A walk down Lombard Street : essays on banking

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Chapter 4

Credit Standards, Information, and Competition

Banks are often criticized for overly lax credit standards. It appears that banks are sometimes aware of the low quality of individual borrowers but choose to extend credit anyway. This paper suggests a novel rationale for banks' lax credit standards. Typical firm projects are long-term, while financing is short-term, so intermediate refinancing is required. Initial credit standards determine the degree of asymmetric information at the refinancing stage. Stringent standards lead to low asymmetric information and intense price competition ("poaching" of good borrowers). Lax standards lead to high asymmetric information, and allow informed banks to collect higher relationship rents. Such banks may moreover "unload" bad credit onto competitors, minimizing its cost.[1]

4.1 Introduction

Banks are known to on occasions employ lax credit standards – extend credit to low quality borrowers. The literature has highlighted a number of possible explanations, such as reputation concerns that create incentives for evergreening (Rajan, 1994), or low benefits of screening when average firm quality is high (Ruckes, 2004). Yet there is evidence of lax credit standards even when screening costs seem much lower than ultimate default losses. Moreover, banks sometimes appear to initiate lending even when they are fully aware of borrowers' low quality. For example, in the case of Parmalat, it has been

[1] Joint work with Enrico Perotti.

claimed that many "insider" banks were aware of the irregularities for a long time, but continued to lend anyway.

This paper suggests a novel rationale for lax bank credit standards. We suggest that extending some credit to "bad" firms increases asymmetric information between the informed bank and possible competitors at the refinancing stage. This limits credit market competition and allows the inside bank to collect higher relationship rents on good firms.

The intuition is that, when a bank is known to employ most stringent credit standards, competitors infer that firms in the bank's portfolio are mostly high-quality, and can easily "poach" them next time firms require refinancing. Relaxing credit standards and adding some bad firms to the portfolio exposes competitors to the winner's curse. Lower competition and higher return on good firms can more than compensate the informed bank for some bad credit. Moreover, under certain conditions (modelled as the possibility of liquidity shocks), the informed bank can unload bad credit onto competitors, escaping its costs.

We capture these effects with a simple model. Penniless firms can be of two types – creditworthy or not. They require financing for a long-term project, while the only available source of funding is short-term debt. This creates the need for intermediate refinancing. Banks are also of two types. A single "inside" bank has information on firms' quality (e.g. due to prior business). It competes with multiple uninformed "outside" banks at two dates – initial funding and refinancing. Outside banks can reveal the firms' type by screening at a cost, or can lend without screening if they believe that average firm quality is high.

Outsiders can assess the average quality of firms financed by the inside bank by observing the volume of lending (the mass of good firms in public knowledge). When the inside bank provides initial financing only to good firms, outsiders infer the high quality of its credit portfolio, and there is intense price competition ("poaching") that eats away insider's relationship rents. Yet if the insider finances also some bad firms, this exposes outside banks to the winner's curse. At first, the effect of reduced competition is strong enough for extra relationship rents on good credit to compensate the inside bank for losses on bad credit. However when credit standards become very lax, outsiders may start screening at the refinancing stage. This reduces the informational advantage of the inside bank, and limits the degree to which bad credit can increase relationship rents. The possibility of screening assures an internal optimum of the inside bank's credit standards decision.

In an extension, we consider the case where the inside bank is subject to liquidity shocks at the refinancing stage. A liquidity shock prevents any lending – to a good firm or to a bad one. When some good firms are rejected by the inside bank at the refinancing stage, outsiders can choose to offer them credit. If they do so without screening (when proportion of good firms among rejected is high) they also take on bad credit issued initially by the inside bank. This passes onto them the costs associated with bad credit ("unloading"), creating additional incentives for the inside bank to adopt lax credit standards.

Our analysis relates to several strands of the literature. In the heart of the paper is a model of credit market competition under asymmetric information. That was first analyzed by Sharpe (1990) and refined by von Thadden (2004). We construct a simplified version of their approach, and extend it in two ways. Firstly, we take a step back and analyze how credit market competition at the refinancing stage influences initial banks' credit standards decisions. Secondly, we study the novel effect of the possibility of unloading bad credit.

Close effects of insider manipulation in credit markets were identified in the literatures on conflict of interests in universal banking (e.g. Rajan, 1995, Puri, 1996) and loan securitization (Gorton and Pennacchi, 1995). The impact on bank liquidity shortages on lending practices was studied by Detragiache et al. (2000) among others.

The paper sheds new light on the controversial relationship between bank competition and the quality of lending. The traditional view is that high competition reduces banks' charter values and increases risk-taking incentives. Yet that line of reasoning is being challenged on theoretical (e.g. Boyd and De Nicolo, 2005) and, more importantly, empirical grounds. In particular, foreign bank entry is commonly associated with improved financial sector performance. This paper offers a possible explanation for the latter effect, suggesting that banking performance improves when new entrants bring about efficiency improvements. In particular, when outsiders can screen more effectively, that reduces the extent to which established banks can generate relationship rents through lax credit standards. As a result, credit quality in the economy increases.

The paper proceeds as follows. Section 2 sets up the model. Section 3 shows that stringent credit standards are the equilibrium in the first best. Section 4 solves the main case and shows that banks can relax credit standards in order to maximize relationship rents. Section 5 introduces liquidity shocks and the possibility of unloading bad credit. Section 6 concludes.

4.2 Setup

Projects and financing Consider a risk-neutral economy with three dates 0, 1, 2 and no discounting. There is a mass 1 of small penniless firms, each with a single investment project. Each project requires an initial investment 1 at date 0. For a mass $g < 1$ of firms, the project is good and returns $X > 1$ at date 2. For an additional mass $1 - g$ of firms, the project is bad and returns 0. Any project can be liquidated at the intermediate date 1, at residual value $L : 0 < L < 1$. A firm does not know its type.

Firms seek external financing from banks. We consider the setting where the only available type of external finance is *short-term debt.* This reflects the fact that, in practice, short-term debt is indeed the predominant source of finance used by all but the largest firms. The reasons for relying on short-term debt have been widely explored in the literature (see e.g. von Thadden, 1995). The need of intermediate refinancing is a convenient modelling feature that allows to study repeated credit market interaction without complex effects associated with retained earnings. Under short term debt, firms borrow 1 from date 0 to date 1 against promised return R_1, and then refinance R_1 by borrowing from date 1 to date 2 against promised return R_2. A firm that cannot refinance at date 1 is automatically liquidated, and proceeds L go to the original lender.

Information We consider the interaction between an informed and multiple uninformed banks in an competitive banking sector. We assume that a single "inside" bank is endowed with information on firms' types (for example, due to prior business). Multiple "outside" banks initially do not have information on individual firms' types, but can reveal it by screening before granting credit. We model screening is a binary decision (screen or not screen), which has a unit cost C, is possible at both dates 0 and 1, and for simplicity always produces a correct signal of firm quality.

We impose a number of restrictions on the cost of screening C. They assure that C is not too high, and allow to focus on the most relevant cases. We assume that:

- $C < 1 - g$: at date 0, outsiders prefer screening to uninformed finance, because its cost is lower than possible loss on lending to bad firms;
- $C < 1 - L$: at date 1, the informational advantage of insiders (when it is related to the cost of screening by outsiders) is lower than the cost of extending credit to bad firms.

Banks do not screen when indifferent.

Credit market competition Banks compete for granting credit to firms at both dates 0 and 1. We model each round of credit market competition as follows:

1. The inside bank posts an interest rate, and commits to it;
2. Outside banks post interest rates, and commit to them;
3. Firms approach the winning bank;
4. The winning bank can screen;
5. The winning bank offers or denies credit at the pre-specified interest rate;
6. If rejected, a firm can seek credit from other banks.

Assuming consequential bids allows to derive an easily tractable equilibrium in pure strategies (simultaneous-move credit market competition under asymmetric information only has a complex equilibrium in mixed strategies, see Von Thadden, 2004). Commitment to pre-specified interest rates allows to avoid undercutting after another bank has incurred the cost of screening. In a benchmark equilibrium, outsiders never undercut nor lend, but their presence caps interest rates the inside bank can offer.

Note that although the inside bank is the first to post an interest rate, that does not necessarily reveal information to outsiders (as would have been if it had to charge a higher rate to bad firms), because the insider can always reject a bad firm later. Instead, it is the credit offer/rejection decision at date 0 that provides information that outsiders can use at date 1. From the volume of lending of the inside bank, d, and the known share of good firms in the economy, g, outsiders can infer the proportion of good and bad firms in the pool financed at date 0. This knowledge reduces asymmetric information at date 1. For example, when the insider bank lends only to good firms at date 0, outside banks observe $d = g$ and there is symmetric information at date 1.

For simplicity, we assume that $R_1 \geq 1$. This can be rationalized by that, otherwise, heavily subsidized date 0 lending would affect "fly-by-night operators". We also impose that X is high enough so that lending is always possible: $X > (1 + C/g)/g$ (the latter term will be shown to be a feasible lending rate). Banks' cost of funds is 1, they maximize total profit. Other else equal, firms prefer to borrow from the inside bank.

4.3 The First Best

We start with a first best benchmark. The main friction in the model is asymmetric information over firms' types during credit market competition at date 1. Here we consider a hypothetical scenario when firm quality information is symmetric at the refinancing stage. We assume that, for some exogenous reason, all inside bank's information becomes public knowledge before date 1. We verify that in this case the inside bank chooses stringent initial credit standards.

We solve backwards. Assume that at date 0, along with a mass g of good firms, the inside bank financed a mass b of bad firms, making total lending $d = g + b$. Since firm quality is public information, no outside bank will extend credit to bad firms at date 1. The inside bank also prefers to liquidate them to recover L instead of 0 if they are allowed to continue.

Since good firms are also known, lending to them is risk-free. They can receive credit from any bank at $R_2 = R_1$. The inside bank makes no relationship rents on date 1 lending, because it does not possess private information.

The inside bank therefore makes a profit $(R_1 - 1)\, g$ on lending to good firms, and loses $(L - 1)\, b$ on lending to bad firms. The loss is minimized for $b = 0$. The inside bank therefore has no incentive to lend to bad firms at date 0. This gives the benchmark result:

Proposition 8 *When information on firm type is symmetric at the refinancing stage, initial credit standards are stringent: the inside bank lends only to good firms at date* 0.

To close the solution, we derive initial interest rate R_1 and the inside bank's profit. The maximal repayment the insider can offer without being undercut is the minimal repayment an outsider can offer without making a loss. If an outsider wins credit market competition at date 0, it has to incur the cost of screening C (this is preferred to uninformed lending since $C < 1 - g$). The cost of screening cannot be recouped later because there are no relationship rents at date 1. (For this, there are two reasons. Firstly, information at date 1 is assumed symmetric in this section. Secondly, even if it was not, the information on firms' types is shared by the inside bank, leading to Bertrand competition.) The minimal repayment the outsider can offer must cover the cost of screening all firms C by repayment from a mass g of good firms. Such repayment is $R_1 = 1 + C/g$. As explained, R_1 will remain the same also in the presence of asymmetric information, analyzed in the following sections of the paper.

The insider's profit is $\Pi_{FB} = g(R_1 - 1) = C$. This reflects the value of the insider's initial informational advantage: it does not need to screen at date 0 to establish firms' types.

4.4 Credit Standards and "Poaching"

We now solve for the main case with asymmetric information at date 1. We show that more stringent insider's credit standards at date 0 reveal more private information on firm quality that outsiders can use at date 1. This increases competition at the refinancing stage and reduces relationship rents the insider can collect. Consequently, the inside bank has incentives to adopt less than fully stringent credit standards.

We again solve backwards. We start with date 1 credit market competition, taking date 0 credit standards as given. We then return to date 0 and derive inside bank's profit-maximizing credit standards.

Refinancing stage Consider date 1. Assume that at date 0 the inside bank extended credit to a mass g of good firms and a mass b of bad firms, making total lending $d = g + b$. At date 1, those firms seek refinancing of the earlier promised repayment R_1. The maximal repayment the insider can offer without being undercut is the minimal repayment an outsider can offer without making a loss. Observe that an outsider who wins credit market competition at date 1 has two options:

1. *Finance all firms without screening.* This leads to a loss on lending to bad firms $(d - g) \cdot R_1$, which must be covered from return on loans to a mass g of good firms. (Put differently, the bank extends credit to a mass d of firms, but only a mass $g < d$ repays). The minimal possible repayment is therefore:

$$R_2^{NoScr} = \frac{d}{g} R_1$$

We verify in the end of this section that return X is high enough for good firms to be able to repay this amount.

2. *Screen and finance good firms only.* The cost of screening $d \cdot C$ must be covered from return on loans to good firms. This makes the minimal possible repayment

$$R_2^{Scr} = R_1 + \frac{d}{g} C$$

A winning outsider would prefer to finance *without screening* for $(d - g) \cdot R_1 \leq d \cdot C$, equivalent to

$$d \leq d^* = g \frac{R_1}{R_1 - C} \tag{4.1}$$

and to finance *only after screening* for $d > d^*$. Note that $d^* > g$.

The intuition is that when initial credit standards are relatively stringent and few bad firms are financed ($g < d \leq d^*$), average quality of firms that require refinancing is high. Then an outsider can refinance all of them without screening, only incurring a loss on a few bad firms. However when initial credit standards are very lax ($d > d^*$), average quality of firms that require refinancing is low. Then an outsider would only extend credit to good firms after screening all the firms.

The repayment $R_2 = R_2^{NoScr}$ for $d \leq d^*$ or $R_2 = R_2^{Scr}$ for $d > d^*$ is the maximal the inside bank can offer at date 1 without being undercut. They are the inside bank's best date 2 response to its own previous lending decision d. Overall, the inside bank makes profit $(R_2 - 1)\, g$ on lending to good firms. It liquidates bad firms by denying them credit at date 1. (Outsiders infer that those firms are bad, and do not finance them either.) The insider ends up with a loss $(L - 1)\, b$ on lending to bad firms. Its total profit as a function of earlier credit standards d is therefore $g\,(R_2 - 1) + (d - g)(L - 1)$.

Initial lending Consider now date 0. We derive the inside bank's profit depending on its credit standards decision d.

For $d \leq d^*$, the inside bank's profit is:

$$\begin{aligned}\Pi &= g\left(R_2^{NoScr} - 1\right) + (d - g)(L - 1) \\ &= g\left(\frac{d}{g}R_1 - 1\right) + (d - g)(L - 1)\end{aligned}$$

Observe that the first derivative is positive:

$$\frac{\partial \Pi}{\partial d} = R_1 + (L - 1) > 0$$

because $R_1 \geq 1$ while $(1 - L) < 1$. The inside bank has incentives to relax credit standards in order to increase relationship rents.

For $d > d^*$, the inside bank's profit is:

$$\begin{aligned}\Pi &= g\left(R_2^{Scr} - 1\right) + (d - g)(L - 1) \\ &= g\left(R_1 + \frac{d}{g}C - 1\right) + (d - g)(L - 1)\end{aligned}$$

Observe that the first derivative is now negative:

$$\frac{\partial \Pi}{\partial d} = C + (L - 1) < 0$$

because the costs of screening is assumed low enough $C < 1 - L$. (Note also that the inside banks's profit is continuous at d^* because $R_2^{NoScr}(d^*) = R_2^{Scr}(d^*)$.)

The profit is therefore non-monotonous in credit standards. It increases in d while $d \leq d^*$, but falls in d for $d > d^*$. The intuition is that when credit standards are relatively stringent, outsiders do not screen at the refinancing stage, and a marginal reduction in credit standards significantly increases the winner's curse. However when standards become too lax, outsiders choose screening as their optimal response at date 1. The possibility of screening by outsiders reduces the marginal informational advantage the inside bank gains from extending more bad credit. The inside bank's profit as a function of d is shown in Figure 1.

Therefore, the profit of the inside bank is maximized at d^* and is

$$\begin{aligned} \Pi &= \left(g \frac{R_1}{R_1 - C} R_1 - g \right) + \left(g \frac{R_1}{R_1 - C} - g \right) (L - 1) \\ &= g \frac{R_1}{R_1 - C} (R_1 + L - 1) - gL \end{aligned} \tag{4.2}$$

We can now formulate the first main result:

Proposition 9 *Bad credit allows the inside bank to maintain relationship rents on good credit.*

1. *Fully stringent credit standards are never optimal:* $\partial \Pi / \partial d_{d=0} > 0$.
2. *The opportunity to collect rents is limited by the screening capacity of outside banks. Inside bank's credit standards have an internal optimum* d^**, corresponding to the point where outside banks start screening at the refinancing stage in response to deteriorating credit quality.*

Proposition 2 identifies the source of banks' incentives to adopt lax credit standards. Lax credit standards preserve asymmetric information at the refinancing stage and allow the inside bank to collect relationship rents. However the scope for doing so is limited by outsiders' opportunity to screen when credit standards become too lax. Therefore, credit standards have an internal optimum, d^*.

To close the solution we derive R_1 and the profit of the inside bank. The maximal repayment the insider can demand at date 0 without being undercut is the minimal repayment a winning outside bank can offer at date 0 without making a loss. An outside bank that wins credit market competition at date 0 has to cover the costs of screening (there are no relationship rent at date 1 because firm type information is shared by the inside bank). The minimal repayment that covers the costs of screening is $R_1 = 1 + C/g$. Note that

$$R_2^{NoScr} = \frac{d}{g}(1 + C/g) \leq \frac{1}{g}(1 + C/g) < X$$

so that the return of good firms is sufficient to repay R_2^{NoScr} charged on lending at date 1 (and sufficient to repay R_2^{Scr} when $R_2^{Scr} < R_2^{NoScr}$).

We substitute R_1 in (4.1) to obtain

$$d^* = g\frac{1 + C/g}{1 + C/g - C}$$

and in profit (4.2) to obtain

$$\begin{aligned} \Pi &= g\frac{1 + C/g}{1 + C/g - C}(C/g + L) - gL \\ &= \frac{1 + C/g}{1 + C/g - C}C \end{aligned}$$

Observe that

$$\Pi = \frac{1 + C/g}{1 + C/g - C}C > C = \Pi_{FB}$$

The profit of the inside bank is higher when it can collect relationship rents thanks to asymmetric information, compared to the "first best" case when information was symmetric and relationship rents were impossible.

4.5 Liquidity Shocks and "Unloading"

Here we extend the analysis to study how the inside bank can unload bad credit onto uninformed competitors at the refinancing stage. This allows the inside bank to avoid the costs of bad credit, in addition to enjoying the relationship rents on good credit that it generates. To study unloading, we make one extension. We assume that the inside bank is subject to possible liquidity shocks at date 1. When the inside bank is hit by a liquidity shock, it cannot lend to any firm – good or bad.

We model liquidity shocks as firm-specific events. We assume that firms arrive for refinancing at date 1 sequentially. At the time of the arrival of each firm, a bank may be hit with a liquidity shock, each time with probability λ. In that case the bank is unable to extend credit to that particular firm. This leads to the inside bank rejecting a mass λg of good firms along with all bad firms[2].

Since the inside bank also rejects some good firms, outsiders can decide to extend credit to firms not refinanced by the inside bank. When outsiders offer refinancing without screening, they also take on the inside banks' rejected bad credit. In that case, the inside bank avoids liquidating bad credit at a cost.

A liquidity shocks can be interpreted as a genuine liquidity shortage, a need to diversify from a particular sector, or the emergence of more profitable investments opportunities. Occurrence of a shock is private information to the bank.

The last simplifying assumption we make is that the inside bank is subject to liquidity shocks only when it lends at date 0. In the out-of-equilibrium case when it is an outside bank that lends at date 0, the inside bank is able to compete fully at date 1. This simplifies the derivation of R_1 (making it the same as in the previous section), and does not affect qualitative results.

We modify restriction on X to ensure it is high enough to make lending to rejected firms always possible: $X > (\lambda g + (1-g))(1+C/g)/\lambda g$ (this will be shown to above a feasible repayment demanded from rejected firms) As before, we solve the model backwards.

Refinancing stage Assume that at date 0 the inside bank extended credit to a mass g of good firms and a mass b of bad firms, making total lending $d = g + b$. At date 1, those firms seek refinancing of the earlier promised repayment R_1. As in the previous section, the inside bank offers the maximum repayment R_2 that cannot be undercut by outsiders immediately ($R_2 = R_2^{NoScr}$ for $d \leq d^*$ or $R_2 = R_2^{Scr}$ for $d > d^*$). After that, the inside bank rejects all bad firms and also a share λ of good firms to which it cannot offer credit due to liquidity problems.

[2]The same effects can be modelled as an aggregate (not firm-specific) liquidity shock, where a bank is only able to extend volume $(1-\lambda)gR_1$ of new credit, also having to deny credit to a mass λg of good firms as a result.

As a result, outside banks are faced with a pool of rejected firms that contains a mass $g\lambda$ of good ones and $d-g$ of bad ones. There are two options in which a winning outside banks can finance these firms.

1. *Finance all remaining firms without screening.* This leads to a loss on lending to bad firms $(d-g)\cdot R_1$, which must be covered from return on loans to a mass λg of good firms. The minimal possible competitive repayment is therefore:

$$R_2^{NoScr2} = \frac{\lambda g + (d-g)}{\lambda g} R_1$$

We verify in the end of this section that return X is high enough for good firms to be able to repay this amount.

2. *Screen and finance good firms only.* The cost of screening $(\lambda g + (d-g))\cdot C$ must be covered from return on loans to good firms. This makes the minimal possible repayment

$$R_2^{Scr2} = R_1 + \frac{d-(1-\lambda)g}{\lambda g} C$$

A winning outside bank would therefore finance the remaining firms without screening for $(d-g)\cdot R_1 \leq (d-(1-\lambda)g)\cdot C$, equivalent to

$$d \leq d^{**} = g\frac{R_1-(1-\lambda)C}{R_1-C} \tag{4.3}$$

and finance only good ones after screening for $d > d^*$. Note that $g < d^{**} < d^*$ and $\partial d^{**}/\partial\lambda > 0$.

The intuition is that when initial credit standards are relatively stringent (low d) and the probability of liquidity shocks is high (high λ), the share of good firms among those rejected at date 1 is high. In this case, outsiders prefer to refinance the rejected firms without screening. However as liquidity standards become more lax, or if the probability of liquidity shocks is low, the share of good firms among those rejected at date 1 becomes low. In this case, outsiders would only extend refinancing to good firms after screening all the firms.

When outsiders screen the remaining firms, they reject bad ones. Such firms are liquidated at a cost $b(L-1)$ to the inside bank. However when outside banks refinance rejected firms without screening, they take on bad firms as well. Then the inside bank effectively "unloads" bad credit on outside competitors, enjoying profit $b(R_1-1)$ on lending to bad firms.

Initial lending We can now derive the inside bank's profit depending on its credit standards decision d.

For $d \leq d^{**}$, the inside bank's profit is:

$$\begin{aligned} \Pi &= g(1-\lambda)(R_2^{NoScr}-1)+g\lambda(R_1-1)+(d-g)(R_1-1) \\ &= g(1-\lambda)\left(\frac{d}{g}R_1-1\right)+g\lambda(R_1-1)+(d-g)(R_1-1) \end{aligned} \tag{4.4}$$

Observe that on this interval the presence of bad credit both increases relationship rents *and* has no costs to the inside bank because it is unloaded to uninformed competitors at the refinancing stage. The first derivative is therefore positive:

$$\frac{\partial \Pi}{\partial d} = (1-\lambda)R_1 + (R_1-1) > 0$$

For $d^{**} < d \leq d^{*}$, the inside bank's profit is:

$$\begin{aligned} \Pi &= g(1-\lambda)(R_2^{NoScr}-1)+g\lambda(R_1-1)+(d-g)(L-1) \\ &= g(1-\lambda)\left(\frac{d}{g}R_1-1\right)+g\lambda(R_1-1)+(d-g)(L-1) \end{aligned} \tag{4.5}$$

On this interval, bad credit increases relationship rents, but is associated with a unit cost $(L-1)$ to the inside bank, because outsiders screen and refuse refinancing to bad firms. There is a discreet fall in profits by $(d-g)(R_1-L)$ at d^{**}, as outside firms start screening and rejecting bad credit. The first derivative is:

$$\frac{\partial \Pi}{\partial d} = (1-\lambda)R_1 + (L-1)$$

The first derivative is positive for low λ (converges to $R_1 + (L-1) > 0$ for $\lambda \to 0$), as a bank is able to collect higher relationships rents on good credit. However it becomes negative for high λ (converges to $L-1$ for $\lambda \to 1$), since relationship rents fall as liquidity shocks become more frequent.

For $d > d^*$, the inside bank's profit is:

$$\begin{aligned}\Pi &= g(1-\lambda)(R_2^{Scr}-1) + g\lambda(R_1-1) + (d-g)(L-1) \\ &= g(1-\lambda)\left(R_1 + \frac{d-(1-\lambda)g}{g}C - 1\right) + g\lambda(R_1-1) + (d-g)(L-1)\end{aligned}$$

The first derivative is negative:

$$\frac{\partial \Pi}{\partial d} = (1-\lambda)C + (L-1) < 0$$

Note that the profit-maximizing credit standards d depend therefore on the probability of liquidity crises λ. On the one hand, when λ is high and liquidity shocks are likely, the profit of the inside bank is maximized at d^{**}. More lax credit standards ($d > d^{**}$) result in a loss of possibility to unload bad credit, while relationship rents are reduced by possible liquidity shocks. Yet on the other hand, when λ is low and liquidity shocks are less likely, profits are maximized in d^*, because higher relationship rents outweigh the benefits of unloading bad credit. The inside bank's profit as a function of d is shown in Figure 2.

Formally, from (4.4) and (4.5), $\Pi(d^{**}) \geq \Pi(d^*)$ when

$$\lambda \geq 1 - \frac{(d^{**}-g)(R_1-1) - (d^*-g)(L-1)}{R_1\left(d^*-d^{**}\right)}$$

Substituting from (4.1) and (4.3)

$$\begin{aligned}d^{**}-g &= g\frac{\lambda C}{R_1-C} \\ d^*-g &= g\frac{C}{R_1-C} \\ d^*-d^{**} &= g\frac{(1-\lambda)C}{R_1-C}\end{aligned}$$

We obtain:

$$\lambda \geq 1 - \frac{\lambda(R_1-1)-(L-1)}{R_1(1-\lambda)}$$

Observe that the latter inequality is always satisfied for $\lambda = 1$ (the right part tends to $-\infty$), and is never satisfied for $\lambda = 0$ ($1-(1-L)/R_1 > 0$). The threshold point is:

$$\lambda^* = \frac{3R_1 - 1 + \sqrt{5R_1^2 - 2R_1 - 4LR_1 + 1}}{2R_1} \tag{4.6}$$

The bank's optimal credit standards can be summarized in the following Lemma:

Lemma 10 *There exists a threshold value λ^* (4.6) such that $\Pi(d^{**}) = \Pi(d^*)$.*

- *For $\lambda \geq \lambda^*$ the inside bank's profit is maximized in credit standards at $d = d^{**}$: the bank foregoes additional relationship rents for the possibility of unloading bad credit.*
- *For $\lambda < \lambda^*$ the profit is maximized at $d = d^*$: the bank prefers higher rents to the possibility of unloading.*

We can now formulate the final main result:

Proposition 11 *When the inside bank is subject to liquidity shocks (and their occurrence is private information), the bank can unload bad credit onto outside competitors.*

1. *Fully stringent credit standards are never optimal: $\partial\Pi/\partial d_{d=0} > 0$.*
2. *There is a trade-off between the possibility to unload bad credit (d^{**} preferred when the probability of liquidity shocks λ is high) and higher relationship rents (d^* preferred when λ is low).*

To close solution, we derive d^*, d^{**}, and λ^*. Recall that $R_1 = 1 + C/g$ (it is the same as in the previous analysis, due to the simplifying assumption that the inside bank does not have liquidity shocks when it did not lend at date 0). Note that

$$R_2^{NoScr2} = \frac{\lambda g + (d-g)}{\lambda g}(1 + C/g) \leq \frac{\lambda g + (1-g)}{\lambda g}(1 + C/g) < X$$

so that the return of good firms is sufficient to repay R_2^{NoScr2} charged by outsiders on lending to firms rejected at date 1 (and sufficient to repay R_2^{Scr2} when $R_2^{Scr2} < R_2^{NoScr2}$).

Substituting into (4.1), (4.3) and (4.6) gives:

$$\begin{aligned}
d^* &= g\frac{1 + C/g}{1 + C/g - C} \\
d^{**} &= g\frac{1 + C/g - (1-\lambda)C}{1 + C/g - C} \\
\lambda^* &= \frac{3(1 + C/g) - 1 + \sqrt{5(1 + C/g)^2 - (2 + 4L)(1 + C/g) + 1}}{2(1 + C/g)}
\end{aligned}$$

Expressions for the inside bank's profit can be obtained by substituting d^*, d^{**}, R_1 and R_2^{NoScr} into (4.4) and (4.5).

4.6 Conclusions

This paper suggests a novel rationale for suboptimal lax bank credit standards. We show that an informed bank can extend some "bad" credit, to increase relationship rents on good credit. Moreover, the bank may be able to avoid the costs of bad credit by "unloading" it to competitors at the refinancing stage.

The results also shed light on the relationship between competition and credit standards. While the traditional view holds that competition is detrimental for the quality of lending, we demonstrate that if new competition brings about efficiency improvements (e.g. in screening technology) that can lead to improved credit standards.

Figure 1

Profit as a function of credit standards

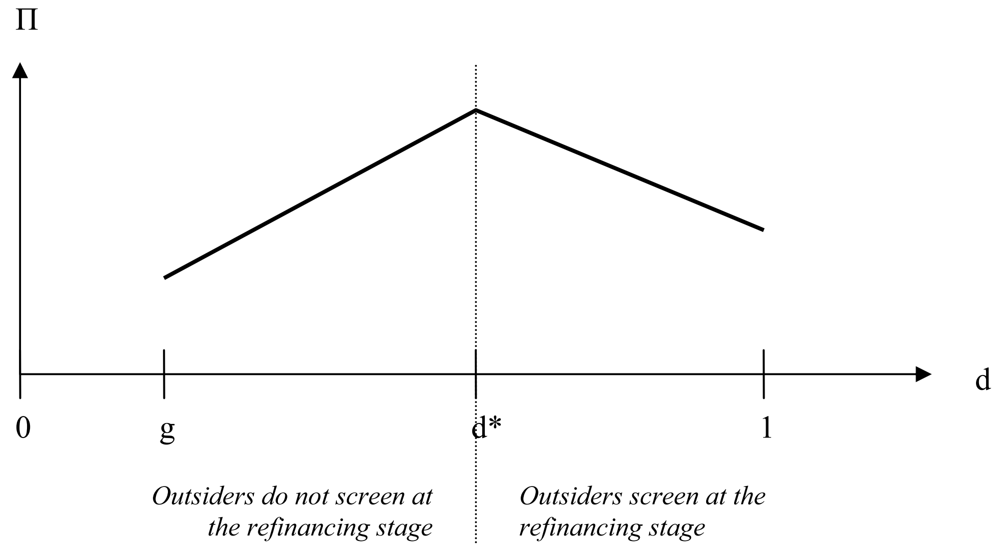

Figure 2

Profit as a function of credit standards, in the presence of liquidity shocks