Essays on bank monitoring, regulation and competition

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Chapter 8

The Maturity of Monitored Finance: Covenants and Insufficient Liquidation

Abstract

The characteristics of an optimal lending contract in a model where a bank obtains proprietary information by monitoring its borrowers are analyzed. A key to the analysis is that, with a short-term contract, the incumbent bank's rent-seeking behavior will trigger competitive offers such that bad borrowers can also obtain financing and liquidation is insufficient. This happens if competition for borrowers is high and competition between banks is based on *simultaneous* offers. Using a long-term contract with covenants leads to liquidation of more bad borrowers. The chapter shows that lower-risk borrowers use short-term contracts while higher-risk borrowers finance themselves with long-term contracts with covenants. As competition for borrowers increases and/or is expected to increase in the future, long-term contracts with covenants become more attractive to borrowers. Moreover, the use of covenants and the contracts maturity are positively correlated with monitoring precision.

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8.1 Introduction

This chapter looks into how competition affects the effectiveness of different contractual arrangements between a bank and its borrowers.

The issue is analyzed in a model in which the bank's main role is to provide for optimal liquidation of (bad) projects. After granting credit, monitoring provides the credit-granting bank with proprietary signals about its borrowers' qualities. The (incumbent) bank rejects financing bad borrowers (the ones with negative signals) and tries to earn rents on good borrowers. Another (competing) bank may appear and compete for borrowers from the incumbent bank. However, it is at a disadvantage due to not having signals about the borrowers' qualities.

In my model, borrowers initially choose either short-term contracts or long-term contracts (with or without covenants) and they seek offers. Banks make loan offers for the chosen contracts. Subsequently, the incumbent bank obtains proprietary information about the borrowers' qualities. Borrowers that choose short-term contracts again search for competing banks. If borrowers do not obtain further financing, their projects are liquidated; otherwise they continue with their projects.

A key to the analysis is that with a long-term contract a bank cannot exploit good borrowers (meaning the ones for which it has received *good* signals). The only borrowers that seek funding from competing banks are bad borrowers. All other banks realize this and thus abstain from funding. Hence, liquidation is efficient. With a short-term contract the rent-seeking behavior of the incumbent bank will have triggered competitive offers such that bad borrowers can also obtain financing and liquidation is insufficient. Insufficient liquidation worsens the lending terms of a short-term contract. This happens when banks grant offers simultaneously.

The reason a short-term contract induces insufficient liquidation deserves further discussion. Due to rent-seeking behavior of the incumbent bank facilitated by a short-term contract, the competing bank might be willing to lend and try to attract good borrowers. However, the competing bank may also end up financing some of the rejected borrowers. More specifically, the incumbent bank obtains proprietary monitoring signals and it uses this informational advantage to take rents from good borrowers and reject bad borrowers. The competing bank is unable to distinguish between borrowers but it may still compete for them. This is because the competing bank may attract good borrowers that the incumbent bank attempts to exploit excessively. This compensates the competing bank for the possibility that it finances rejected (i.e., bad) borrowers, but may also prevent optimal liquidation.

The drawback of a short-term contract highlighted here, insufficient liquidation, is different from the ones in Rajan (1992), Sharpe (1990), and Von Thadden (1995). They employ similar types of models where private information gives bargaining power to the incumbent bank. In their studies, however, this creates inefficiencies on the borrowers' side. In particular, borrowers that anticipate lower profits either invest inefficiently (see Rajan (1992)), put

too little effort into their projects (see Sharpe (1990)) or may invest too much in short-term projects and too little in long-term projects (see Von Thadden (1995)).

Berglof and Von Thadden (1994) and Bolton and Scharfstein (1996) argue that renegotiation makes liquidation less efficient. They show that a financial structure with multiple investors (with different maturity of their claims) may restore efficient liquidation. In this case, insufficient liquidation is not the consequence of renegotiation. Rather, increased competition prevents the full use of private information obtained through bank monitoring.

This analysis is related to studies that examine the impact of competition on the efficiency of bank monitoring. Petersen and Rajan (1995) argue that competition may hamper the intensity of bank-borrower relationships and lead to reduced availability of credit. Hauswald and Marquez (2006) combine the hold-up problem with spatial competition. They show that, as competition increases, banks invest less in monitoring and therefore make less efficient lending decisions. In contrast, Boot and Thakor (2000) argue that competition may make bank monitoring even more important. They show that relationship lending helps insulate banks from pure price competition. In their view, banks move to relationship lending as competition increases. My analysis shows that competition may prevent the full use of private information obtained through monitoring.[1]

This analysis still brings a positive view to the relation between competition and monitored finance, however. In particular, banks can largely circumvent the detrimental effect of competition on the efficiency of monitoring (and liquidation of bad borrowers) by carefully designing their contractual relationships with borrowers. The analysis shows that it may be optimal to offer a long-term contract with a termination clause; that is, a long-term contract coupled with covenants. This gives the bank the power to terminate the contract. However, if the bank does not terminate the contract, it has to uphold the previously arranged contractual terms. Such contracts prevent the incumbent bank with proprietary monitoring signals from engaging in rent-seeking behavior. Consequently, the only borrowers that try to find a competing bank are rejected borrowers. Anticipating this, a competing bank is not willing to provide financing and liquidation is efficient. Von Thadden (1995) similarly proposes that short-term contract deficiencies may be diminished with a carefully designed long-term contract. In his model, an example of such contract may be a debt contract coupled with a credit line arrangement.

Rajan and Winton (1995) analyze bank monitoring under the mix of bank debt and public debt. Public debt holders may free-ride on bank monitoring, which makes monitoring less valuable. Rajan and Winton (1995) show that including a covenant improves a bank's incentives to monitor the borrower. In my case, covenants are valuable because they give the bank the right to act upon receiving negative signals and terminate the bad borrowers. In this respect a short-term contract is less efficient because uninformed banks may continue to finance an already-rejected bad borrower.

[1] A study by Dell'Ariccia and Marquez (2006) is also related. They show that as information asymmetries decrease, banks may loosen their credit standards. I show that an increase in competition may lead to less efficient liquidation of borrowers although the bank credit standards remain unchanged.

While this study focuses on the relationship between a bank and its borrowers, this analysis is applicable to other contractual relationships. Aghion and Bolton (1987) show that customers are willing to sign a long-term contract that limits their future bargaining power. They argue that a long-term contract can be used to extract efficiency rents from future entrants and partially pass those rents on to customers. They show that long-term contracts would optimally control their duration by including costly termination clauses. My analysis points to a different reason why a long-term contract with a termination clause (i.e., a covenant) may be optimal: it provides for an efficient use of proprietary information obtained during the contractual relationship.

While this analysis is limited to debt contracts, Bolton and Scharfstein (1990) and Hart and Moore (1998) set their analyses more broadly. In the incomplete contract framework, they show that debt contracts are optimal for a wide range of conditions because they prevent managers from taking unobservable cash flows.[2] In Hart and Moore (1998), the bank may excessively liquidate its borrowers if they cannot commit to repay late. In this sense, long-term debt protects borrowers from inefficient liquidation of the bank (see also Hart and Moore (1994)). In my analysis, long-term contracts with covenants allow for efficient liquidation but protect borrowers from rent-seeking behavior by their bank.

I also analyze the strategic considerations of how borrowers optimally select the contracts type. A long-term contract with covenants is socially optimal because it provides for optimal liquidation of bad projects. Nevertheless, borrowers may prefer a short-term contract for strategic reasons. In particular, a short-term contract allows borrowers to search for a competing bank in the future, giving them additional bargaining power, while a long-term contract permanently binds them to the incumbent bank. This then translates into the trade-off between short-term contracts and long-term contracts with covenants explored here.

Flannery (1986) predicts a positive relation between the maturity of a debt contract and a borrower's risk. He argues that good borrowers use short-term debt contracts so that the bank can learn their borrower type during the first period. Bad borrowers use long-term contracts to spare the transaction costs of writing the contract.[3] This analysis also predicts that, on average, higher-risk borrowers opt for long-term contracts. However, the intuition for this is different from Flannery's (1986).

In my model, borrowers do not know their type. The choice between contracts depends on the publicly known proportions of good versus bad borrowers in the economy. With a high proportion of bad borrowers, long-term contracts with covenants are preferred while

[2]Bolton and Scharfstein (1990) show how debt financing affects product market competition through deterring liquidation, while this analysis focuses on the impact of competition in lending markets on the maturity of debt.

[3]Diamond (1991b), however, involves another effect. He argues that much higher-risk borrowers may be refused the option of long-term debt. In his view, highly risky and safe borrowers finance with short-term debt and borrowers of medium risk finance with long-term debt. Recently, Berger, Espinosa-Vega, Frame, and Miller (2005) have presented evidence for a positive relation between debt maturity and the borrower's risk as suggested by Flannery (1986).

short-term contracts might be preferred if this proportion is relatively low. This will depend on the competitiveness of the banking system at $t = 0$. This is because efficient liquidation is especially important if the proportion of bad projects is high. For lower-risk borrowers, liquidation efficiency loses its importance. Borrowers then choose a short-term contract to gain bargaining power at $t = 1$ if the banking system is relatively non-competitive at $t = 0$. Comparative statics show that high-quality banks (with high monitoring precision) more frequently use long-term contracts with covenants. In contrast, low-quality banks predominantly stick to short-term contracts.

My analysis yields some novel predictions regarding the relation between competition and the maturity of contracts. Interestingly, as competition for borrowers increases, borrowers opt more frequently for long-term contracts with covenants. This is for two reasons. First, borrowers anticipate that greater competition eliminates banks' rents, hence they opt for more efficient long-term contracts with covenants. Second, greater expected competition in the future exacerbates the problem of insufficient liquidations that short-term contracts bring.

The chapter is organized as follows. The model is developed in Section 8.2. Section 8.3 analyzes the different types of contracts. The borrower's choice of contract is analyzed in Section 8.4, Section 8.5 allows for costly covenants and contains the empirical predictions. Section 8.6 is the conclusion.

8.2 Model Specifications

It is assumed throughout that the risk free rate is zero. Both types of agents in the model – banks and borrowers – are risk neutral.

Borrowers: At $t = 0$, each borrower needs \$1 of initial investment to finance his project. The parameter γ describes the proportion of borrowers with good projects. With probability γ a borrower has a good project which yields a sure return R at $t = 2$, where it is ex-ante efficient to grant a loan; i.e., $R > \frac{1}{\gamma}$. With probability $[1 - \gamma]$ a borrower has a bad project. A bad project always fails and yields zero return. Borrowers do not know their project types. Borrowers can choose to liquidate the projects at $t = 1$; each project then yields \$1 (regardless of the type of a borrower).

Financing options: Borrowers approach a bank for financing. All contracts are debt contracts.[4] Borrowers choose either a short-term contract (for one period, i.e., from $t = 0$ to $t = 1$, possibly followed by another short-term loan, i.e., from $t = 1$ to $t = 2$) or a long-term contract; that is, for two periods from $t = 0$ to $t = 2$. A long-term contract does not require intermediate payments.

Bank monitoring: The bank has monitoring technology in place that, just prior to $t = 1$ (just prior to the termination of a short-term contract), gives the bank costless signals $S \in \{B, G\}$ which noisily reveal the qualities of the borrowers. The quality of the bank

[4]Townsend (1979) finds that debt contracts are optimal using the costly state verification approach.

results in the precision of its signals Φ. If a borrower has a bad project, the bank always obtains a negative signal $S = B$. If a borrower has a good project, the bank obtains a positive signal $S = G$ with probability Φ and a negative signal $S = B$ with probability $[1 - \Phi]$.

In the case of a one-period loan the bank can condition its renewal decisions at $t = 1$ on the signals received. Note that only the initial credit-granting bank (hereafter: the incumbent bank) receives the signals. Thus, it has an informational advantage at $t = 1$ compared to competing banks. With a two-period loan the incumbent bank cannot terminate the loan at $t = 1$, unless a covenant is included in the contract that allows it to do so. The covenant (if included) stipulates that the bank is allowed to call the loan at $t = 1$. This can be considered a MAC (material adverse change) clause, as often accounted for in bank loan contracts. It is assumed that inclusion of such a covenant gives the incumbent bank the right to call the loan.[5] However, if the loan is not called, the incumbent bank has to continue financing at the previously agreed conditions.

Competition and information structure: At $t = 0$, borrowers choose the contract type. With probability q_0, borrowers can choose between competing banks. With probability $[1 - q_0]$, they only have one bank to choose from.[6] When there is only one bank to choose from, borrowers have no choice but to accept a monopolistic offer, provided this yields positive returns. When banks compete, banks compete for borrowers as Bertrand competitors.

At $t = 1$, in case of a one-period contract and/or a two-period contract that has been terminated by the incumbent (initial) bank at $t = 1$, borrowers search for offers. They succeed in locating a competing bank with probability q_1. With probability $[1 - q_1]$, they do not find a competing bank and can only choose the offer (if any) from the incumbent bank. If a competing bank is found, both the incumbent and competing bank simultaneously decide whether they give offers to the borrowers, and if so, under what conditions. Borrowers then choose the offer that yields the highest profits. If borrowers obtain no offers for further financing, their projects are liquidated.

Time line: At $t = 0$, borrowers choose the contract type. Subsequently, they search for offers. The bank makes loan offers to borrowers for the chosen contracts. Just prior to $t = 1$, the incumbent (initial) bank obtains proprietary information about each borrower's quality. Borrowers again search for competing banks. The incumbent and competing bank (if one is found) may then *simultaneously* give second-period offers to borrowers. If borrowers do not obtain further financing, their projects are liquidated. If borrowers do obtain further financing, they continue with their projects. The outcomes of the projects are realized at

[5]This might be because it is costly for borrowers to dispute a bank's loan termination decision. Also, empirical evidence seems to confirm that covenants are set extremely tightly. Chava and Roberts (2006) show that approximately 15-20% of outstanding loans are in violation during a typical quarter and, conditional on violating a covenant, a loan is delinquent about 40% of the time.

[6]The competition parameter q_0 (and q_1) can be interpreted in terms of a spatial model as the level of transportation costs. In particular, a high level of transportation costs may make the banking system fragmented, such that each bank behaves as a monopolist in a local market and borrowers are left with only one offer (in our model q_0 is low). However, as transportation costs decrease, borrowers can reach the competing bank (in our model q_0 is high). See Thisse and Vives (1988).

$t = 0$:	$t = 1$:	$t = 2$:
♠ The borrower has \$1 of funding needs.	♠ The incumbent bank receives a signal about the quality of its borrower.	♠ Payoffs are realized.
♠ The borrower chooses either a short-term contract or a long-term contract (with or without covenants).	♠ The competing bank materializes with probability q_1.	
♠ A competing bank materializes with probability q_0.	♠ In the case of a short-term contract, the incumbent bank and competing bank simultaneously bid for a borrower.	
♠ The borrower undertakes the project.	♠ In the case of a long-term contract with covenants, the incumbent (initial) bank can terminate the contract upon receiving a negative signal.	
	♠ If the borrower has further financing, he continues his project. Otherwise his project is liquidated.	

Figure 8.1: Timeline

$t = 2$. Figure 8.1 depicts the sequence of events.

8.3 Analysis

This section presents analyzes of the different types of contracts. Long-term contracts with and/or without covenants are analyzed first. Short-term contracts are analyzed second. The model is solved by backward induction.

8.3.1 Long-term contract

First the borrowers' expected profits if they choose a long-term contract without covenants are analyzed. Second, the profitability of a long-term contract with covenants is considered.

A long-term contract without covenants is defined as a contract *without* a termination clause; hence, it does not allow the incumbent bank to terminate the financing at $t = 1$, even if it obtains a negative signal.[7] Consequently, borrowers can always hold on to financing once obtained at $t = 0$. The situation at $t = 0$ is the following: the total expected profits of the projects are $\gamma R - 1$. The borrowers either have offers from one bank (w.p. $1 - q_0$) or from two (w.p. q_0). In the case of two banks competing, borrowers seize all the rents. With probability $1 - q_0$, there is only one bank. This bank can seize all the profits. Hence, upon choosing a long-term contract without covenants the expected values of the projects for the

[7]Potential renegotiation between the bank and borrowers at $t = 1$ is not considered here. In particular, if borrowers can seize the entire proceeds from renegotiation, the bank will not monitor them (if monitoring comes at a small cost for a bank). This then prevents renegotiation. For more on renegotiation, see Rajan (1992) and Berlin and Mester (1992).

borrowers are

$$V_{LT} = q_0[\gamma R - 1]. \tag{8.1}$$

Now I focus on a long-term contract with covenants, starting with an analysis of the situation at $t = 1$. Covenants give power to the incumbent (initial) bank to terminate the financing if the monitoring signal is negative.[8] The question remains whether the incumbent bank is willing to do so. Conditional on receiving a negative signal, the profitability of lending is as follows: the incumbent bank receives a negative signal if a borrower is bad. This happens with probability $1-\gamma$. However, the bank might also receive a negative signal if the borrower has a good project. The probability of this event is $\gamma[1-\Phi]$. Hence, the success probability of the borrowers for which the bank receives negative signals is

$$p(S = B) = \frac{\gamma[1-\Phi]}{\gamma[1-\Phi]+1-\gamma}. \tag{8.2}$$

The highest return that the bank can demand from borrowers is R. Hence, lending to the borrowers with negative signals is not profitable if

$$p(S = B)R - 1 < 0. \tag{8.3}$$

It is assumed that borrowers are liquidated conditional on negative signals. This amounts to assuming that monitoring is sufficiently precise; that is, if the following assumption is satisfied (use (8.2) and (8.3)).

Assumption 8.1. *Monitoring precision is sufficiently high, i.e.* $\Phi > \beta$*, where*

$$\beta \equiv \frac{\gamma R - 1}{\gamma[R-1]}. \tag{8.4}$$

Assumption 8.1 allows me to focus on the main role that banks play in this model, namely liquidation of bad projects. In particular, banks monitor their borrowers to gather proprietary information about the quality of borrowers and, consequently, act upon this information to deny credit whenever optimal. Such borrowers may be liquidated if they do not obtain financing at a competing bank. As shown here, with a long-term contract with covenants, borrowers that are denied credit by their incumbent (initial) bank will always be liquidated. Assumption 8.1 guarantees that monitoring precision is sufficiently high that liquidation of bad projects indeed occurs. Note that the condition in Assumption 8.1 can be rewritten as

$$\gamma < \gamma_0, \text{ where } \gamma_0 = \frac{1}{R - \Phi[R-1]}. \tag{8.5}$$

The condition in (8.5) shows that bank monitoring provides for liquidation only if borrowers are relatively unsafe on average. In this case, the incumbent bank rejects borrowers upon receiving negative monitoring signals. Because borrowers have no initial wealth, the bank

[8] Borrowers can have the signals verified in court. This prevents banks from lying.

cannot insure itself higher repayment than the return of the project R. However, lending at the interest rate lower than R is not profitable and borrowers are liquidated.

Banks are valuable because they provide for liquidation of bad projects. If borrowers are too safe on average; that is, if $\gamma \geq \gamma_0$, the incumbent bank does not reject them upon receiving negative signals. In this case, no borrower is liquidated and bank monitoring does not play a socially beneficial role. Assumption 8.1 precludes this case.

To summarize, the model contains:

Lemma 8.1. *With a long-term contract with covenants, the incumbent (initial) bank continues to finance borrowers (under the agreed conditions) upon receiving positive signals. Upon receiving negative signals the incumbent bank terminates the funding and borrowers are liquidated.*

Proof of Lemma 8.1: Upon receiving positive signals, it is profitable to finance borrowers. Even though the incumbent bank would like to increase the interest rate, a long-term contract does not allow for that. The incumbent bank can only terminate the contract but in this case it receives zero profits. Hence, it prefers to continue financing the borrowers at the agreed-upon terms. Upon receiving negative signals it is not profitable to finance the borrowers as Assumption 8.1 guarantees. Hence, the incumbent bank denies credit. A competing bank, if found, anticipates that the rejected borrowers are unprofitable and does not finance them either. ■

Lemma 8.1 points to the benefit of including covenants in a long-term contract. Banks can use valuable monitoring information together with long-term lending. More specifically, the bank monitors borrowers to receive signals about their credit qualities. As a consequence, the incumbent (initial) bank may weed out bad borrowers upon receiving negative signals.

The total profit with a long-term contract with covenants is computed as follows. Borrowers are liquidated if the bank obtains negative signals (see Lemma 8.1). In that case, liquidation proceeds exactly recoup the investment in the project and the total profit is zero. If the bank receives a positive signal, the project financing will be continued. This happens with probability $\gamma\Phi$. That is, with probability γ the borrower has a good project and, if and only if this is the case, the bank obtains a positive signal with probability Φ. The gain on a good project is $R-1$. Hence, the expected profits on a long-term contract with covenants are

$$\gamma\Phi[R-1]. \tag{8.6}$$

However, the borrowers only obtain this profit if they are exposed to competing banks at $t=0$. This happens with probability q_0. With probability $1-q_0$, there is only one bank, and this bank takes all rents. Hence, the borrowers' expected value of the project with long-term financing (with covenants) is

$$V_{COV} = q_0\gamma\Phi[R-1]. \tag{8.7}$$

Recall that the profits *without* covenants are given in (8.1). The next lemma is the following:

Lemma 8.2. *Borrowers prefer a long-term contract with covenants over a long-term contract without covenants.*

Proof of Lemma 8.2: Observe that (8.7) is greater than (8.1) for $\Phi > \beta$, and this is true if Assumption 8.1 holds. ■

Lemma 8.2 shows that it is not optimal to design a contract that precludes the incumbent bank from using (costless) monitoring signals. Thus the long-term contract without covenants cannot be optimal. Hence, hereafter the analysis is narrowed to include only long-term contracts with covenants.

8.3.2 Short-term contract

This analysis first shows that liquidation with a short-term contract is less efficient than it is with a long-term contract with covenants. Second, the borrowers' expected profits are considered.

Insufficient liquidation

The first analysis considers the situation at $t = 1$. Two cases are analyzed individually. In the first case, the focus is on a short-term contract conditional on the absence of a competing bank at $t = 1$; that is, $q_1 = 0$. The incumbent bank then offers second-period financing to the borrowers upon receiving positive signals. Upon receiving negative signals, it denies further financing to such borrowers. Without the competing bank, the rejected borrowers cannot obtain further financing. Therefore, they are forced into liquidation.

The following lemma summarizes the above.

Lemma 8.3. *If $q_1 = 0$, borrowers with negative signals are liquidated and borrowers with positive signals obtain further financing.*

Note that liquidation in the case of a short-term contract with no competition; that is, $q_1 = 0$, is equally as efficient as liquidation in the case of a long-term contract with covenants. In both situations the borrowers are liquidated upon receiving negative signals.

The second case considers a short-term contract if borrowers always find a competing bank at $t = 1$; that is, $q_1 = 1$. In this case, the incumbent bank has an informational advantage over the competing bank because it has signals about the borrowers' quality. No pure strategy equilibrium exists, however, the following mixed strategy equilibrium exists (see Broecker (1990), Von Thadden (2004), and Hauswald and Marquez (2006)).

Lemma 8.4. *If $q_1 = 1$, the incumbent (initial) bank always makes an offer to borrowers with positive signals and it denies financing to borrowers with bad signals. The competing bank (acting simultaneously) offers a loan with probability β and it denies credit with probability $1 - \beta$. Both banks randomly mix over the offered interest rates (the mixing probabilities are*

given in the appendix). The competing bank breaks even. The expected profit of the incumbent bank at $t = 1$ *is*

$$\Pi^1_{ST}(q_1 = 1) = \Phi[1 - \gamma]. \tag{8.8}$$

Proof of Lemma 8.4: See Appendix. ■

The intuition for Lemma 8.4 is the following. The incumbent bank wants to use its proprietary information to earn profits. The incumbent bank rejects borrowers upon receiving negative signals (because monitoring is precise enough as guaranteed by Assumption 8.1). Things are more complicated for borrowers with good signals. The incumbent bank always makes an offer to such borrowers. However, it cannot offer a unique interest rate because the competing bank would respond by slightly overbidding and seizing all the borrowers. The optimal solution for the incumbent bank is to randomize over the interest rate offered. The competing bank responds by randomizing the interest rates and over-accepting versus rejecting each borrower with the probability β versus $1 - \beta$.

Lemma 8.4 points to the key insight of this analysis. A short-term contract can prevent an efficient usage of proprietary information that the incumbent bank has obtained with monitoring. The intuition for this is the following. A short-term contract allows the incumbent bank to use its information advantage to expropriate rents. This rent-seeking behavior of the incumbent bank induces inefficiencies; namely, it allows the competing bank to bid for the borrowers. The competing bank may then not only attract borrowers with good projects but also the bad ones. As a consequence, borrowers can still be financed even if the incumbent bank obtains negative signals. Hence, liquidation is less efficient.

Interestingly, the following proposition shows that the efficiency of liquidation at $t = 1$ depends on the type of contract (combine Lemma 8.1, Lemma 8.3, and Lemma 8.4).

Proposition 8.1. *Liquidation is (weakly) more efficient with a long-term contract with covenants than with a short-term contract.*

With a short-term contract, borrowers may be further financed even upon receiving negative signals, whereas with a long-term contract all such borrowers are liquidated. The following corollary shows that this inefficiency stems from the combination of short-term contracts and competition for borrowers.[9]

Corollary 8.1. *With no competition at* $t = 1$*, a short-term contract and a long-term contract with covenants are equally efficient. Increasing competition at* $t = 1$ *hampers the efficiency of liquidation (only) in the case of a short-term contract.*

Proof of Corollary 8.1: Combine Lemma 8.1, Lemma 8.3, and Lemma 8.4. ■

The intuition for Corollary 8.1 is the following. In the case of a short-term contract, borrowers are liquidated upon being rejected by their incumbent bank if there is no competing

[9]Schmeits (2005) also shows that short-term contracts are dominated by long-term contracts. She argues that long-term discretionary contracts allow for an intertemporal wealth redistribution (as well as cross-sectional wealth distribution) that cannot be mimicked by short-term contracts.

bank at $t = 1$. Consequently, the monitoring signals are fully exploited and liquidation is efficient. Yet, as competition increases and a competing bank materializes, the rejected borrowers can possibly finance at the competing bank. This is because the competing bank cannot distinguish good from bad rejected borrowers. This creates an inefficiency in the liquidation process. In contrast, if the borrowers are rejected with a long-term contract with covenants, competition does not affect their liquidation because the competing bank knows that only borrowers upon receiving negative signals end up looking for financing. Hence, it is not willing to finance such borrowers.

Profits at $t = 1$

Now I compute the expected profits of the borrowers and incumbent bank at $t = 1$. I denote them with V_{ST}^1 and Π_{ST}^1, respectively. I proceed as follows. With probability $1 - q_1$, borrowers do not find a competing bank. In this situation, borrowers obtain zero profits and the incumbent bank obtains $\gamma\Phi[R - 1]$; see (8.6). That is,

$$V_{ST}^1(q_1 = 0) = 0, \quad \Pi_{ST}^1(q_1 = 0) = \gamma\Phi[R - 1]. \tag{8.9}$$

With probability q_1, borrowers find a competing bank. In this case, the incumbent bank obtains $\Phi[1-\gamma]$, see (8.8). The borrowers' profits are computed as follows. With probability γ, the borrower is good. In this case his project yields R. Conditional on the borrower being good, he obtains financing at the incumbent bank with probability Φ (upon receiving a positive signal) and at the competing bank with probability $[1-\Phi]\beta$. Hence, the probability of being financed is $\Phi + [1 - \Phi]\beta$ and the expected return is

$$\gamma\{\Phi + [1 - \Phi]\beta\}R. \tag{8.10}$$

The costs of financing the project are as follows. The borrower cannot pursue the project if he is rejected simultaneously by the incumbent bank and competing bank. The incumbent bank rejects the borrower with probability $\gamma[1 - \Phi] + [1 - \gamma] = 1 - \gamma\Phi$ and the competing bank does so with probability $1-\beta$. If the project is pursued, \$1 of funds are needed. Hence, the total investment needed is

$$1 - [1 - \gamma\Phi][1 - \beta]. \tag{8.11}$$

Subtracting (8.11) from (8.10) yields the total expected profits of a short-term contract

$$\Phi[1 - \gamma] + \beta[\gamma R - 1]. \tag{8.12}$$

Borrowers, however, cannot take the total profit because the incumbent bank can take at least the rents as given in (8.8). In sum,

$$V_{ST}^1(q_1 = 1) = \beta[\gamma R - 1], \quad \Pi_{ST}^1(q_1 = 1) = \Phi[1 - \gamma]. \tag{8.13}$$

With probability $1-q_1$, borrowers do not find a competing bank and the computed profits in (8.9) are relevant. With probability q_1, borrowers find a competing bank and the profits in (8.13) apply. That is,

$$V_{ST}^1 = q_1\beta[\gamma R - 1], \tag{8.14}$$
$$\Pi_{ST}^1 = [1-q_1]\gamma\Phi[R-1] + q_1\Phi[1-\gamma]. \tag{8.15}$$

Profits at $t=0$

Now I compute the expected profits of the borrowers at $t=0$ (I denote this with V_{ST}). With probability $1-q_0$, borrowers are only served by one bank. Hence, this bank has all the bargaining power and the borrowers receive nothing except what they anticipated to make after the first period contract.[10] That is, they earn (8.14), i.e.,

$$V_{ST}(q_0=0) = q_1\beta[\gamma R - 1]. \tag{8.16}$$

With probability q_0, however, borrowers have competing banks to choose from at $t=0$. In this case, the bank anticipates that it will earn the profit as given in (8.15). Hence, it is willing to subsidize the borrowers in the first period by exactly the amount of its expected second-period profits.[11] The borrowers expect the following profits (add (8.14) and (8.15)):

$$V_{ST}(q_0=1) = q_1[\beta-\Phi][\gamma R - 1] + \gamma\Phi[R-1]. \tag{8.17}$$

Combining (8.16) with (8.17), I determine the expected profits of the borrowers choosing a short-term contract,

$$V_{ST} = q_1[\beta - q_0\Phi][\gamma R - 1] + q_0\gamma\Phi[R-1]. \tag{8.18}$$

8.4 Contract Choice

In this section I analyze the borrowers' choices between contracts. I discuss the strategic considerations of the borrowers' choices of contract with respect to the expected level of competition at $t=0$. I conclude with some comparative statics results.

First, I limit the analysis to the situation where there is competition for the borrowers at $t=0$. That is, the borrowers choose the contract type anticipating that they will find (two) competing banks at $t=0$. I can now show the following proposition.

[10] A short-term contract does not allow the bank to demand a long-term repayment from the borrowers. A contract with a long-term repayment would already be a long-term contract. I also step aside from potential renegotiation that may appear at $t=1$ between the incumbent bank and borrowers. In particular, the incumbent bank cannot demand higher repayment at $t=1$ than is the liquidation value of the project. Berlin and Mester (1992) analyze the role of covenants in light of efficient renegotiation.

[11] Borrowers at $t=1$ again borrow \$1 and consume the rest at $t=1$. The results do not change if I allow borrowers to invest the proceeds of the first period into the second period of the project, assuming that they are uninformed about the signals.

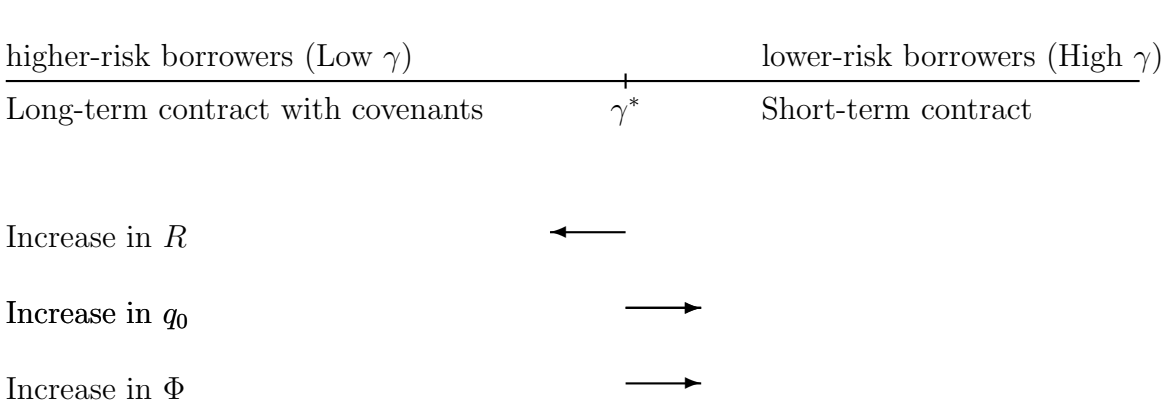

Figure 8.2: Ranges of optimal financing

Proposition 8.2. *If there is competition at $t = 0$, i.e. $q_0 = 1$, borrowers (weakly) prefer a long-term contract with covenants.*

Proof of Proposition 8.2: Note that (8.17) is greater (or equal if $q_1 = 0$) than (8.7). ■

The intuition is that a long-term contract with covenants allows for more efficient liquidation than a short-term contract (see Proposition 8.1). Namely, with a short-term contract the competing bank may also finance the rejected borrowers, which is inefficient. Hence, the total profit with a short-term contract is (weakly) lower than with a long-term contract with covenants. If competition at $t = 0$ is perfect, borrowers are able to take the total profit; hence, they choose a long-term contract with covenants.

Corollary 8.2. *If $q_0 = 1$, borrowers select the welfare optimal type of contract – a long-term contract with covenants.*

If competition at $t = 0$ is perfect, the borrowers anticipate taking all rents. Hence, they choose the type of contract that maximizes the total profit; that is, the welfare optimal contract. The welfare optimal type of contract is a long-term contract because it provides for efficient liquidation (see Proposition 8.1).

Now I generalize the analysis to the situation where competition at $t = 0$ is limited (described by parameter q_0). In this case, borrowers choose the type of a contract anticipating that they find themselves with competing banks only with probability q_0. With probability $1 - q_0$, they are left with only one bank.

I show the following proposition.

Proposition 8.3. *For $\gamma > \gamma^*$, where $\gamma^* \leq \gamma_0$, borrowers prefer a short-term contract. For $\gamma \leq \gamma^*$, borrowers prefer a long-term contract with covenants.*

Proof of Proposition 8.3: Subtract (8.7) from (8.18) to obtain

$$V_{ST} - V_{COV} = q_1[\beta - q_0\Phi][\gamma R - 1]. \tag{8.19}$$

Setting (8.19) to zero and solving for γ, I obtain the following solution (use (8.4))

$$\gamma^* = \frac{1}{R - q_0\Phi[R-1]}. \tag{8.20}$$

Use (8.4) and (8.19) to see that $V_{ST} > V_{COV}$ if $\gamma > \gamma^*$ and $V_{ST} \leq V_{COV}$ if $\gamma \leq \gamma^*$. ■

The intuition for Proposition 8.3 is the following. Borrowers may choose a short-term contract to partially protect themselves from being exploited by the incumbent (initial) bank. That is, with a short-term contract competition might also be realized at $t = 1$, and that allows borrowers to take second-period profits. For lower-risk borrowers (i.e., if $\gamma > \gamma^*$), liquidation efficiency is less important, and this consideration prevails and they choose a short-term contract. However, for higher-risk borrowers (i.e., if $\gamma \leq \gamma^*$), efficient liquidation of bad projects becomes important and borrowers choose a long-term contract with covenants.

Figure 8.2 graphically presents the result of Proposition 8.3. On average, higher-risk borrowers (where γ is low; i.e., $\gamma \leq \gamma^*$) choose a long-term contract with covenants. On average, lower-risk borrowers (where γ is high; i.e., $\gamma > \gamma^*$) choose a short-term contract. Figure 8.2 also presents the effects of an increase in competition q_0 and monitoring precision Φ on the use of long and short-term contracts. I analyze these comparative statics results now.

The return of borrowers' projects affect the choice of contract as follows.

Corollary 8.3. *As their return increases, borrowers more often use a short-term contract relative to a long-term contract with covenants; i.e.,* $\frac{\partial \gamma^*}{\partial R} < 0$.

Proof of Corollary 8.3: Note from (8.20) that γ^* is decreasing in R. ■

The intuition for this Corollary is reminiscent of Proposition 8.3. Borrowers with higher return in the case of success R want to protect themselves from being exploited by the incumbent (initial) bank. With a short-term contract, competition may also be realized at $t = 1$, and this may allow borrowers to take second-period profits. Hence, they choose a short-term contract more often.

The effect of competition on the choice of contract is as follows.

Corollary 8.4. *As competition for borrowers at $t = 0$ increases, borrowers more often use a long-term contract with covenants relative to a short-term contract, i.e.* $\frac{\partial \gamma^*}{\partial q_0} > 0$.

Proof of Corollary 8.4: Note from (8.20) that γ^* is increasing in q_0. ■

As competition increases, borrowers need a short-term contract less to protect against monopolistic market power of the incumbent bank. Hence, they choose a long-term contract with covenants that optimizes the liquidation decision more often.

Next I analyze how monitoring precision influences the optimal financing mode of the borrowers.

Corollary 8.5. *As monitoring precision increases, borrowers more often choose a long-term contract with covenants relative to a short-term contract; i.e.,* $\frac{\partial \gamma^*}{\partial \Phi} > 0$.

Proof of Corollary 8.5: Use (8.20) to see that γ^* is increasing in Φ. ■

High monitoring precision exacerbates the insufficient liquidation of a short-term contract. More specifically, especially in the case of high-quality banks for which monitoring precision is high, borrowers should be liquidated upon receiving negative signals. Yet, with a short-term contract, such borrowers may still obtain financing at a competing bank. This is inefficient. With a long-term contract with covenants, borrowers are always liquidated upon receiving negative signals. Hence, higher precision of a monitoring signal (higher quality of the bank) makes long-term contracts with covenants more attractive (see Figure 8.2).

8.5 Model Extensions and Empirical Predictions

In this section I first analyze an extension in which covenants are costly. Second, I discern some empirical predictions from the analysis.

8.5.1 Costly covenants

I expand the previous model by assuming that including covenants in the contract is not costless for borrowers. In particular, I assume that including such covenants in the loan contract limits the flexibility of borrowers. More specifically, I assume that a borrower cannot undertake an additional action at $t = 1/2$ that provides a synergy benefit of $\alpha[\gamma R - 1]$ at $t = 1$. Note that the synergy benefit $\alpha[\gamma R - 1]$ is proportional to the expected return that a borrower obtains on the project when he is not liquidated. I let α be the proportionality parameter.

Now borrowers will prefer a short-term contract more often to keep their flexibility intact. The difference between the expected profit of borrowers with a short-term contract and long-term contract with covenants is now (compare with (8.19))

$$V_{ST} - V_{COV} = \{q_1[\beta - q_0\Phi] + \alpha\}[\gamma R - 1]. \tag{8.21}$$

Setting (8.21) to zero and solving for γ, it follows that borrowers are indifferent between a short-term contract and a long-term contract if the expression in (8.21) equals zero; that is, if

$$\gamma_2 = \frac{1}{R - [q_0\Phi - \frac{\alpha}{q_1}][R - 1]}. \tag{8.22}$$

Borrowers prefer a short-term contract for $\gamma > \gamma_2$ and a long-term contract with covenants for $\gamma \leq \gamma_2$.

Because including covenants is costly, borrowers choose a long-term contract with covenants less often (use (8.20) and (8.22) to see that $\gamma_2 < \gamma^*$). The higher the costs of covenants are (i.e., the higher α is), the lower γ has to be to choose for a long-term contract with covenants. Only if γ is low enough, the additional value obtained due to the more efficient liquidation at $t = 1$ compensates borrowers for the lost flexibility.

I can now show the following result.

Proposition 8.4. *As the expected competition at $t = 1$ increases, borrowers more often prefer a long-term contract with covenants.*

Proof of Proposition 8.4: Use (8.22) to see that γ_2 is increasing in q_1. ■

The intuition for this result is the following. Increasing competition at $t = 1$ exacerbates the drawback of a short-term contract. In particular, it is more likely that borrowers obtain further financing upon receiving negative signals; that is, a competing bank materializes more often. That is, liquidation becomes less efficient with a short-term contract. In response, borrowers more often prefer a long-term contract with covenants to benefit from more efficient liquidation.

Proposition 8.4 is counterintuitive at first sight. One could expect that borrowers more often choose a short-term contract upon anticipating an increase in competition in the future. A short-term contract could allow borrowers to search for a competing bank in the future when competition is higher. Proposition 8.4 shows that another, stronger effect is at work. As competition increases in the future, the inefficiency of a short-term contract worsens; the liquidation decision becomes less efficient. Hence, borrowers prefer a long-term contract with covenants to bypass the lost efficiency of a short-term contract.

8.5.2 Empirical predictions and evidence

In this section, I list the empirical/stylized facts that are consistent with the predictions following from my analysis.

1. Lummer and McConnell (1989) classify announcements of loan agreements and revisions to agreements into announcement containing positive or negative information. They show that negative renewals have significantly negative abnormal returns. Cancellation of a bank loan results in the strongest negative response. Lemma 8.1 predicts that the termination of a long-term contract should result in liquidation of borrowers. This may be different with a short-term contract. In particular, Lemma 8.3 shows that upon termination of a short-term contract borrowers may obtain funds at the competing bank. This predicts that the termination of a long-term loan should result in a stronger negative announcement effect than the termination of a short-term contract. Proposition 8.3 predicts that this effect should be stronger if competition between banks is high.

2. Proposition 8.3 predicts that the relation between the maturity of loan contracts and borrowers' risk should be positive. Berger, Espinosa-Vega, Frame, and Miller (2005) provide evidence that higher-risk borrowers raise bank loans with longer maturities than lower-risk borrowers. Sorge and Zhang (2007) show that countries with higher dispersion of firms' credit qualities are characterized by more long-term debt. However, the empirical evidence is mixed. Barclay and Smith Jr. (1995) and Johnson (2003) point

to the non-monotone relation between debt maturity and borrowers' risk as predicted by Diamond (1991a). Ortiz-Molina and Penas (2006) use accounting data to assess a firm's risk. On the sample of small firms in the U.S., they show that riskier firms use loans with lower maturity. Hence, more research is needed on this point. My analysis stresses that focusing only on the maturity of loans may not be enough. Considering other contractual features such as loan covenants seems to be crucial.

3. The implication of Lemma 8.2 is that especially long-term loans should include covenants. Billett, King, and Mauer (2007) confirm the positive relation between the loan maturity and the inclusion of covenants.

4. Corollary 8.3 predicts that borrowers with high growth potential more often finance with a short-term debt. Barclay and Smith Jr. (1995) and Goyal, Lehn, and Racic (2002) confirm this relation.

5. Corollary 8.5 predicts that higher monitoring precision leads to higher maturity of lending contracts. First, this is aligned with the evidence that smaller firms – which are likely to be relatively opaque (i.e., monitoring precision is likely to be low) – finance with short-term debt (see Stohs and Mauer (1996) and Scherr and Hulburt (2001)). Second, Berger, Espinosa-Vega, Frame, and Miller (2005) directly confirm predictions from Corollary 8.5. They show that higher quality banks that have more advanced credit-scoring techniques and therefore higher monitoring precision grant loans with on average longer maturity.

6. Corollary 8.5 also predicts that higher quality banks (with high monitoring precision) should use covenants more frequently. This is related to the empirical evidence put forward by Smith Jr. and Warner (1979) and Dichev and Skinner (2002) that shows that covenants are set more tightly in private lending agreements (where monitoring precision is high) than in public lending agreements.

7. Corollary 8.5 establishes a relation between contract features and characteristics of banking systems. In high-quality banking systems, longer-term contracts and covenants would be used more often than in low-quality banking systems. This is confirmed by Caprio Jr. and Demirgüç-Kunt (1997), who show that in developing countries borrowers predominantly use short-term contracts. Additionally, Sorge and Zhang (2007) show that borrowers in countries with poor credit information and low quality of accounting standards use contracts with shorter maturities. A prediction on the comparative use of covenants in developing versus developed countries remains to be tested.

8. Corollary 8.4 and Proposition 8.4 predict some yet unveiled relation between competition and structural features of contracts. First, increasing competition should augment

the use of bank covenants. Second, increasing competition should augment the maturity of lending contracts. The closest empirical research to this end seems to be Caprio Jr. and Demirgüç-Kunt (1997). They show that in developing countries borrowers use shorter term contracts than their developed country counterparts. One possibility for this could be that in developing countries bank competition is limited and that this makes a short-term contract superior. As competition increases, in line with my analysis, short-term contracts are replaced by longer maturity contracts that include other contractual features such as covenants.

8.6 Conclusions

This chapter adds some key insights to understanding the interaction between the choice of the type of a contract and competition. I show that a short-term contract can lead to insufficient liquidation of (bad) borrowers. This is because a short-term contract can worsen the efficient use of information obtained with monitoring, particularly if competition for borrowers is high. Using a long-term contract with a termination clause could mitigate this inefficiency.

More specifically, a long-term contract with covenants prevents a bank from extracting rents from its borrowers. Only borrowers for which the bank has obtained negative signals are rejected. Other banks anticipate this and such borrowers are efficiently liquidated. In contrast, with a short-term contract, the incumbent (initial) bank exploits proprietary monitoring signals and seeks to extract rents from its borrowers. Now, the competing bank cannot distinguish whether borrowers are switching to gain better funding terms or because they were rejected due to the negative signals of their bank. In equilibrium, the competing bank also finances some rejected borrowers. This makes liquidation insufficient.

To summarize, efficient liquidation makes a long-term contract socially optimal. However, borrowers may opt for a short-term contract in order to gain bargaining power over the incumbent (initial) bank in the later period. This leads then to the key prediction of the analysis: As competition for borrowers increases, borrowers choose a longer term contract coupled with covenants. This is for two reasons. First, higher competition eliminates banks' rents; hence, borrowers opt for a more efficient long-term contract with covenants. Second, higher expected competition exacerbates the insufficient liquidation of a short-term contract.

8.7 Appendix

Proof of Lemma 8.4

The proof is similar to the proof of Proposition 1 in Hauswald and Marquez (2002); hence, the proof of existence of the mixed strategy equilibrium is omitted (see also Hauswald and Marquez (2006)). If the incumbent bank observes a positive signal, the project always succeeds; that is, $p(S = G) = 1$. If the incumbent bank observes a negative signal, the project succeeds with probability $p(S = B)$ as given in (8.2). In this case, the incumbent bank rejects the second-period financing. To see this, note that Assumption 8.1 guarantees that $p(S = B)R < 1$.

The probability that the incumbent bank is willing to make an offer is $Pr(G) = \gamma\Phi$. With probability $Pr(B) = 1 - \gamma\Phi$, the incumbent bank rejects the borrower. In a mixed strategy equilibrium, the incumbent and competing bank obtain equal profits for all interest-rate offers that they are willing to make. Thus,

$$[1 - F_C(r)][p(G)r - 1] = \Pi(S = G), \tag{8.23}$$

$$Pr(G)[1 - F_I(r|S = G)][p(G)r - 1] + Pr(B)[p(B)r - 1] = 0, \tag{8.24}$$

where I have defined the density distributions for the offers of the incumbent bank as $F_I(r)$ and the competing bank as $F_C(r)$. The lowest level of interest rate that the competing bank is willing to offer is $r = \frac{1}{\gamma}$. Hence, I have $F_C(\frac{1}{\gamma}) = 0$. Insert this into (8.23) to obtain the profitability of a bank upon obtaining a positive signal

$$\Pi(S = G) = 1/\gamma - 1. \tag{8.25}$$

However, the incumbent bank receives a positive signal with probability $\gamma\Phi$. The profit at $t = 1$ of the incumbent bank as expected at $t = 0$ is as given in (8.8). Rearrange (8.24) to obtain

$$\gamma\Phi[1 - F_I(r|S = G)][r - 1] + [1 - \gamma\Phi][\frac{\gamma[1 - \Phi]}{1 - \gamma\Phi}r - 1] = 0. \tag{8.26}$$

Some manipulations yield

$$F_I(r|S = G) = \frac{\gamma r - 1}{\Phi\gamma[r - 1]}. \tag{8.27}$$

From (8.23) one obtains

$$F_C(r) = \frac{\gamma r - 1}{\gamma[r - 1]}. \tag{8.28}$$

Note that the competing bank makes an offer with probability

$$F_C(R) = \frac{\gamma R - 1}{\gamma[R - 1]} = \beta, \tag{8.29}$$

which is identical to β as defined in (8.4). With probability $1-\beta$, the competing bank rejects the borrower. ■