases the likelihood of an asset sale by 0.37. Furthermore, a one-standard-deviation increase in the MB ratio decreases the likelihood of an asset sale by 0.15, while one standard deviation increase in size (as measured by *Log(mkcapUS$)* increases the likelihood of an asset sale by 0.13. Finally, firms owned by the government are likely to engage in asset sales. Government ownership increases the likelihood of asset sales by 0.09.

We then analyze the determinants of the decision to merge (or being taken over). Three variables explain this choice: *Leverage*, *Collateral* and *Control*. *Collateral* is positively and significantly related to the likelihood of a merger. One standard deviation increase in this variable results in an increase in the likelihood of a merger by 0.17. This result is in line with earlier evidence by Ambrose and Megginson (1992). The positive relationship may be explained by the fact that bidders like safe assets. Additionally, since firms with high collateral have higher debt capacity, they can be considered ideal target for high-leveraged transactions (HLTs). Once again, *Leverage* is positively and significantly associated with the probability of restructuring –this time through a merger, although the impact of this variable is no longer as strongly statistically significant as for the previous two responses. One standard deviation increase in leverage increases the likelihood of a merger by 0.14. Notice that this result contrasts with most of the previous literature aimed at predicting takeover

targets (e.g., Palepu, 1986, Song and Walkling, 1993, Comment and Schwert, 1995, and Pinkowitz, 2002), which finds leverage to be insignificantly or negatively related to the likelihood of becoming a takeover target. The difference is however easily explained in this context: most highly leveraged firms in our sample are financially distressed, and therefore actively seek for some form of restructuring. Finally, we find a small but significant effect of control rights concentration on the likelihood of a merger: In particular, one standard deviation increase in the level of concentration of control results in a reduction of the likelihood of becoming a takeover target by 0.002. This result, too, is easily explained. If, as documented in Nenova (2003) and Dyck and Zingales (2004), control is valuable, a dominant shareholder may be reluctant to sell her stake since this would result in the loss of sizeable private benefits; the preference for other restructuring choices (or no restructuring at all) is then inevitable.

Finally, we examine the determinants of the choice of liquidation. Firms that opt for liquidation are small in size, highly leveraged, have more dispersed ownership and are less likely to have political connections. One standard deviation increase in leverage increases the likelihood of liquidation by anything from 0.02 to 0.06. Finally variables like *Control* and *Politically Connected* have a small, yet significant impact on the likelihood of liquidation. Not surprisingly, closely-held firms and those with political connections are less likely to be liquidated.

It is worthwhile to point out that the signs on the marginal effects for *Leverage* and MB ratio are the same in all of the four responses and across all specifications (for each response). This underlines the fact that highly leveraged firms with poor growth opportunities firms are simply more likely to react to the economic crisis

through restructuring or face liquidation.

Multivariate Probit Regressions

An alternative way to estimate the model is to relax the assumption of independent responses. Consequently, the model can be estimated by a multivariate probit model. This requires four probit equations (one for each response) with correlated disturbances, similar in spirit to seemingly unrelated regression models. The specification for the four-equation model is

$$\begin{aligned} y_{ij}^{*} &= \mathbf{x}_{ij}\boldsymbol{\beta} + \varepsilon_{ij}, \qquad i = 1, 2, ..., n;\ j = 1, 2, 3, 4. \qquad (32) \\ \text{where} \quad y_{ij} &= 1, \quad \text{if } y_{ij}^{*} > 0, \ \ 0 \text{ otherwise} \end{aligned}$$

The error terms, ε_{ij}, are distributed as a multivariate normal, with a mean of zero, and a variance-covariance matrix V, in which $cov[\varepsilon_{ij}, \varepsilon_{ik}] = \rho_{jk} = \rho_{kj}$ and $\rho_{kk} = 1$.[41] The dependent variables in the model are

$$\begin{aligned} y_{i1} &= \text{response is a debt workout} \\ y_{i2} &= \text{response is an asset sale} \\ y_{i3} &= \text{response is a merger} \\ y_{i4} &= \text{response is liquidation} \end{aligned}$$

Under the null that $\rho_{jk} = 0$ (for all $j \neq k$), the model consists of independent

[41] The practical difficulty to estimating (32) lies in evaluating higher-order mulitvariate normal integrals. The multidimensional normal integrals in the likelihood function are estimated using the GHK smooth recursive simulator described in Greene (2003, pp. 714-719).

probit equations which could be estimated separately. This assumption was implicitly made by Asquith et al. (1994).

The estimated coefficients of the multivariate model are reported in Panel A of Table 7. Panel B of Table 7 reports the correlation structure of the error terms. Generally, the correlation coefficients are small. Note that the correlation coefficient between the error term in the first equation and the error term in the second equation (i.e., ρ_{12}) and the correlation coefficient between the error term in the second and the error term in the fourth equation (i.e., ρ_{24}) are statistically significant. However, the other four correlation coefficients are not significant at standard levels. We then further investigate the lack of independence by computing the likelihood ratio of test for the null hypothesis $\rho_{12} = \rho_{13} = \rho_{13} = \rho_{23} = \rho_{24} = \rho_{34} = 0$. The likelihood ratio test does not allow rejecting the null of zero correlation ($\chi^2_{(6)} = 8.31$ and $p - value = 0.22$). Thus, it seems that estimating independent probit regressions is not too restrictive an assumption.

We also report the coefficients for similar tests of the independent probit regressions in Table 11 (Note that Tables 6-9 report marginal effects). A quick comparison between the coefficients reported in Table 11 with those in Table 10, reveals a small difference between the two sets. The statistical significance of the coefficients is similar between the two estimations procedures.

Testing the "fire" sales hypothesis

Earlier work by Asquith et al. (1994) found that distressed companies are less likely to sell assets if they operate in highly leveraged industries, and more likely to

sell assets if they operate in industries with higher growth perspectives. However, all companies are likely to face liquidity problems to some degree during an economy-wide crisis. This makes it difficult to find evidence in support of the above phenomenon if we limit our analysis to data during the crisis.

An alternative test of the fire-sale hypothesis would be to compare prices on asset sales before the onset of the crisis (which we will refer to as the "pre-crisis" period) to asset sales during, and in the aftermath of the crisis (also referred to as the "post-crisis" period). We compare the price-to-sales multiples paid for the acquisition of companies in a given (2-digit SIC) industry for the pre-crisis and post-crisis periods. We rely on the price to sales multiples for two reasons. First, multiples based on EBIT or accounting profits are rendered meaningless because most companies had negative profitability during the crisis. Second, data on price-to-sales multiples is more readily available in *SDC Platinum*™ than other accounting items such as book value of equity. This is important because a larger sample size helps in reducing the impact of outliers in the data.

We first compute the ratio of the price paid for control transactions divided by the book value of sales for the given target. Control transactions include M&As, leveraged buyouts, inter-corporate tender offers, spin-offs, purchases of minority stakes (i.e., toehold acquisitions), of remaining interests, and recapitalizations. This is done for all recorded transactions in *SDC Platinum*™ between January 1, 1995 and December 31, 2000. To be included in our sample, the targets of these transactions must be headquartered in one of the five countries in our analysis. However, we do not impose

any restriction on the country of the buyer.[42]

We then average the price-to-sales multiples across firms in each (2-digit SIC) industry, separately for the "pre-crisis" (1995-1997) and "post-crisis" (1998-2000) periods. Due to lack of observations (or possibly, a lack of transactions in the period of crisis) a comparison between data for the two periods is possible for only 30 industries (as before, we exclude the financial sector). The results are summarized in Table 12. In support of the fire-sale hypothesis we find that, for 23 out of 30 industries, the average multiple was lower in the post-crisis when compared to the pre-crisis period. More specifically, prior to the crisis, the average price to sales multiple (across all industries) was 4.18, while in the aftermath of the crisis this ratio dropped to 2.48. The difference between the two is statistically significant (paired t test p-value = 0.002). A comparison of the pre- and post-crisis periods indicates that prices dropped by 40.6% during the crisis, which suggests substantially large discounts. These discounts are more pronounced than those documented earlier by Pulvino (1998), who records an average discount of 14% for the sale of aircrafts by distressed airlines in the U.S., which further increased to 30% during market recessions. Larger discounts documented here can be explained when one considers two factors. First, as mentioned earlier, it is more difficult for corporations to sell assets during an economy-wide crisis because firms across all industries –as opposed to firms within the specific industry—face liquidity problems. Second, these liquidity problems are more acute in emerging markets than in developed economies like the US. Clearly, these large discounts could explain why

[42]It is worthwhile to point out that for 81% of the deals in the pre-crisis period, both target and bidder were from the same country. However, this proportion drops to 65% during the crisis. This is suggestive of the fact that fewer companies in countries affected by the crisis could bid successfully for the target.

the restructuring of liabilities in our sample is more common than the sale of assets.

Robustness tests

Media Bias

Any study, for which empirical data has been collected from media reports, is bound to have a bias, and ours is no exception. For example, a large number of firms have been categorized under the "do nothing" group. Indeed, one could argue that such firms probably undertook some form of financial restructuring, but these were not captured in the news items of the IBL database. However, it is worthwhile to mention that firms classified under the "do nothing" group have better operating performance (e.g., higher MB ratios) and lower leverage than those belonging to any of the other groups. Clearly, such firms are more likely to "do nothing" when it comes to responding to the crisis.

Distressed firms only

Following Asquith et al. (1994), we conduct probit regressions over a sample of firms which are defined to be distressed under some financial criterion. A firm is defined to be financially distressed if during 1997-2000, the company had (any) two consecutive years with earnings before interest, taxes, depreciation and amortization (EBITDA) less than its reported interest expense or, in any one year, EBITDA was less than 80% of the firm's interest expense. This reduces the number of firms in the sample from 651 to 315.

The results of independent probit regressions on the (smaller) sample of distressed

firms are presented in Tables 13-16. The results confirm our findings from the full sample: the likelihood of undertaking an asset sale or a debt workout—the predominant forms of restructuring—increases with the leverage and size of the firm but decreases with better growth perspectives (as measured by the MB ratio). Moreover, just as in the full sample regression, *Collateral* is positively and significantly related to the likelihood of a merger. Again, we find a small but significant negative effect of control rights concentration on the likelihood of any asset-side restructuring (like a merger or an asset sale).

However, there are two notable exceptions when one includes distressed firms only. First, industry level variables now have a strong and significant impact on the likelihood of any asset-side restructuring. Both *Industry Median MB Ratio* and *Leverage* record positive and significant effects on the likelihood that a distressed firm undertakes an assets sale or a merger. Finally, some ownership variables are also significant for distressed firm restructurings, but their impact is small. In particular, *Family* ownership decreases the likelihood of asset sales, *Banks in Group* increases the likelihood of mergers and *Government* ownership increases the likelihood of liquidations.

Other measures of asset sales

As mentioned earlier, we check the robustness of our results on determinants of asset sales using a dummy variable of PPE reduction for drops in the book value of property, plant and equipment exceeding 15% of the book value of total assets in any given year. The results are presented in Table 17. As before, highly-leveraged firms are more likely to record drops in PPE, but now even the industry-wide leverage

has a positive and significant impact on the likelihood of asset-side restructurings. Note that the sign on the variable contradicts the hypothesis that industry leverage adversely influences the likelihood of asset sales. A possible explanation here could be the distinction between an industry-wide recession and an economy-wide crisis. As a result of a crisis, firms selling assets under pressure from creditors may be forced to sell to buyers from a different industry, or even (as documented earlier) to buyers in a different country. Thus, the likelihood of an asset sale increases with increase in the industry median leverage as creditors force companies to sell assets, to any buyer, even from outside the industry. Here too, the ownership variables have a small impact on asset sales.

Other measures of operating performance

As mentioned before, we conduct robustness checks on the determinants of a firms' choice of response by adopting different measures of operating performance. We conduct independent probit regressions by using two alternative measures, namely *Return on Assets* (the results of which are given in Table 18) and *Industry Adjusted EBITDA/TA* (the results of which are given in Table 19). Again results confirm our findings from the full sample (we conduct regressions on specification (1) in Tables 6-9). A firm's financial condition is an important determinant of its restructuring choice while other ownership variables are marginally significant at best.

Conclusion

This paper investigates the determinants of the choice of corporate restructuring during an economy-wide crisis. Evidently, financial variables have a large impact

on the type of response, but we find that governance variables are only marginally significant at best. In particular, we find that companies which chose to restructure by asset sales and debt workouts are predominantly large firms with high leverage and poor growth prospects (as measured by the MB ratio). Companies with higher debt capacity (as measured by *Collateral*) are more likely targets of mergers. As for governance variables, we find, for example, that political connections can reduce the likelihood that a firm is liquidated. However, the impact of such variables is extremely small.

Another important finding of this study points to a preference of firms to undertake a restructuring of its liabilities as opposed to its assets during an economy-wide crisis. This is in line with previous theoretical hypothesis in Shleifer and Vishny (1992) that given a general downturn in the industry (in our case, the economy), asset sales might therefore become particularly unattractive because prospective buyers of such assets are themselves liquidity-constrained. This study documents evidence in support of the "fire-sale" hypothesis that, during the Asian crises, assets sales were usually at large discounts (40% price discount on average)

Table 3—Summary statistics: Panel A reports the summary statistics for 651 firms in five countries affected by the East Asian crisis. Panel B reports the summary statistics for the financial variables by the choice of firm response to the crisis. Summary statistics are means excepted where denoted. Financial statement data comes from Worldscope and is based on the latest financial statements prior to December 1997. The data for responses under distress have been collected publicly available archive of news items on the website of the Internet Bankruptcy Library (IBL), SCD and Factiva (see text for details). *Workout* is an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm (for both public and private loan agreements). *Asset Sale* includes news items that record both sales of assets and divestitures in subsidiaries or divisions in order to retire debt. *Merger* is an indicator that denotes whether a given company merged or was taken over during 1998-2000. *Liquidation* is an indicator that denotes whether a given company was liquidated during 1998-2000. *Do nothing* indicate firms that did not undertake any visible form of financial restructuring during the period analyzed. *Mkt. capitalization ($, million)* is the company's equity market capitalization as of December 31, 1997 measured in millions of US$. *Total assets ($, million)* is the book value of the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment, and other assets. *Mkt. value/ book ratio* is the ratio of the market value of equity (ordinary and preferred) plus book value of total debt over the book value of total assets. The latter is defined as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment, and other assets. *Leverage* is defined as the ratio of total debt to the sum of book value of equity plus book value of debt. *Return on Assets* (ROA) is calculated as annual earnings before interest and taxes (EBIT) divided by year-end total assets (%). *Return on Equity* (ROE) is calculated as net income available to shareholders divided by year-end book value of shareholder equity (%). *Largest block-holder concentration* is defined as the percentage holdings of the largest shareholder. *Group-affiliation* is a dummy variable that indicates whether the company is part of a major business group. This variable comes from Claessens, Djankov and Lang (2000).

Panel A: Comparison by country

	All countries	Indonesia	Malaysia	Philippines	South Korea	Thailand
Sample inclusion criteria						
Number of firms in Worldscope	1,305	154	445	114	313	279
Number of firms passing Claessens et al (2002) screen	869	137	215	110	274	133
Number of firms after the elimination of financial companies	**651**	**104**	**159**	**70**	**225**	**93**
Response under distress						
Workout	119	20	17	10	43	29
Asset sale	80	3	26	8	34	9
Merger	68	4	15	12	32	5
Liquidation	26	2	0	0	23	1
Financial Statistics						
Mkt. capitalization ($, million)	258.36	286.08	507.62	231.46	135.06	119.72
Total assets ($, million)	853.72	497.21	718.88	422.05	1,425.33	424.87
Mkt. Value/ Book Ratio (mean)	1.19	1.08	1.51	0.97	1.11	1.10
Mkt. Value/ Book Ratio (median)	1.02	0.89	1.05	0.82	1.07	0.97
Leverage	0.68	0.66	0.56	0.47	0.82	0.73
Return on assets	0.71	1.46	4.64	3.59	1.49	-10.88
Return on equity	-16.05	-9.43	0.37	2.61	-24.61	-44.89
Ownership Structure						
Group affiliation (percentage)	59.45	69.23	59.12	74.29	54.22	50.54
Largest block-holder concentration	26.09	34.76	28.36	24.21	17.77	34.02

Panel B: Comparison by response type

Response	No. of firms	Total Assets	Mkt. Value/ Book Ratio		Leverage		Return on assets		Return on equity		Largest block-holder concentration		Group affiliation
		Mean	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Percentage
Workout	119	1,535.71	1.11	1.02	0.85	0.84	-6.02	-0.37	-42.85	-15.25	25.16	29.85	67.23
Asset sale	80	2,708.42	1.07	1.07	0.78	0.82	-0.44	3.41	-14.82	-1.55	20.92	20.00	66.25
Merger	68	1,182.50	1.11	1.06	0.77	0.83	-0.39	2.08	-19.68	-7.96	22.42	20.00	64.70
Liquidation	26	1,864.42	1.07	1.03	0.90	0.94	-1.14	0.18	-73.35	-41.68	15.57	10.00	50.00
Do nothing	423	474.15	1.24	1.00	0.61	0.61	2.74	4.31	-6.87	4.07	27.50	30.00	57.21

Table 4—Classification of responses by firms. The responses are recorded under the following four (financial) alternatives available to corporate managers for dealing with distress: (1) financial (or debt) restructurings, (2) asset sales, (3) mergers and (4) liquidations. *Workout* is an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm (for both public and private loan agreements). *Asset Sale* includes news items that record both sales of assets and divestitures in subsidiaries or divisions in order to retire debt. *Merger* is an indicator that denotes whether a given company merged or was taken over during 1998-2000. *Liquidation* is an indicator that denotes whether a given company was liquidated during 1998-2000. The data sources for all variables are given in the text. In Panel A, the diagonal numbers denote single responses by firms, while off-diagonal numbers denote two responses by firms. Panel B lists the distribution of responses for firms that record three responses. No firm in our sample has recorded four responses.

Panel A: One or two responses by firms

	Workout	Asset sale	Merger	Liquidation
Workout	74			
Asset sale	23	40		
Merger	13	12	36	
Liquidation	2	0	1	20
Total	119	80	68	26

Panel B: Three responses by firms

Response	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Total
Workout	1	1	1	1	1	1	1	7
Asset sale	1	1	1	1	1	0	0	5
Merger	1	1	1	1	0	1	1	6
Liquidation	0	0	0	0	1	1	1	3

Table 5—Pair-wise correlations for exogenous variables. *Leverage* is defined as the ratio of total debt to the sum of book value of equity plus book value of debt. *[(Interest Expense – EBITDA)/ Interest Expense]* is computed as the ratio of the difference between interest expense on debt and EBITDA over the interest expense on debt. Interest expense on debt represents the service charge for the use of capital. EBITDA is defined as earnings of a company before interest expense, income taxes, depreciation and amortization. *Mkt. value/ book ratio* is the ratio of the market value of equity (ordinary and preferred) plus book value of total debt over the book value of total assets. The latter is defined as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment, and other assets. *Collateral* is calculated as the ratio of property, plant and equipment to total assets. *Log (mkcapUS$)* is the log of the company's equity market capitalization as of December 31, 1997 measured in thousands of US$. *Return on Equity* (ROE) is calculated as net income available to shareholders divided by year-end book value of shareholder equity (%). *Sales/TA*, also the asset-turnover ratio, is measured as the total sales divided by total assets. *Group* is a dummy variable that indicates whether the company is part of a major business group. This variable comes from Claessens, Djankov and Lang (2000). *Largest block-holder concentration* is defined as the percentage holdings of the largest shareholder. *Industry Median MB Ratio* and *Industry Median Leverage* are industry-level financial variables where a firm's industry is defined based on its primary two-digit SIC code (across countries). *Political connection* is a dummy variable that takes the value of 1 if at least one of the company's top directors (CEO, president, vice-president, or secretary) or large shareholders (any blockholder controlling at least 10% of votes) is a member of parliament, or a minister, or is closely related to a top politician or party, and 0 otherwise.

	Leverage	[(Int. Expense – EBITDA)/ Int. Expense]	Mkt. Value/ Book Ratio	Collateral	Log (Mkt. Cap) (US$)	Return on Equity	Sales/ TA	Group	Largest block-holder concen.	Industry Median MB Ratio	Industry Median Leverage
[(Int. Expense – EBITDA)/ Int. Expense]	0.029										
Mkt. Value/ Book Ratio	0.124	-0.161									
Collateral	-0.044	-0.060	-0.079								
Log (Mkt. Cap) in USD	-0.178	-0.063	0.339	0.127							
Return on Equity	-0.506	-0.047	0.006	-0.041	0.219						
Sales/TA	0.073	-0.073	0.141	-0.231	-0.037	0.050					
Group	-0.006	0.021	-0.018	-0.071	0.119	0.058	0.025				
Largest block-holder concentration	-0.131	-0.028	0.104	0.072	0.121	0.027	0.069	0.071			
Industry Median MB Ratio	-0.014	-0.082	0.364	-0.105	0.238	0.072	0.116	0.081	0.108		
Industry Median Leverage	0.284	-0.117	-0.102	-0.130	-0.116	-0.077	0.149	-0.001	-0.065	-0.058	
Politically connected	-0.018	-0.020	0.103	-0.076	0.207	0.033	-0.073	0.127	0.080	0.126	-0.086

Table 6—Determinants of Workouts: Results of independent probit regressions used to predict firm debt workouts. Dependent variable is an indicator equal to 1 if a company undertook a debt workout during 1998-2000, and zero otherwise. Workout is an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm (for both public and private loan agreements). *Family* takes the value of one if the largest shareholder of the company under consideration is a family or a privately held firm. *Government* denotes instances in which the largest shareholder is a national government, a local authority, or a government agency. *Bank in Group* takes the value of one if the group includes at least one bank. The definitions of the other regressors are the same as in Tables 5. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.538***	0.445***	0.562***	0.456***	0.534***	0.442***
	(0.056)	(0.128)	(0.059)	(0.145)	(0.046)	(0.121)
[(Int. Expense – EBITDA) / Int. Expense]	-0.0000236	-0.000036	-0.0000219	-0.0000349	-0.0000229	-0.0000357
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.185***	-0.142***	-0.195***	-0.149***	-0.186***	-0.144***
	(0.023)	(0.049)	(0.024)	(0.055)	(0.024)	(0.047)
Collateral	0.007	-0.034	-0.011	-0.053	-0.000451	-0.047
	(0.083)	(0.086)	(0.082)	(0.085)	(0.092)	(0.095)
Log (Mkt. capital) in USD	0.090***	0.078*	0.096***	0.083*	0.094***	0.083*
	(0.033)	(0.044)	(0.036)	(0.048)	(0.035)	(0.046)
Return on Equity	-0.0000796		-0.0000359		-0.0000667	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.116**		-0.114**		-0.115**
		(0.057)		(0.054)		(0.057)
Group	0.039	0.045				
	(0.032)	(0.036)				
Largest block-holder concentration			0.001**	0.001		
			(0.001)	(0.001)		
Bank in Group					-0.021	-0.013
					(0.055)	(0.057)
Family					0.007	0.004
					(0.036)	(0.034)
Government					-0.002	-0.016
					(0.054)	(0.048)
Politically connected	0.061	0.036	0.061	0.039	0.066	0.042
	(0.066)	(0.058)	(0.057)	(0.049)	(0.059)	(0.052)
Industry Median MB Ratio	-0.139	-0.108	-0.121	-0.093	-0.131	-0.098
	(0.103)	(0.081)	(0.105)	(0.080)	(0.111)	(0.085)
Industry Median Leverage	-0.142*	-0.028	-0.143*	-0.024	-0.136	-0.022
	(0.086)	(0.131)	(0.080)	(0.126)	(0.086)	(0.122)
Observations	549	560	549	560	549	560
Pseudo R-squared	0.13	0.12	0.12	0.12	0.12	0.12

Table 7—Determinants of Asset Sales: Results of independent probit regressions used to predict firm asset sales. Dependent variable is an indicator equal to 1 if a company undertook an asset sale during 1998-2000, and zero otherwise. Asset Sale includes news items that record both sales of assets and divestitures in subsidiaries or divisions in order to retire debt. Data on asset sales comes from two sources: (1) we look at whether any information concerning sales of assets was reported in the *Troubled Company Reporter*, and (2) we integrate this data with the information contained in *SDC Platinum*™, which reports information on the divestitures of subsidiaries. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.374***	0.300***	0.319***	0.262***	0.374***	0.302***
	(0.054)	(0.054)	(0.053)	(0.055)	(0.052)	(0.046)
[(Int. Expense – EBITDA) / Int. Expense]	-0.000003	-0.000005	-0.000004	-0.000004	0.000001	-0.000003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.156***	-0.168***	-0.143***	-0.155***	-0.156***	-0.167***
	(0.046)	(0.043)	(0.044)	(0.042)	(0.045)	(0.042)
Collateral	-0.086	-0.080	-0.068	-0.058	-0.068	-0.066
	(0.053)	(0.059)	(0.048)	(0.059)	(0.052)	(0.055)
Log (Mkt. capital) in USD	0.132***	0.137***	0.129***	0.132***	0.126***	0.130***
	(0.031)	(0.027)	(0.030)	(0.026)	(0.025)	(0.022)
Return on Equity	0.0002908		0.0001989		0.0002747*	
	(0.000)		(0.000)		(0.000)	
Sales/TA		0.009		0.010		0.005
		(0.012)		(0.014)		(0.012)
Group	-0.007	-0.006				
	(0.072)	(0.070)				
Largest block-holder concentration			-0.003***	-0.003***		
			(0.001)	(0.001)		
Bank in Group					-0.002	-0.002
					(0.044)	(0.043)
Family					-0.005	-0.004
					(0.039)	(0.039)
Government					0.096**	0.085**
					(0.039)	(0.037)
Politically connected	0.026	0.025	0.033	0.034	0.032	0.030
	(0.045)	(0.042)	(0.044)	(0.041)	(0.040)	(0.038)
Industry Median MB Ratio	-0.034	-0.019	-0.022	-0.009	-0.033	-0.015
	(0.034)	(0.032)	(0.047)	(0.045)	(0.039)	(0.033)
Industry Median Leverage	-0.044	-0.012	-0.026	-0.003	-0.043	-0.006
	(0.137)	(0.124)	(0.125)	(0.112)	(0.129)	(0.114)
Observations	549	560	549	560	549	560
Pseudo R-squared	0.17	0.16	0.18	0.18	0.18	0.17

Table 8—Determinants of Mergers: Results of independent probit regressions used to predict merger of firms. Dependent variable is an indicator equal to 1 if a company was taken over or undertook a merger with another firm during 1998-2000, and zero otherwise. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.174*	0.143*	0.142*	0.118	0.182**	0.150*
	(0.090)	(0.081)	(0.082)	(0.073)	(0.089)	(0.084)
[(Int. Expense – EBITDA) /Int. Expense]	0.000023***	0.000019**	0.000023**	0.000019**	0.000023***	0.000019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.055***	-0.060***	-0.049***	-0.054***	-0.058***	-0.063***
	(0.010)	(0.010)	(0.007)	(0.008)	(0.008)	(0.009)
Collateral	0.173***	0.161**	0.181***	0.173**	0.167**	0.153**
	(0.066)	(0.069)	(0.067)	(0.069)	(0.065)	(0.070)
Log (Mkt. capital) in USD	0.022	0.026	0.022	0.026	0.023	0.027
	(0.026)	(0.027)	(0.025)	(0.025)	(0.030)	(0.031)
Return on Equity	0.0001658		0.0001315		0.0001855**	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.007		-0.003		-0.006
		(0.008)		(0.009)		(0.008)
Group	0.021	0.024				
	(0.022)	(0.020)				
Largest block-holder concentration			-0.002***	-0.002***		
			(0.000)	(0.000)		
Bank in Group					0.026	0.029**
					(0.017)	(0.015)
Family					-0.006	-0.008
					(0.034)	(0.033)
Government					0.055*	0.049*
					(0.031)	(0.028)
Politically connected	0.008	0.003	0.022	0.019	0.014	0.011
	(0.022)	(0.024)	(0.023)	(0.025)	(0.026)	(0.030)
Industry Median MB Ratio	0.044	0.050	0.057	0.062	0.054	0.061
	(0.058)	(0.064)	(0.054)	(0.060)	(0.063)	(0.068)
Industry Median Leverage	0.192	0.207	0.195	0.202	0.185	0.199
	(0.160)	(0.148)	(0.157)	(0.146)	(0.163)	(0.153)
Observations	549	560	549	560	549	560
Pseudo R-squared	0.06	0.06	0.07	0.07	0.06	0.06

Table 9—Determinants of Liquidations: Results of independent probit regressions used to predict liquidations of firms. Dependent variable is an indicator equal to 1 if a company was liquidated during 1998-2000, and zero otherwise. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.064**	0.059	0.023**	0.025	0.060*	0.056
	(0.032)	(0.039)	(0.012)	(0.018)	(0.033)	(0.039)
[(Int. Expense – EBITDA) /Int. Expense]	-0.0000621	-0.0000421	-.0000282	-0.000022	-0.0000464	-0.0000263
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.030	-0.033	-0.016*	-0.017	-0.028	-0.032
	(0.022)	(0.021)	(0.008)	(0.010)	(0.021)	(0.021)
Collateral	-0.057	-0.053	-0.021	-0.020	-0.055	-0.052
	(0.040)	(0.041)	(0.015)	(0.018)	(0.042)	(0.044)
Log (Mkt. capital) in USD	-0.004**	-0.003***	-0.003***	-0.002***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Return on Equity	-0.0000126		-0.0000139		-0.0000129	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.003		-0.001		-0.003
		(0.008)		(0.003)		(0.007)
Group	-0.007	-0.007				
	(0.006)	(0.006)				
Largest block-holder concentration			-0.001*	-0.001*		
			(0.000)	(0.000)		
Bank in Group					0.001	0.002
					(0.005)	(0.004)
Family					0.005	0.007
					(0.005)	(0.006)
Government					0.016*	0.016
					(0.008)	(0.010)
Politically connected	-0.009***	-0.009**	-0.003*	-0.003	-0.010**	-0.010**
	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)	(0.005)
Industry Median MB Ratio	-0.002	0.007	-0.002	0.001	-0.008	0.003
	(0.014)	(0.006)	(0.010)	(0.007)	(0.020)	(0.010)
Industry Median Leverage	-0.049	-0.039	-0.021	-0.021	-0.050	-0.041
	(0.037)	(0.037)	(0.015)	(0.019)	(0.041)	(0.042)
Observations	549	560	549	560	549	560
Pseudo R-squared	0.20	0.19	0.28	0.26	0.20	0.19

Table 10—Multivariate probit regressions: The sample includes 559 companies with available data. The dependent variable is a vector of responses, where each element of the vector is an indicator variable of responses that takes the value 1 if the firms selects that response in distress. The four responses are as follows: (1) *Workout* is an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm (for both public and private loan agreements); (2) *Asset Sale* includes news items that record both sales of assets and divestitures in subsidiaries or divisions in order to retire debt; (3) *Merger* is an indicator that denotes whether a given company merged or was taken over during 1998-2000; (4) *Liquidation* is an indicator that denotes whether a given company was liquidated during 1998-2000. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the coefficients; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

Panel A. Coefficient Estimates of Multivariate Probit equations

	Workout	Asset Sale	Mergers	Liquidation
Leverage	1.859***	1.763***	0.850*	2.304***
	(0.519)	(0.333)	(0.488)	(0.830)
[(Int. Expense – EBITDA) /Int. Expense]	-0.000*	-0.000	0.000*	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Mkt. Value/ Book Ratio	-0.592***	-0.972***	-0.347***	-1.439**
	(0.215)	(0.158)	(0.070)	(0.716)
Collateral	-0.145	-0.442	0.967**	-1.993***
	(0.358)	(0.331)	(0.429)	(0.693)
Log (Mkt. capital) in USD	0.324	0.814***	0.148	-0.102
	(0.210)	(0.080)	(0.166)	(0.096)
Sales/TA	-0.504***	0.053	-0.055	-0.087
	(0.183)	(0.083)	(0.049)	(0.262)
Bank in Group	0.196	-0.033	0.142	-0.239**
	(0.176)	(0.409)	(0.128)	(0.114)
Politically connected	0.144	0.134	0.023	-0.491***
	(0.214)	(0.203)	(0.144)	(0.105)
Industry Median MB Ratio	-0.447	-0.115	0.301	0.260
	(0.316)	(0.187)	(0.370)	(0.323)
Industry Median Leverage	-0.153	-0.139	1.215	-1.484*
	(0.534)	(0.756)	(0.916)	(0.890)
Constant	-2.299*	-4.860***	-3.819***	0.071
	(1.276)	(0.925)	(0.947)	(1.282)
Number of Observations				560
Log pseudo-likelihood				-684.516

Panel B. Estimates of the covariance terms of multivariate probit equation

	(1)	(2)	(3)
(2)	0.174**		
	(0.082)		
(3)	0.132	0.168	
	(0.103)	(0.107)	
(4)	-0.108	-0.228***	0.020
	(0.128)	(0.084)	(0.103)

Likelihood ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0:
Chi2(6)= 8.38722 Prob > chi2 = 0.2111

Table 11—Independent Probit regressions: The sample includes 559 companies with available data. In regression (1), the dependent variable is an indicator equal to 1 if a company opted for a workout of liabilities, and zero otherwise. In regression (2), the dependent variable is an indicator equal to 1 if a company undertook an asset sale, and zero otherwise. In regression (3), the dependent variable is an indicator equal to 1 if a company merged with another, and zero otherwise. In regression (4), the dependent variable is an indicator equal to 1 if a company was liquidated, and zero otherwise. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the coefficients; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1) Workout	(2) Asset Sale	(3) Mergers	(4) Liquidation
Leverage	1.865***	1.789***	0.856*	2.247***
	(0.528)	(0.355)	(0.475)	(0.717)
[(Int. Expense – EBITDA) /Int. Expense]	-0.000*	-0.000	0.000*	-0.002
	(0.000)	(0.000)	(0.000)	(0.001)
Mkt. Value/ Book Ratio	-0.597***	-0.998***	-0.359***	-1.282**
	(0.215)	(0.165)	(0.073)	(0.623)
Collateral	-0.145	-0.475	0.961**	-2.021***
	(0.352)	(0.313)	(0.427)	(0.694)
Log (Mkt. capital) in USD	0.327	0.813***	0.154	-0.127
	(0.214)	(0.082)	(0.163)	(0.082)
Sales/TA	-0.485**	0.055	-0.043	-0.097
	(0.198)	(0.077)	(0.042)	(0.267)
Bank in Group	0.191	-0.035	0.149	-0.262***
	(0.177)	(0.409)	(0.123)	(0.097)
Politically connected	0.142	0.140	0.019	-0.496***
	(0.212)	(0.202)	(0.145)	(0.106)
Industry Median MB Ratio	-0.455	-0.111	0.301	0.278
	(0.324)	(0.191)	(0.373)	(0.299)
Industry Median Leverage	-0.119	-0.073	1.235	-1.508*
	(0.551)	(0.730)	(0.908)	(0.863)
Constant	-2.333*	-4.881***	-3.863***	0.094
	(1.308)	(0.892)	(0.936)	(1.248)
Number of Observations	559	559	559	559
Pseudo R-squared	0.12	0.16	0.06	0.19

Table 12—Comparison of "pre-crisis" and "post-crisis" price-to-sales multiples: The table reports average price-to-sales multiples across 30 industries (defined by their 2-digit SIC codes) for recorded transactions in SDC for "pre-crisis" period (1995-1997) and for the "post-crisis" period (1998-2000). The *price-to-sales multiple* is the ratio of the price paid for a transaction divided by the book value of sales for the given target. It is then averaged across all transactions in a given industry for each of the two sub-periods considered. The *post-crisis multiple to pre-crisis multiple ratio* for each industry is the ratio of the *price-to-sales multiple* for 1995-1997 to the *price-to-sales multiple* for 1998-2000.

Industry 2-digit SIC code	Industry average pre-crisis price-to-sales multiple	Industry average post- crisis price-to-sales multiple	post-crisis multiple to pre-crisis multiple ratio
	(1)	(2)	(1) /(2)
8	2.261	6.556	2.899
10	4.888	3.795	0.776
14	4.424	5.404	1.222
15	3.818	0.196	0.051
20	3.691	1.057	0.286
22	4.061	0.616	0.152
24	10.889	0.721	0.066
26	0.835	1.042	1.248
27	3.903	1.512	0.387
28	3.244	3.118	0.961
30	8.958	4.487	0.501
32	6.846	2.552	0.373
33	2.160	0.729	0.338
34	2.489	1.648	0.662
35	0.938	0.244	0.260
36	1.908	0.945	0.495
37	1.042	0.476	0.457
39	0.449	1.139	2.537
44	4.905	1.119	0.228
45	0.287	0.547	1.907
48	4.409	4.129	0.937
49	8.002	3.030	0.379
50	0.431	0.795	1.844
54	1.626	0.169	0.104
55	1.098	0.037	0.034
59	5.833	0.690	0.118
70	8.032	3.253	0.405
73	14.506	17.211	1.186
79	4.905	2.970	0.605
87	4.558	4.334	0.951
All industries	4.180	2.484	0.594

Table 13—Robustness checks on determinants of workouts for distressed firms only: A firm is defined to be financially distressed if during 1997-2000, the company had (any) two consecutive years with earnings before interest, taxes, depreciation and amortization (EBITDA) less than its reported interest expense or, in any one year, EBITDA was less than 80% of the firm's interest expense. Dependent variable is an indicator equal to 1 if a company undertook a debt workout during 1998-2000, and zero otherwise. Workout is defined as an agreement by the firms' creditors to modify any terms of an outstanding financial claim currently held against the firm (for both public and private loan agreements). The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.718***	0.479**	0.747***	0.488**	0.719***	0.481**
	(0.137)	(0.224)	(0.156)	(0.237)	(0.110)	(0.222)
[(Int. Expense – EBITDA) / Int. Expense]	-0.00028	-0.00015	-0.00036	-0.00016	-0.00038	-0.00017
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Mkt. Value/ Book Ratio	-0.238***	-0.166*	-0.247***	-0.172*	-0.245***	-0.173**
	(0.052)	(0.087)	(0.062)	(0.090)	(0.041)	(0.081)
Collateral	0.104	0.068	0.086	0.050	0.094	0.054
	(0.158)	(0.148)	(0.157)	(0.152)	(0.158)	(0.145)
Log (Mkt. capital) in USD	0.209***	0.201**	0.218***	0.209**	0.213***	0.207**
	(0.068)	(0.086)	(0.067)	(0.087)	(0.074)	(0.092)
Return on Equity	0.0001		0.00021		0.00016	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.061		-0.061		-0.058
		(0.043)		(0.045)		(0.045)
Group	0.046	0.054				
	(0.081)	(0.085)				
Largest block-holder concentration			0.002	0.002		
			(0.003)	(0.004)		
Bank in Group					-0.002	0.001
					(0.061)	(0.066)
Family					-0.014	-0.013
					(0.073)	(0.074)
Government					-0.036	-0.065
					(0.087)	(0.057)
Politically connected	0.035	0.020	0.027	0.016	0.040	0.026
	(0.134)	(0.129)	(0.112)	(0.106)	(0.120)	(0.117)
Industry Median MB Ratio	-0.192	-0.132	-0.169	-0.108	-0.155	-0.096
	(0.330)	(0.305)	(0.380)	(0.331)	(0.355)	(0.316)
Industry Median Leverage	-0.261	-0.082	-0.268	-0.080	-0.254	-0.073
	(0.323)	(0.393)	(0.307)	(0.388)	(0.305)	(0.375)
Observations	265	271	265	271	265	271
Pseudo R-squared	0.11	0.10	0.12	0.10	0.11	0.1

Table 14—Robustness check on determinants of asset sales for distressed firms only: A firm is defined to be financially distressed if during 1997-2000, the company had (any) two consecutive years with earnings before interest, taxes, depreciation and amortization (EBITDA) less than its reported interest expense or, in any one year, EBITDA was less than 80% of the firm's interest expense. Dependent variable is an indicator equal to 1 if a company undertook an asset sale during 1998-2000, and zero otherwise. *Asset Sale* includes news items that record both sales of assets and divestitures in subsidiaries or divisions in order to retire debt. Data on asset sales comes from two sources: (1) information concerning sales of assets reported in the *Troubled Company Reporter*, and this is integrated with (2) data from *SDC Platinum*™ which records information on the divestitures of subsidiaries. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.303**	0.200**	0.258*	0.177*	0.315**	0.220**
	(0.140)	(0.101)	(0.148)	(0.104)	(0.135)	(0.091)
[(Int. Expense – EBITDA) / Int. Expense]	-0.000025	-0.000039	-0.000025	-0.000027	-0.000002	-0.000008
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.136**	-0.136***	-0.119**	-0.124**	-0.138**	-0.134**
	(0.056)	(0.052)	(0.060)	(0.055)	(0.057)	(0.055)
Collateral	-0.017	-0.006	-0.004	0.010	0.015	0.017
	(0.063)	(0.076)	(0.071)	(0.088)	(0.071)	(0.076)
Log (Mkt. capital) in USD	0.149***	0.154***	0.142***	0.146***	0.135***	0.139***
	(0.047)	(0.045)	(0.048)	(0.045)	(0.047)	(0.045)
Return on Equity	0.00039		0.00029		0.00029	
	(0.000)		(0.000)		(0.000)	
Sales/TA		0.018*		0.016		0.011
		(0.011)		(0.014)		(0.013)
Group	-0.064	-0.063				
	(0.084)	(0.077)				
Largest block-holder concentration			-0.002*	-0.002***		
			(0.001)	(0.001)		
Bank in Group					0.018	0.015
					(0.033)	(0.030)
Family					-0.069***	-0.069***
					(0.025)	(0.027)
Government					0.064***	0.036
					(0.022)	(0.027)
Politically connected	0.025	0.025	0.034	0.037	0.035	0.035
	(0.061)	(0.058)	(0.062)	(0.061)	(0.056)	(0.054)
Industry Median MB Ratio	0.190***	0.208***	0.185***	0.204***	0.175***	0.201***
	(0.070)	(0.054)	(0.065)	(0.054)	(0.065)	(0.047)
Industry Median Leverage	0.195**	0.211**	0.195**	0.207**	0.163**	0.197***
	(0.096)	(0.090)	(0.088)	(0.084)	(0.077)	(0.068)
Observations	265	271	265	271	265	271
Pseudo R-squared	0.17	0.17	0.17	0.17	0.18	0.18

Table 15—Robustness check on determinants of mergers for distressed firms only: A firm is defined to be financially distressed if during 1997-2000, the company had (any) two consecutive years with earnings before interest, taxes, depreciation and amortization (EBITDA) less than its reported interest expense or, in any one year, EBITDA was less than 80% of the firm's interest expense. The dependent variable is an indicator equal to 1 if a company opted for a merger or was taken over, and zero otherwise. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.108	0.066	0.096	0.056	0.149	0.105
	(0.154)	(0.138)	(0.145)	(0.130)	(0.149)	(0.151)
[(Int. Expense – EBITDA) / Int. Expense]	-0.000004	-0.000018	-0.0000003	-0.000012	-0.000018	-0.00009
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.034	-0.036	-0.035	-0.038	-0.051	-0.054
	(0.033)	(0.031)	(0.027)	(0.025)	(0.037)	(0.036)
Collateral	0.294***	0.275***	0.305***	0.293***	0.271***	0.249***
	(0.083)	(0.090)	(0.085)	(0.092)	(0.085)	(0.095)
Log (Mkt. capital) in USD	0.052	0.057	0.050	0.055	0.053	0.058
	(0.057)	(0.058)	(0.058)	(0.057)	(0.066)	(0.064)
Return on Equity	0.00025**		0.00024*		0.00029**	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.008		-0.005		-0.003
		(0.021)		(0.022)		(0.023)
Group	0.012	0.020				
	(0.026)	(0.025)				
Largest block-holder concentration			-0.002***	-0.002***		
			(0.001)	(0.000)		
Bank in Group					0.089**	0.092***
					(0.036)	(0.033)
Family					-0.040	-0.045
					(0.034)	(0.033)
Government					-0.006	-0.021
					(0.023)	(0.023)
Politically connected	-0.024	-0.028	-0.012	-0.012	-0.034	-0.037
	(0.058)	(0.059)	(0.063)	(0.064)	(0.060)	(0.061)
Industry Median MB Ratio	0.190	0.197	0.197	0.205	0.220	0.231
	(0.212)	(0.235)	(0.204)	(0.224)	(0.187)	(0.202)
Industry Median Leverage	0.447**	0.466***	0.434**	0.444**	0.389**	0.402**
	(0.179)	(0.168)	(0.184)	(0.176)	(0.172)	(0.166)
Observations	265	271	265	271	265	271
Pseudo R-squared	0.09	0.09	0.10	0.09	0.11	0.11

Table 16—Robustness check on determinants of liquidations for distressed firms only: A firm is defined to be financially distressed if during 1997-2000, the company had (any) two consecutive years with earnings before interest, taxes, depreciation and amortization (EBITDA) less than its reported interest expense or, in any one year, EBITDA was less than 80% of the firm's interest expense. The dependent variable is an indicator equal to 1 if a company was liquidated, and zero otherwise. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.102	0.097	0.039	0.052	0.099	0.091
	(0.088)	(0.094)	(0.037)	(0.055)	(0.074)	(0.085)
[(Int. Expense – EBITDA) / Int. Expense]	-0. 00023	-0.00019	-0.0001	-0.00009	-0.00011	-0.00007
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.047	-0.047	-0.027	-0.033	-0.042	-0.046
	(0.050)	(0.055)	(0.032)	(0.038)	(0.044)	(0.053)
Collateral	-0.147	-0.151	-0.075	-0.084	-0.147	-0.153
	(0.118)	(0.125)	(0.064)	(0.080)	(0.125)	(0.134)
Log (Mkt. capital) in USD	-0.004	-0.005	-0.007	-0.006	-0.008	-0.008
	(0.008)	(0.008)	(0.005)	(0.005)	(0.008)	(0.008)
Return on Equity	-0. 00005		-0.000046		-0.00004	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.011		-0.004		-0.012
		(0.013)		(0.006)		(0.013)
Group	-0.032	-0.037				
	(0.033)	(0.036)				
Largest block-holder concentration			-0.002	-0.002		
			(0.001)	(0.001)		
Bank in Group					0.004	0.006
					(0.021)	(0.021)
Family					0.024	0.031
					(0.035)	(0.039)
Government					0.089***	0.090*
					(0.030)	(0.051)
Politically connected	-0.023***	-0.025**	-0.009*	-0.011	-0.028*	-0.031
	(0.009)	(0.011)	(0.005)	(0.008)	(0.016)	(0.019)
Industry Median MB Ratio	-0.007	0.025	-0.025	-0.011	-0.047	-0.009
	(0.047)	(0.029)	(0.048)	(0.031)	(0.072)	(0.049)
Industry Median Leverage	-0.121	-0.104	-0.058	-0.068	-0.145	-0.125
	(0.123)	(0.126)	(0.065)	(0.086)	(0.137)	(0.148)
Observations	265	271	265	271	265	271
Pseudo R-squared	0.18	0.16	0.29	0.26	0.19	0.17

Table 17—Determinants of Asset Sales as measured by reduction in Property Plant and Equipment. The dependent variable is a dummy that takes the value of 1 if there is drop in the book value of property, plant and equipment (gross of accumulated depreciation and amortization) that exceeds 10% of the book value of total assets in any given year. This indicator is built based on the *Worldscope* data for the period 1997-2000. The definitions of the regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	0.244**	0.200*	0.210**	0.179*	0.246**	0.193*
	(0.125)	(0.114)	(0.106)	(0.107)	(0.120)	(0.111)
[(Int. Expense – EBITDA) / Int. Expense]	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	0.005	0.019	0.002	0.016	0.005	0.019
	(0.030)	(0.040)	(0.028)	(0.037)	(0.030)	(0.038)
Collateral	-0.075	-0.079	-0.062	-0.064	-0.067	-0.074
	(0.098)	(0.085)	(0.095)	(0.081)	(0.097)	(0.086)
Log (Mkt. capital) in USD	-0.066*	-0.063	-0.064*	-0.059	-0.060	-0.055
	(0.036)	(0.042)	(0.036)	(0.040)	(0.040)	(0.047)
Return on Equity	0.000		-0.000		0.000	
	(0.000)		(0.000)		(0.000)	
Sales/TA		-0.026		-0.020		-0.028
		(0.024)		(0.021)		(0.023)
Group	0.047***	0.052***				
	(0.013)	(0.017)				
Largest block-holder concentration			-0.004**	-0.003**		
			(0.002)	(0.002)		
Bank in Group					-0.052	-0.056
					(0.041)	(0.037)
Family					0.067	0.067
					(0.068)	(0.074)
Government					0.127***	0.112***
					(0.042)	(0.032)
Politically connected	0.024	0.032	0.049**	0.057**	0.027	0.034
	(0.031)	(0.030)	(0.024)	(0.024)	(0.040)	(0.040)
Industry Median MB Ratio	0.004	-0.011	0.032	0.014	-0.007	-0.023
	(0.057)	(0.052)	(0.063)	(0.057)	(0.051)	(0.041)
Industry Median Leverage	0.190***	0.228***	0.186***	0.214***	0.190**	0.231***
	(0.069)	(0.045)	(0.067)	(0.041)	(0.080)	(0.044)
Observations	548	559	548	559	548	559
Pseudo R-squared	0.05	0.05	0.06	0.06	0.06	0.06

Table 18—Robustness check using *Return on Assets* (*ROA*) as the measure of operating performance: The sample includes 555 companies with available data. In regression (1), the dependent variable is an indicator equal to 1 if a company opted for a workout of liabilities, and zero otherwise. In regression (2), the dependent variable is an indicator equal to 1 if a company undertook an asset sale, and zero otherwise. In regression (3), the dependent variable is an indicator equal to 1 if a company merged with another, and zero otherwise. In regression (4), the dependent variable is an indicator equal to 1 if a company was liquidated, and zero otherwise. *Return on Assets* (ROA) is calculated as annual earnings before interest and taxes (EBIT) divided by year-end total assets (%). The definitions of the other regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1) Workout	(2) Asset Sale	(3) Mergers	(4) Liquidation
Leverage	0.435***	0.297***	0.159**	0.064**
	(0.097)	(0.067)	(0.080)	(0.032)
[(Int. Expense – EBITDA) /Int. Expense]	-0. 00002	-0.000008	0.000025**	-0.000003
	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.194***	-0.166***	-0.059***	-0.025*
	(0.034)	(0.047)	(0.010)	(0.015)
Collateral	0.007	-0.087	0.170***	-0.040
	(0.092)	(0.053)	(0.064)	(0.030)
Log (Mkt. capital) in USD	0.099***	0.138***	0.024	-0.005***
	(0.027)	(0.030)	(0.025)	(0.001)
Return on Assets	-0.002	-0.000	0.001	0.001***
	(0.002)	(0.001)	(0.001)	(0.000)
Group	0.044	-0.004	0.023	-0.007
	(0.029)	(0.069)	(0.022)	(0.004)
Politically connected	0.054	0.024	0.009	-0.005***
	(0.048)	(0.043)	(0.024)	(0.001)
Industry Median MB Ratio	-0.090	-0.016	0.049	0.002
	(0.116)	(0.032)	(0.064)	(0.007)
Industry Median Leverage	-0.074	-0.003	0.201	-0.042
	(0.106)	(0.125)	(0.147)	(0.034)
Number of Observations	555	555	555	555
Pseudo R-squared	0.12	0.16	0.06	0.22

Table 19—Robustness check using *Industry Adjusted EBITDA/TA* as the measure of operating performance: The sample includes 559 companies with available data. In regression (1), the dependent variable is an indicator equal to 1 if a company opted for a workout of liabilities, and zero otherwise. In regression (2), the dependent variable is an indicator equal to 1 if a company undertook an asset sale, and zero otherwise. In regression (3), the dependent variable is an indicator equal to 1 if a company merged with another, and zero otherwise. In regression (4), the dependent variable is an indicator equal to 1 if a company was liquidated, and zero otherwise. *Industry Adjusted EBITDA/Assets* ratio is defined as the ratio of the earnings of a company before interest expense, income taxes, depreciation and amortization (EBITDA), to the book value of total assets. The ratio is netted out of its industry median (evaluated across countries), where a firm's industry is given by its primary two-digit SIC code. The definitions of the other regressors are the same as in Tables 5 and 6. Robust standard errors, corrected for country-level clustering, are reported in parentheses below the marginal effects; ***, **, * indicate significance at 1-, 5- and 10-percent levels, respectively.

	(1) Workout	(2) Asset Sale	(3) Mergers	(4) Liquidation
Leverage	0.537***	0.341***	0.145	0.064*
	(0.101)	(0.040)	(0.110)	(0.036)
[(Int. Expense – EBITDA) /Int. Expense]	0. 000012	0.000007	0. 00002**	-0.000001
	(0.000)	(0.000)	(0.000)	(0.000)
Mkt. Value/ Book Ratio	-0.156***	-0.157***	-0.061***	-0.020
	(0.044)	(0.046)	(0.010)	(0.015)
Collateral	-0.0001	-0.091*	0.165**	-0.046
	(0.087)	(0.051)	(0.068)	(0.034)
Log (Mkt. capital) in USD	0.084**	0.132***	0.026	-0.003
	(0.037)	(0.029)	(0.026)	(0.002)
Industry Adjusted EBITDA/TA	0.209*	0.135*	0.002	0.051***
	(0.125)	(0.074)	(0.096)	(0.013)
Group	0.043	-0.006	0.024	-0.006
	(0.038)	(0.072)	(0.020)	(0.004)
Politically connected	0.065	0.029	0.005	-0.006***
	(0.071)	(0.044)	(0.025)	(0.002)
Industry Median MB Ratio	-0.142	-0.014	0.050	-0.000
	(0.091)	(0.031)	(0.064)	(0.009)
Industry Median Leverage	-0.124	-0.032	0.202	-0.045
	(0.105)	(0.126)	(0.161)	(0.038)
Number of Observations	559	559	559	559
Pseudo R-squared	0.11	0.16	0.06	0.22

Appendix: Examples of news articles from the Internet Bankruptcy Library's web site

Examples of liquidations

ANAM ELECTRONICS: Applied for liquidation

(TCR: Monday, March 22, 1999, Vol. 2, No. 56)

According to the Korean language Maeil Kyungje's Business Brief section, the Anam Electronics Company applied for liquidation. Earlier newspaper reports mentioned that the Anam Electronics company's workout program was terminated on March 17th, 1999 when the main creditor of the electronics maker, Seoul Guarantee Insurance Company, refused to continue the company's workout program on the grounds of weak company performance.

CHONGGU CORP: To Seek Court Receivership

(TCR: Thursday, May 7, 1998, Vol. 1, No. 54)

A leading South Korean construction company, Chonggu Corp., which filed for court protection to reschedule its debts repayment, said Wednesday that it would instead seek court receivership within the week, sources at Chonggu and the Taegu District Court said. Under Korean bankruptcy law, a company loses managerial rights under court receivership and is liquidated. But under court protection, it can restructure, while retaining managerial control. The home-building firm would file for liquidation and court receivership Friday, on the recommendation of the court, the sources added. Chonggu's new direction comes on the heels of two big retailers, New Core and Midopa, being turned down for court protection for debt rescheduling by the courts. Judge Park Tae-ho of the Taegu court said that he had advised Chonggu Group chairman to file for liquidation because most of the conglomerate's

affiliates had shown little sign of viability and had complicated debt problems. Three Chonggu affiliates, including the Bluehill Department Store, are likely to follow in the steps of its parent company. (Asia Pulse 06-May-1998)

PT DHARMALA SAKTI SEJAHTERA: Court keeps bankruptcy status

(TCR: Monday, August 7, 2000, Vol. 3, No. 152)

The Supreme Court has rejected PT Dharmala Sakti Sejahtera's appeal to revoke the company's bankruptcy status, according to court documents. The Supreme Court said there were no legal defects to the original bankruptcy ruling issued by the Jakarta Commercial Court. "The appeal cannot be sustained. We do not see that the Jakarta Commercial Court misapplying the bankruptcy law in its ruling against the company," the Supreme Court said. Dharmala Sakti was declared bankrupt in early June after the majority of its creditors voted to reject the company's debt restructuring proposal. In its appeal the company claimed that the Jakarta Commercial Court had permitted a creditor vote "prematurely," and that two creditors acted in bad faith by influenced other creditors to vote against the debt restructuring proposal. Dharmala Sakti is now under court-supervised liquidation. (AFX News Limited 03- Aug-2000)

Examples of asset sales

AMSTEEL CORP BHD, LION GROUP: Finalizing restructuring scheme

(TCR: Tuesday, June 27, 2000, Vol. 3, No. 124)

The group's main problem appears to be Amsteel Corp Bhd, which has lots of other businesses, some unprofitable. Amsteel has incurred loans of nearly RM8.5bil which made up the bulk of the RM10.5bil in debts that the Lion group has. Major asset sales, expected

to be spread over five years, would involve the potential divestment of: Shopping complexes such as the Subang Parade and Klang Parade in Selangor and the Mahkota Parade in Malacca; Asia Commercial Finance Bhd; A large stake in Malaysia British Assurance Bhd. and Klang-based Amsteel Securities Sdn Bhd. One major transaction already completed has been the sale of a 50% stake in Inverfin Sdn Bhd, owner of Menara Lion, in a deal valued at RM200mil. Inverfin is 70% owned by Amsteel and the deal resulted in a net cash inflow of RM55.53mil. The group was supposed to have made an announcement on their restructuring in April but had to defer it because some issues had to be thrashed out with more than 100 creditors. (The Star Online 24-Jun-2000)

SAN MIGUEL: Sells stake in drinks business

(TCR: Thursday, July 16, 1998, Vol. 1, No. 102)

RP-Business News cites an Agence France-Presse article that Philippine food-and-beverage giant San Miguel Corp. has sold its 47-percent stake in a British soft drink bottling business spun off by Coca-Cola Amatil Ltd. (CCA) of Australia. The sale in London fetched 339.6 million pounds (555 million dollars), it said. San Miguel is the second largest shareholder of CCA with 25 percent, the result of a 2.7-billion-dollar stock swap agreement last year to create the largest Coca-Cola bottling group outside the United States. The company invested more than 400 million dollars on a string of breweries and packaging plants in Hong Kong, China, Vietnam and Indonesia which went sour amid the Asian financial crisis.

DAEWOO TELECOM: Sells off IT division

(TCR: Thursday, October 12, 2000, Vol. 3, No. 199)

Daewoo Telecom announced Tuesday it signed a formal contract to sell off its IT operations to Mercury Telecom, a multinational holding firm. Daewoo's IT operations will launch as Mercury Telecom beginning from November 1 as the special shareholders' meeting of the Korean firm, planned on October 25, is expected to endorse the deal. Daewoo Telecom precedes all 12 Daewoo business group subsidiaries undergoing workouts in the sell-off bid. The selling price of the IT operations ranges from W330 billion to W370 billion, depending on performance this year and next, according to Daewoo Telecom. Mercury Telecom has been set up as a consortium, led by CVC, an investment arm of Citigroup of the United States. (Digital Chosun 10-Oct-2000)

Examples of workouts

PT MEDCO ENERGI CORP.: Gets creditor approval of rehab

(TCR: Monday, November 6, 2000, Vol. 3, No. 216)

PT Medco Energi Corp. (JSX:MEDC) said part of its debts would be converted into shares and the rest would be settled with a rollover of 8 years. A company spokesman said the decision was made in a meeting last week attended by its creditors representing 92% of its total loan. The spokesman said the creditors gave commitment to support the restructuring program of the oil and gas contractor. In an earlier meeting, Medco succeeded in securing agreement from the majority of 52% of the creditors to restructure its US$ 250 million debts. (Asia Pulse 22-Oct-1999)

REPUBLIC CEMENT CORP.: P6.5B loan deal with Blue Circle

(TCR: Monday, August 28, 2000, Vol. 3, No. 167)

Republic Cement Corp. (RCC) will borrow P6.5 billion from Blue Circle Philippines

Inc. (BCPI) for its capital expenditure requirements and debt servicing. As of end-1999, RCC total borrowings were pegged at P2.433 billion. It ended the year with a net loss of P383.70 million. BCPI owns P495.8-million shares in RCC. The shares represent a 34-percent stake. It is a unit of London-based Blue Circle Industries Plc. "The board of directors unanimously approved the availment by the corporation of a loan from BCPI up to the maximum principal amount of P6.5 billion and under such terms and conditions as may be agreed upon with BCPI. Part of the loan proceeds shall be used by the corporation to prepay its outstanding loans with various creditors," RCC senior vice president for finance Renato C. Sunico said in a disclosure to the Philippine Stock Exchange. (The Manila Times 26-Aug-2000)

ACESITE HOTEL CORP.: Foreign firm in debt bailout

(TCR: Friday, November 24, 2000, Vol. 3, No. 229)

A British Virgin Island company will bail out the owners of local hotel operator Acesite (Phils.) Hotel Corp. (APHC) from debts owed to a local bank through the acquisition of 75% stake in the listed firm's majority shareholder. APHC president Francis Lam said the South Port Development Ltd. will acquire Acesite (BVI) Ltd. which owns majority interest in APHC, operator of the Holiday Inn Manila for 1.66 billion Philippine pesos ($33.50 million at PhP49.554=$1). The sale will avoid the foreclosure of shares in Acesite Limited and APHC by Equitable PCI Bank. The said shares were used as collateral by Acesite Limited owners Evallon Investment Ltd. and Sino-i.com Ltd. to secure a $2-million loan from the local bank. South Port is currently engaged in the leisure business in the People's Republic of China and Australia. Mr. Lam said the foreign firm is expected to

bring new marketing and business opportunities to APHC. "This constitutes a positive contributing factor to the enhancement of the corporation's future operations and financial position," he said. (Business World 22-Nov-2000)

CHAPTER V

CONCLUSION

A widely accepted feature of financial markets across the world is that there are limits to access credit. While this problem is extremely acute at times of economic crisis and recession, it is also prevalent at times of robust economic growth. When investment opportunities in an economy are strong, outside banks seek to enter the markets in search of higher profits. Presumably, removal of regulatory barriers that facilitates the entry of foreign banks should increase access to credit for local firms. However, opinion is divided as to whether this actually occurs in practice.

On the other hand, when firms are faced with economy-wide crisis, liquidity constraints are fairly acute. In such circumstances, perfect capital markets would require that scarce capital be allocated to its highest marginal return making wealth distribution irrelevant. Here too, previous work suggests that the functional efficiency of capital markets depends on the distribution of corporate control in an economy.

The first two essays are aimed to gain a better understanding of the first problem, primarily from a theoretical standpoint, while the third essay is an empirical study of issues that govern the second problem. The first two essays show that asymmetric information between incumbents and entrant banks can work as an endogenous barrier to entry. Moreover, entrant banks find it easier to secure markets with better borrower quality but have to engage in costly screening where firm quality is poor, as is the case for the small-firm market. The third essay finds that, contrary to popular belief, the distribution of corporate control mattered little in the resolution of financial distress

for firms that were affected by the crisis in East Asia. Our empirical results conclude that financial considerations were predominant in the resolving firm-specific distress.

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