Penalty-free Prepayments and Credit Rationing*

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Abstract

I argue that non-price credit rationing is a way to maintain borrowers' flexibility to prepay freely. In my model, if voluntary prepayments are penalty-free, over time good borrowers prepay their loans while bad borrowers stay. This self-selection to prepay leaves the lender with bad borrowers only. Increasing the interest rate alone is not sufficient to compensate the lender for the prepayment risk, and hence the lender resorts to non-price credit rationing. In addition, the lender may employ a non-linear pricing approach in which an upfront fee is charged for loans with relatively high prepayment risk and low refinancing costs. Empirical evidence supports this prediction. Using a sample of 64,555 term loans to U.S. firms between 1987 and 2011, I find that a 100 basis points increase in the loan spread, measuring prepayment risk, leads to a 5.3 basis points average increase in the upfront fee. Moreover, loans with higher refinancing costs, e.g. syndication loans (vs. traditional bank loans), are in general associated with lower upfront fees.

Keywords: *prepayment, credit rationing, financial flexibility, loan contract, fees, collateral, borrower risk, adverse selection, time inconsistency*

JEL Classifications: *D82, D86, G21, G32*

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1 Introduction

This paper studies and links the following two stylized facts in commercial and industrial (C&I) loan markets:

Stylized Fact I: *Non-price credit rationing is a prevalent phenomenon. The lender often use non-price instruments such as collateral rather than the interest rate to ration credit.*

Credit rationing seems to be the very nature of the credit markets and exists as a long-term equilibrium phenomenon (Tirole (2006)). In practice, the interest spread is remarkably low, while non-price instruments such as collateral are widely observed debt features.[1] Moreover, the loan interest rates are sticky with respect to changes in nominal treasury rates (e.g., Berger and Udell (1992)) and lending standards strongly dominate loan rates in explaining variations in business loans (Lown and Morgan (2006)). These observed phenomena deviates from the standard neoclassical assumption of perfect credit markets, which predicts that the interest rate can clear the credit market, leaving no room for non-price credit rationing. The literature resorts to imperfections in the credit markets to provide rationales for credit rationing, e.g., adverse selection and risk-shifting (Jaffee and Russell (1976), Stiglitz and Weiss (1981)), costly state verification (Gale and Hellwig (1985),Williamson (1987)), money diversion (Hart and Moore (1994), Stein (1997)), and hidden effort (Tirole (2006)).

Stylized Fact II: *Firms prepay their bank loans frequently, while prepayment penalty is rarely observed in* C&I *loan markets.*

Roberts (2010) finds that most bank loans are renegotiated multiple times over relatively short time horizons, leading to significant changes in the loan terms.[2] Each change of the contract terms is equivalent to refinancing the original loan. Nevertheless, according to

[1]Among more than 86,000 U.S. C&I loans in the DealScan database between 1987 and 2011, the interest spread over LIBOR has a mean 2.53% and standard deviation 1.58%, and around 84% are secured. For over 1.1 million U.S. small business loans issued between 1977 and 1988 in the dataset from the Federal Reserve's Survey of Terms of Bank Lending, the mean and standard deviation of the interest spread are 2.47% and 2.59% respectively, and over 70% are secured (Berger and Udell (1992)). In the United Kingdom, Black and de Meza (1992) report that the interest spread is rarely over 3%-4% and Black, de Meza, and Jeffreys (1996) report that for 85% of small business loans, the ratio of collateral to loan size exceeds unity.

[2]In his sample, ignoring the few short-term loans that are not renegotiated, the typical loan is renegotiated four times, despite having a stated maturity of less than five years.

Standard&Poor's (2009), unlike most bonds, which have long no-call periods and high call premiums, most loans are prepayable at any time typically without prepayment fees.[3] Why are bank lenders, in contrast to bondholders, willing to accept prepayments without penalty? Does it imply that the option to prepay freely in these loans has no value? The answer is, of course, no. Then how are bank lenders compensated for prepayment risk?

In this paper, I argue that non-price credit rationing is a way to maintain the borrower's option to prepay freely. Based on their future investment opportunities, borrowers trade off two dimensions of financial flexibility: callability and non-price constraints. For firms with large investment opportunities, e.g. small- and medium-sized enterprises (SMEs), the free-call option is valuable to mitigate agency problems such as debt-overhang and adverse selection. Thus, these firms are willing to accept the constraints from non-price instruments to maintain the free-call option, e.g., by issuing bank loans. For other firms with few investment opportunities, e.g. large firms, the free-call option has little value. They may therefore give up the free-call option in favor of relaxing constraints from non-price instruments, e.g., by issuing bonds. This argument is consistent with the empirical observation that credit rationing is most common for SMEs (Berger and Udell (1998)). The table, *Features of C&I Bank Loans and Bonds*, compares features of C&I loans and bonds related to financial flexibility. From the table, C&I loan borrowers hold the free call option while accepting

Features of C&I Bank Loans and Bonds

		C&I Loans	**Bonds**
Borrower Size		all sizes	large
Callability		call freely	no call or call with premium
Non-price Instruments	Pricing	floating rate	fixed rate
	Payments	amortizing	non-amortizing
	Seniority	senior	not senior
	Security	secured	unsecured
	Covenants	more	less
	Maturity	shorter	longer

[3] Amir Sufi on his website, `http://faculty.chicagobooth.edu/amir.sufi/data.htm`, provides 3,720 loan contracts, of which none specifies a penalty for voluntary prepayments. It is very common that the following term is included in a loan contract: "the borrower may prepay any base rate borrowing in whole at any time, or from time to time in part, without premium or penalty".

more strict constraints on the non-price instruments such as seniority, security, etc. In contrast, bond issuers give up the free call option and hence relax the constraints on non-price instruments.

The paper thus has two main contributions to the literature. First, I argue that the need for financial flexibility, achieved through penalty-free prepayments, could explain the prevalence of credit rationing. Second, I show that a non-linear pricing approach with an upfront fee may allow for penalty-free prepayments in C&I loans.

I first construct a simple model illustrating how the option of penalty-free prepayments in loan contracts can induce credit rationing. In my model, the borrower signs a loan contract with the lender to finance an investment project. Shortly after the project is started, the borrower privately observes a signal concerning the project's future payoff. This signal may induce strategic prepayments and renegotiations. If the signal is good, the project is better than ex-ante expectation and the original interest rate is not *fair* anymore. Thus, the borrower refinances the original loan with a new cheaper loan. In this case, the lender breaks even.[4] If the signal is bad, the project has negative NPV and the lender will lose money for sure. Conditional on a positive probability of prepayment, the lender always loses money ex ante. Increasing the interest rate alone is not sufficient to compensate the lender for prepayment risk because, no matter how high the original interest rate is, the lender cannot capture the upside of the project due to prepayment. Then non-price instruments such as collateral are necessary to protect the lender from the downside risk.

For a given project, the probability of prepayment is increasing with the interest rate and is lower when the borrower pledges collateral. This is consistent with the empirical finding that loans with higher spreads are more likely to be renegotiated (Roberts (2010)) and that more risky and more poor-in-cash firms are more likely to be rationed (e.g. Berger and Udell (1990)). The model predicts a positive correlation between observed borrower risk and the use of collateral. This is because the probability of strategic prepayments is higher for more risky borrowers, who are more likely to get a signal that differs much from the original expectation. Although empirical research does find such a positive correlation (e.g.

[4]The accrued interest can be ignored when the signal arrives *very* early. A high interest before the signal is infeasible, because it may take away all the payoff of the borrower in the case of the bad signal so that the borrower quits. More discussion is given in the model latter.

Berger, Frame, and Ioannidou (2011a,b)), there are limited theoretical explanations for this relationship in the literature.[5]

For some firms, the non-price instruments may still constrain the firms' borrowing capacity. For example, firms may have limited collateral to secure a loan. In this case, the loan can instead employ a non-linear pricing approach, where the price of the loan is split into two parts: interest paid annually and an upfront fee paid as a lump-sum. The upfront fee mitigates the firm's incentive to prepay the loan early by reducing the interest rate. I thus propose two hypotheses concerning the use of upfront fees. First, loans with higher prepayment risk have higher upfront fees in order to reducing this risk. Second, upfront fees are lower or less likely to be included in loans with higher refinancing costs because these loans have lower prepayment risk.

To test these model implications, I construct a sample of 64,555 term loans to U.S. firms between 1987 and 2011. The information of upfront fees as well as other contract terms is from LPC DealScan. I use the loan spread as an estimate for prepayment risk and an indicator of syndication as a proxy for the level of refinancing costs. Compared to traditional bank loans, syndication loans have multiple lenders and a complex structure, so they are associated with higher renegotiation and refinancing costs (see e.g., Bolton and Scharfstein (1996), Brunner and Krahnen (2008)). The regression results are consistent with my model predictions. First, the use of upfront fees is positively correlated with the loan spread. In particular, a 100 basis points (bps) increase in spread raises the upfront fee by on average 5.3bps. Second, syndication loans tend to be associated with lower upfront fees, suggesting that higher refinancing costs reduce the use of upfront fees. It is commonly argued that the upfront fee compensates the lender for fixed cost associated with originating the loan. My findings indicate that this is not the only function of upfront fees.

In the model, the borrower maintains the free-call option by accepting constraints on the non-price instruments or lump-sum fees. However, these non-interest terms may incur some deadweight costs. For instance, there are screening, monitoring, and repossession costs as-

[5]Stulz and Johnson (1985) shows that secured debt increases firm value by mitigating the underinvestment problem associated with equity and risky debt. Boot, Thakor, and Udell (1991) suggest that collateral extracts more effort for more risky borrowers because it delivers in default, so collateral use is positively associated with borrower risk.

sociated with collateral (Berger, Frame, and Ioannidou (2011b)). This raises the question whether a prepayment penalty can substitute for non-interest terms. This does not appear to be the case in practice. As Stylized Fact II shows, prepayment penalty is rarely observed. I propose three rationales that allow for penalty-free prepayments. *First*, the lender ex ante loses money only if the borrower refinances the loan with a cheaper one, but prepayment may occur for various reasons. For example, the arrival of new investment opportunities may require refinance or renegotiate the loan to mitigate a debt-overhang. In C&I loan markets, however it is difficult to identify the purpose of the refinancing at the time of prepayment. Hence, it is impossible to impose prepayment penalties contingent on the purpose.[6] The flexibility to prepay freely allows the borrower to capture valuable investment opportunities and thus maintains her competitive advantage in product markets. Consistent with this argument, several papers emphasize the importance of financial flexibility in corporate finance (e.g., Graham and Harvey (2001) and Gamba and Triantis (2008)).

Second, there might be ex-ante hidden risk of borrowers that cannot be screened perfectly. Then, intuitively, a prepayment penalty penalizes the good type of borrowers more than the bad type because it is triggered only in good states. Instead, collateral penalizes the bad type more because it is seized by the lender only in default. Due to this adverse selection effect, the equilibrium contract that pools different risks should exclude prepayment penalty. *Third*, in many cases, loan renegotiations are desirable due to the time-inconsistency problem (Kydland and Prescott (1977)). When observing a good signal, the borrower has better outside options and hence more bargaining power. Then she can negotiate away the prepayment penalty, while the lender may have to accept it to maintain a good reputation or relationship. In contrast, the upfront fee is paid in advance and hence cannot be eliminated in subsequent negotiations. In an extreme case, if a large prepayment penalty is charged for a small business, the entrepreneur may walk away once he observes a good signal (Hart and Moore (1994)). For this reason, venture capital funding usually includes a "no-compete" provision (Kaplan and Strömberg (2003)).

While there to my best knowledge are no extant papers on the prepayment of C&I loans,

[6] In mortgage markets, prepayments occur for two main reasons, family movements and changed market interest rate, which are both easy to detect. Prepayment penalty is thus commonly included in subprime loans, frequently contingent on the purpose of refinance.

there are papers that study prepayments of mortgage loans, most of which focus on pricing mortgages. One of the exceptions is Mayer, Piskorski, and Tchistyi (2011), who show that prepayment penalties benefit risky borrowers through extended credit availability. In their model, the lender accurately observes the credit quality of the borrower, so adverse selection is not a concern. Moreover, financial flexibility for mortgage customers are not as important as that for businesses and, in particular, the purpose of the refinancing is easier to detect. For these reasons, it is generally feasible to include a prepayment penalty in the mortgage contract is feasible. Mayer, Piskorski, and Tchistyi (2011) report that 72% of subprime mortgage loans have prepayment penalties.[7] Concerning how penalty-free prepayments induce credit rationing, their model uses a similar intuition as mine.

In the rest of the paper, section 2 constructs the model, illustrating how penalty-free prepayments can induce credit rationing and how non-price instruments in loan contracts solve for credit rationing. Section 3 provides empirical evidence supporting the model predictions. In section 4, I discuss the conditions that allow for penalty-free prepayments. Finally, section 5 concludes.

2 Credit Rationing when Prepayments are Penalty-free

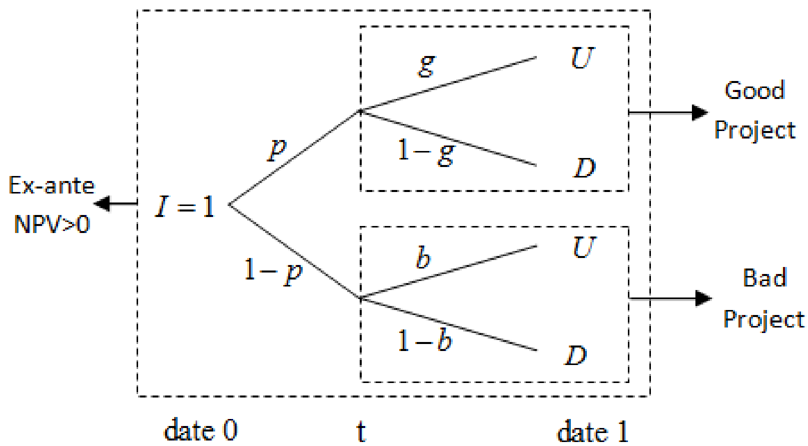
2.1 Setup

Consider the representative borrower in a competitive credit market and her lender. The lender is a bank or other lending institution. The borrower is a firm with limited liability endowed with an investment project. Both parties are risk-neutral. Without loss of generality, assume that the borrower has zero initial net worth so that the project is fully financed by debt. There are three dates, date 0, date 1 and an interim date t ($0 < t < 1$). At date 0, the investment project requires an initial investment, $I = 1$, and it will realize a date 1 payoff U if it succeeds and D if it fails, where $U > 1 > D$. To address credit rationing, I first consider the case in which the loan contract is specified only by the gross interest

[7]Mortgage loans, like bonds, usually have fixed-rate, so changes of the market interest rate may be the key reasons for prepayments. This is different from C&I loans which has floating rates.

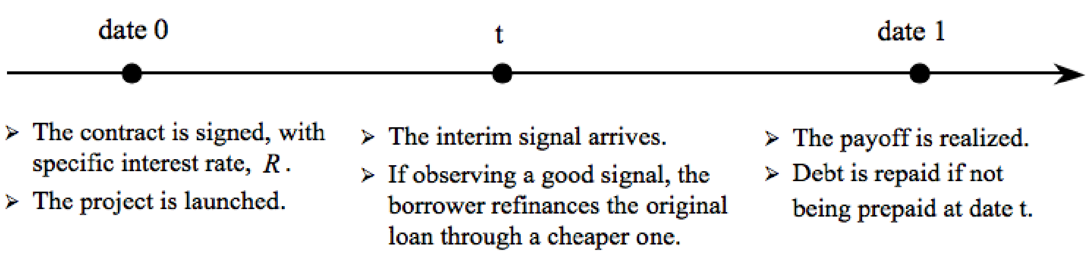
rate, R. The date 0 loan contract is a standard debt contract which matures at date 1. At maturity, the borrower pays R to the lender and keeps $U - R$ when no default occurs, and loses everything in default.

Payoff Structure of the Investment Project



The payoff structure of the project is illustrated in the figure, *Payoff Structure of the Investment Project*. The timeline of the model are illustrated in the figure, *Timeline of the Model*.

Timeline of the Model



At date 1, information is symmetric, the loan contract is signed and the borrower starts the investment. Then, at the interim date t *shortly* after the project is started but before the maturity date 1, the borrower gets a signal concerning the date 1 payoff of the project. As only the borrower can observe the signal, it is uncontractible. With probability p, the signal is good and otherwise, the signal is bad. Conditional on the good or bad signal, the probability of success of the project is g or b. In total, the date 1 payoff of the project is U with probability s and D with probability $1 - s$, where $s = pg + (1 - p)b$. Assume that the project has positive NPV ex ante, but negative NPV with the bad signal, i.e.

$$gU + (1 - g)D > sU + (1 - s)D > 1 > bU + (1 - b)D. \tag{1}$$

Assume that after privately observing the signal, the borrower is able to successfully convey it to the credit market. The ability of the borrower to communicate with lenders is a crucial assumption in the model.[8] The communication process can be thought of as follows. Before the investment is undertaken, the two contract parties agree on the initial contract based on rough information of the future payoff of the project. After the project starts, the borrower learns more product and market information, which helps her to better know the quality of the project. This is the case especially for small businesses and for new projects.[9]

With a good signal at date t, the original interest rate R is no longer *fair* in a competitive credit market. Then if the cost of prepayment is less than the benefit, the borrower has an incentive to prepay the original loan and refinance at better terms. In practice, motivations for exercising the prepayment option are wide-ranging. For mortgages, prepayments are mainly triggered by changes in market interest rates. In contrast, most C&I loans have floating rates, so the impetus to refinance is beyond changes of the market interest rates (Roberts and Sufi (2009) and Roberts (2010)). Roberts and Sufi (2009) find that the accrual of new information concerning credit quality and outside options is a strong predictor of the incidence of renegotiations including those for prepayments. I have introduced new information, i.e. the interim signal about changed credit quality, to the model. Further let

[8]Myers and Majluf (1984) assume that private inside information cannot be transmitted to investors. This is not inconsistent with my assumption here because, in their model, stock market investors are widely dispersed, while investors in my model are sophisticated and concentrated investors such as banks. To monitor and communicate with firms is one of the key features that distinguish banks from atomic investors, or bank loan markets from the other financial markets such as bond or public equity markets (see e.g. Diamond (1984)).

[9]The literature usually assumes that information concerning future payoffs of the project arrives continuously and steadily, for example, following a pre-specified stochastic process (e.g. in continuous-time models). In my model, much information comes shortly after the investment is launched. This should be a plausible assumption especially for new projects.

α be the costs of the borrower to access outside financing options. The refinancing costs reflect time and effort spent by the contracting parties in negotiating the new deal.

2.2 Prepayment and Credit Rationing

To start, consider the first-best case when the two contract parties perfectly commit to the original contract regardless of the signal. In a competitive credit market, the lender breaks even ex ante.

$$sR + (1-s)D = 1 \tag{2}$$

Given that the project has positive NPV ex ante, there is a unique solution to (2),

$$R^* = \frac{1}{s}[1-(1-s)D]. \tag{3}$$

With the interest rate, R^*, the project can be financed. Although the lender will have a loss, $(s-b)(1-D)/s$, with the bad signal, she will get a profit, $(g-s)(1-D)/s$, with the good signal. Ex ante, the expected loss equates the expected benefit and the lender breaks even. Therefore, with perfect commitment, the two contract parties are able to use only the loan interest rate to reach an agreement, leaving no space for non-price credit rationing.

However, perfect commitment is not credible if prepayments are penalty-free. Let us first assume that voluntary prepayments are penalty-free.[10] When observing the good signal, the borrower prepays the original loan as long as the refinancing costs are not too high to offset the benefits from the cheaper new loan. In this case, the lender cannot capture the high interest after t. The participation constraint changes to

$$p[t(R-1)+1] + (1-p)[bR + (1-b)D] = 1 \tag{4}$$

The left-hand of (4) includes two parts. The first part is the expected payoff to the lender with the good signal. Being prepaid at date t, the lender gets the accrued interest before t, $t(R-1)$, and the face value of the loan, 1. The second part is the expected payoff of the

[10] Below in section 4, I will discuss why prepayment penalties should not be included in C&I loan contracts.

lender with the bad signal. Rewrite (4) as

$$R = U + \frac{(1-p)\{1-[bU+(1-b)D]\} - p(U-1)t}{b+pt}. \tag{5}$$

Equation (5) shows that $R > U$, i.e. the loan cannot be fully prepaid at date t, as long as

$$t < \frac{(1-p)\{1-[bU+(1-b)D]\}}{p(U-1)}. \tag{6}$$

In the model setup, we assume that the signal arrives shortly after the project is started. Now let further assume that (6) is satisfied so that the lender can break even only when $R > U$. Such a high interest rate is not feasible to implement because the borrower will terminate the project after observing the bad signal. Suppose that the project will pay off zero if it is abandoned after a bad signal. In this case, the project is ex-ante not worth investing in, i.e., $p[gU + (1-g)D] < 1$. Then, conditional on a positive probability of prepayment, the participation constraint of the lender, equation (4), cannot be satisfied due to the prepayment risk. Increasing the interest rate alone is not sufficient to compensate the lender because, no matter how high the original interest rate is, the lender cannot capture the upside of the project while losing money in the downside. To make it attractive for the bank to lend money, it has to resort to non-price credit rationing.

Obviously, refinancing occurs if and only if

$$gR + (1-g)D > 1 + \alpha \tag{7}$$

The left-hand side of (7) is the cost of the borrower to keep the original contract, while the right-hand side is the cost to refinance the loan in a competitive credit market. Combine (2) and (7), we get

$$(g-b)(1-p)(1-D) > s\alpha. \tag{8}$$

This is the necessary condition for refinance or prepayment. From (8), the larger is s, D or α, the less likely is refinancing to occur, and so is credit rationing. In this paper, I focus only on the interesting case in which s, D and α are low enough so that equation (8) is always satisfied. The parameters s and D respectively capture default risk and loss-given-default risk, which are the principal credit risk factors according to Standard & Poor's (2009), while α captures competition and efficiency of the credit market.

Proposition 1: *If voluntary prepayment is penalty-free, some risky borrowers with positive NPV projects cannot get the loan they need even if they are willing to increase the interest rate, resulting in credit rationing. In general, more risky borrowers with lower refinancing costs are more likely to be credit rationed.*

For borrowers with high observed risk, the lender requires a high interest rate as compensation for potential losses in bad states. At the same time, the high interest rate induces the borrower to refinance the loan after observing a good signal. Thus, the promised payment from the borrower is not credible given that prepayments are penalty-free. Using only the interest rate, the two contracting parties cannot reach an agreement that both avoids prepayments and allows the lender to recoup her investment. Non-price credit rationing occurs in the sense of Tirole (2006).

In the model, no project being financed should be prepaid. It follows that no prepayment could occur in equilibrium. However, prepayments are widely observed in practice as discussed above. It seems that the model prediction here is not consistent with the reality. To see why, note that in my model, the necessary condition for credit rationing to occur is equation (8), in which the lender's loss is required to be sufficiently large with a bad signal. This is not always the case. If the loan size is small comparing to the asset size of the borrower, e.g. when the borrower has substantial initial net worth, the loan can be fully paid even after a bad signal, and the project can be financed despite penalty-free prepayments. More importantly, prepayments in practice occur for various reasons other than what I discussed above. For example, LBOs, MBOs and takeovers may also trigger firm recapitalization or debt refinance.

2.3 Non-price Instruments in Loan Contracts

For some risky borrowers, the interest rate alone is insufficient for the lender to recoup her investment due to prepayment risk. In this case, non-price instruments can be used to compensate the lender for prepayment risk. In this section, I consider the collateral requirement and discuss the use of other non-price instruments such as the loan size, maturity and covenants.

Collateral Requirement

Denote (R, C) as the contract where C is outside collateral.[11] Consider only the interesting case when the loan is risky, i.e. and $C \leq 1 - D$. Conditional on a positive probability of prepayment, credit rationing occurs, so any feasible contract should incentive-compatibly deter prepayments, i.e., be *renegotiation-proof.* This calls for the incentive-compatibility constraint of the borrower when the good signal is observed,

$$gR + (1-g)D \leq 1 + \alpha, \tag{9}$$

and the participation constraint of the lender is

$$sR + (1-s)(D + C) = 1. \tag{10}$$

Combining (9) and (10), we have

$$C \geq \underline{C} = 1 - D - \frac{s\alpha}{(1-p)(g-b)} \tag{11}$$

To finance the project, equation (11) has to be satisfied. That is, borrowers with less collateral than a minimum level $\underline{C}$ will be credit rationed. Although the above example concerns collateral, it can simply be expanded to net worth or the loan size. By pledging collateral, the required interest rate is reduced and hence the borrower has less incentive to strategically prepay the loan when observing a good signal. Thus, the use of collateral solves the time-inconsistency problem of financial contracting. From (11), we can derive the relationship between the collateral requirement and the observed borrower risk or refinancing costs. We get the following proposition.

[11] By definition, outside collateral is assets outside the firm. Implicitly, the borrower is assumed to pledge all inside collateral in the contract, which is limited as D in the model.

Proposition 2: *Borrowers with less collateral than $\underline{C}$ are credit rationed. To avoid rationing, ceteris paribus, the minimum requirement of collateral is higher with lower refinancing costs, α, higher default risk, $1 - s$, and a lower recovery rate in default, D.*

The conclusion in (11) is similar to that in the basic credit rationing model of Holmstrom and Tirole (1997) or Tirole (2006). Like them, I identify sufficient conditions for credit rationing and the minimum collateral requirement to finance the project. There are two key differences. First, in the one-period Holmstrom and Tirole (1997) model, implicitly the borrower commits to the original contract, but I allow for strategic prepayments to capture the dynamic behavior of the borrower. Second, I derive a positive correlation between borrower risk and the likeliness of credit rationing, which are not considered in Holmstrom and Tirole (1997).

Other Non-price Instruments to Mitigate Prepayment Risk

In addition to collateral, other non-price instruments also have the potential to mitigate prepayment risk. First, the use of collateral, is equivalent to lowering the loan size or requiring higher net worth. A smaller loan size or higher net worth relative to initial investment eases financing in two dimensions: first, the borrower's benefit from prepayment is lower, so prepayment is less likely to occur; second, the lender's loss with the bad signal is lower as well, so it is easier to get her investment paid back.

Second, as showed in the comparison in section 1, bank loans include more strict constraints on non-price instruments than bonds, for example, shorter maturity and more covenants. If debt maturity is short so that the accrued interest before the signal is relatively significant, the borrower has less incentive to refinance the loan. Hence, ceteris paribus, a shorter maturity may mitigate prepayment risk. This is consistent with the fact that C&I loans, mostly associated with a free-call option, typically have amortizing payment schedules while bonds, mostly without the free-call option, have balloon payment schedules. It is also consistent with the empirical observation on maturities of different types of debt. On average, traditional bank loans have the shortest maturities, and then syndicated loans, bonds and mortgages in turn. The dispersed ownership structure of bonds hampers renegotiation and prepayment, allowing for longer maturity. A similar reason holds for syndicated loans that have multiple lenders and incur higher refinancing costs than traditional bank loans. For mortgages, the story is a little different. Prime mortgages are fully secured and hence almost risk-free, so prepayment in our context is not a relevant issue, while subprime mortgages usually carry penalties to reduce prepayment risk. Debt covenants can lock lenders' loss in default, reducing information asymmetry and hence also mitigating prepayment risk.

Finally, bank loans usually have floating rates, amortizing payment schedules, and seniority. The non-price instruments compensate bank lenders for the free-call option. When bond holders face lower prepayment risk, the constraints on non-price instruments are relaxed.

2.4 Non-linear Loan Pricing - the use of Upfront Fees

For some borrowers, the non-price instruments are constrained or too costly. For example, collateral may be limited, maturity cannot be reduced further or covenants are exhausted. If the residual risk of the borrower is still high after controlling for the non-price instruments, the price of the loan is high, and so is prepayment risk and the probability of credit rationing. When this is the case, a non-linear pricing approach can be employed to finance the project, in which the loan price is split into two parts: the linear part paid annually (the interest rate) and the non-linear part paid as a lump-sum (fees). One example of a lump-sum fee is the upfront fee, which is a one-time fee most often collected at the closing of the transaction.

As part of the loan price, the upfront fee is also a monetary transfer from the borrower to the lender. Typically, the upfront fee is thought of as compensation for the lender's fixed costs to arrange the loan. That is, the fixed contracting sunk costs are reimbursed before any amount is paid out.[12] If this is the case, why is the upfront fee not included in the interest? I argue that the upfront fee can be used to mitigate prepayment risk and hence non-price credit rationing.[13] Denote the loan price as R' and the upfront fee as δ. Ignoring the non-price

[12] The literature also suggests that loan commitments (or revolver credit loans) use a combination of various fees, e.g. annual fees, utilization fees and commitment fees, and loan rates to screen borrowers (Thakor and Udell (1987) and Shockley and Thakor (1997)).

[13] One may think that the use of upfront fee is also an indication of credit rationing in the sense that not only the interest rate is used to ration credit. Note that in the paper, credit rationing means *non-price* credit rationing. Since the upfront fee is a part of the loan price practically, the use of an upfront fee is not considered as non-price credit rationing.

contract variables, the loan contract now is (R, δ) where $\delta + R = R'$. Since (R, δ) includes the residual cost of the loan after controlling for the non-price variables, it satisfies the participation constraint of the lender. Renegotiation proof calls for the borrower's incentive constraint, (9). Combining with $R' = \delta + R$, we have

$$\delta \geq \underline{\delta} = R' - \frac{1}{g}\alpha + \frac{(1-g)D - 1}{g} \tag{12}$$

From this inequality, we have the following proposition:

Proposition 3: *An up-front fee can be employed to reduce the interest rate and hence to eliminate non-price credit rationing. Ceteris paribus, the minimum up-front fee is higher with a lower refinancing cost and a higher loan price.*

Below, I will test this proposition using a sample of term loan contracts from the LPC DealScan Database, where the information on upfront fees is available.

3 Empirical Evidence

The model generates a couple of predictions in Proposition 2 and 3 concerning the use of collateral and upfront fees, which can be tested using data on bank loan contracts. In the following, I will empirically test the implications for the use of upfront fees. The use of collateral has been extensively studied in the literature and the extant empirical evidence is largely consistent with Proposition 2.[14] I will not test the use of collateral for the following reasons. First, the DealScan database lacks of the collateral-to-debt ratio and the type of collateral (outside or inside collateral, or real estate or inventory) for each loan. The results may be biased (Berger, Frame, and Ioannidou (2011a)). Second, collateral and the loan price are simultaneously determined, so a single-equation test may include simultaneity bias (Brick and Palia (2007)). Even if using a a simultaneous equation approach, the choice of exogenous controls is a big challenge.

[14] See **?** for a survey of the empirical literature.

3.1 The Use of Collateral

Collateral is a widely observed debt feature, while the underlying motivation for collateral is not well understood (Berger, Frame, and Ioannidou (2011b)). Especially, it is not clear how borrower risk affects the use of collateral. Proposition 2 concludes that the use of collateral is positively correlated with "observed" borrower risk, captured by s and D in equation (11). This is in line with a branch of models in the literature that argues for the *disciplinary* role of collateral to mitigate ex-post moral hazard problems, e.g. Stulz and Johnson (1985), Boot, Thakor, and Udell (1991) and Holmstrom and Tirole (1997), etc. In general, these models also predict that more risky borrowers are required to pledge more collateral. Consistent with this prediction, the empirical literature does find a positive relationship between collateral use and observed borrower risk (e.g., Berger and Udell (1990)). An obvious case is that loans in leveraged markets are usually secured while those in investment-grade markets are not.[15]

Nevertheless, the borrower's risk may also include a hidden component when asymmetric information is present. There is another branch of literature arguing for the *signaling* role of collateral to solve the adverse selection problem through risk-sorting (e.g., Bester (1985, 1987), Besanko and Thakor (1987a,b), etc.). In the signaling models, good-quality borrowers pledge more collateral to signal their types so that collateral use is positively associated with *unobserved* borrower risk.

To sum up, in the presence of asymmetric information, the relationship between collateral use and borrower risk is determined by two opposite effects: borrowers with higher observed risk has to pledge more collateral due to higher prepayment risk; borrowers with lower unobserved risk pledge more collateral to signal their type. Most empirical studies test the two effects separately. In general, the negative signaling effect is difficult to test because we lack of good proxies for hidden risk. Berger, Frame, and Ioannidou (2011a) find empirical evidence of the two opposite effects by employing an excellent dataset in Bolivia credit markets.

In addition, Proposition 2 predicts that the use of collateral is negatively correlated with refinancing costs. In the past two decades before the 2007-2009 financial crisis, excess liquidity in credit markets intensified competition among banks and other institutional investors,

[15]By definition, investment-grade loan markets contains loans to companies rated BBB- or better, and leveraged loan markets contains loans to companies rated BB+ or worse.

which significantly reduces refinancing costs. This may explain the fact that an increasing number of loans, especially those for small and medium businesses, are secured over time.[16]

3.2 The Use of Upfront Fees in Term Loans

In practice, unlike bonds which compensate lenders through interest payments alone, bank loans frequently employ a non-linear pricing approach. That is, the total cost of C&I loans has two parts: interest (an annual rate over the LIBOR rate or the prime rate) and fees such as an upfront fee paid by the borrower as a lump-sum. In this section, I examine the use of upfront fees using data on individual C&I bank loans. Unlike collateral, fees are rarely studied in the literature. Shockley and Thakor (1997) argue that fees can be used as a screening device to sort borrowers. In their model, the good borrowers are more likely to draw down their loan commitments, so a commitment fee on the unused balance may screen out the bad borrowers. They provide empirical evidence to support this screening effect of fees. To exclude such a screening effect, I focus on term loans instead of loan commitments. Term loans are almost always fully drawn down, so the screening effect in the sense of Shockley and Thakor (1997) is trivial.

3.2.1 Hypotheses

Proposition 3 suggests that an upfront fee can be used to mitigate prepayment risk and ease borrowing. From equation (12), ceteris paribus, loans with higher prices, which are an indicator for the borrower's willing to prepay, and loans with lower refinancing costs require higher upfront fees. I test the following hypothesis:

Hypothesis I: The size of upfront fees is positively correlated with the loan price and negatively correlated with refinancing costs.

[16]The National Survey of Small Business Finance (NSSBF) conducted in 1998 revealed that, for 30.3% of the loans, business (or inside) collateral had to be provided. In 2003, the use of business collateral increased to 45% of the loans granted. In addition, the NSSBF of 2003 shows that for 53% of the loans granted personal (or outside) collateral was pledged, while in the NSSBF of 1987 only 28% of the loans required personal collateral pledging. See Steijvers and Voordeckers (2009) for more details.

The test is simply specified as

$$UpfrontFee = \beta_0 + \beta_1 * LoanPrice + \beta_2 * RefinancingCost + \gamma * \mathbf{X} + \epsilon. \tag{13}$$

where $\mathbf{X}$ is a set of control variables. From proposition 3, β_1 in equation (13) should be positive and β_2 should be negative. Typically the upfront fee is thought of as compensation for the fixed costs of the lender associated with originating the loan. For example, the largest part of the upfront fee for a syndicated loan goes to the lead arranger as compensation for structuring the loan. If this is the only role of the upfront fee, it should not be correlated with the loan price after controlling for other loan characteristics. Therefore, a positive β_1 indicates that the role of the upfront fee goes beyond compensating the lender for fixed costs associated with the loan origination.

3.2.2 Data and Samples

The data used to test the hypothesis are taken from the LPC DealScan Database. Each observation corresponds to a separate loan agreement. Most loans in the database are senior, secured and syndications for medium and large size firm borrowers. While the database does not contain all loans that were made, it records the majority of major new loans made to public firms in the United States.[17] Since becoming available in 1987, the database has been progressively more comprehensive during later periods.

I start with all term loans in DealScan issued by U.S. borrowers between January 1987 and October 2011. I exclude loans to regulated and financial industries, identified with the 2-digit SIC 40-45, 49, 60-69, and 90-99, and loans with negative interest spread. In the data, there are term loans with an upfront fee hundred times higher than the all-in-spread, which by definition is the total annual cost of the loan including the loan interest spread and annualized fees. To exclude potential outlier bias, I trim the ratio of upfront fee to all-in-spread at the 1% and 99% levels. This results in a total of 64,555 term loans, which I refer to as the "DealScan sample". To obtain borrower accounting information, I link DealScan with Compustat to construct the "DealScan-Compustat sample", which includes 14,113 term

[17]According to Carey and Nini (2007), Dealscan has information on 50-75% of all U.S. commercial loan volume into the early 1990s, with coverage increasing to 80 -90% from 1992-2002.

loans from Sample 1 with borrower information in Compustat.[18]

3.2.3 Variable Description

All variables are defined and described in Table 1. The dependent variable is the upfront fee, $UfFee$, measured in basis points (bps). Around 17% of the observations in the "DealScan sample" include an upfront fee. The mean and median of $UfFee$ are 84 bps and 65 bps respectively. My main interest is the effect on the size of the upfront fee from prepayment risk, or the loan price and refinancing costs. As discussed above, it is the high interest rate that induce prepayments and hence credit rationing. Thus, I use the loan interest spread, $Spread$, as the proxy for the loan price.[19] The interest spread of loans in the "DealScan sample" has an average of 271 bps and a median of 250 bps. I use a dummy, $Synd$, which indicates whether or not a loan is syndicated, as a proxy for the refinancing costs. Syndication loans have multiple lenders and are considered to be associated with higher refinancing/renegotiation costs compared with traditional bank loans. These refinancing costs include bank syndication fees, legal and accounting costs and management time to structuring and syndicating the facilities in general (see e.g., Bolton and Scharfstein (1996), Brunner and Krahnen (2008)). In the "DealScan sample", 85.8% of the loans are syndicated.

I control for a large set of variables including non-price loan characteristics, borrower characteristics and market conditions, which are commonly used in the empirical literature (e.g. Ivashina (2009)). The summary statistics are given in Table 2. Non-price loan characteristics include log of the loan amount ($LogDeal$ and $LogTran$) in million U.S. \$,[20] maturity ($LogMatu$) in months, and a set of dummy variables indicating the status of security ($Secu$), whether or not the loan has a third-party guarantor ($Guar$), whether it includes

[18]I thank Michael Roberts for providing the link data between DealScan and Compustat which is first used by Chava and Roberts (2008).

[19]One may consider the all-in-spread as a proxy for the loan price. In the data, the upfront fee is a part of the all-in-spread, so the two should be positively correlated regardless of whether prepayment risk plays any role in their relationship. For this reason, I choose the interest spread instead of the all-in-spread.

[20]A loan deal in DealScan usually includes multiple tranches, for example, term loans (term loan A, B, C...) and revolving credit lines. Although my tests concern only term loans, the size of the deal including both term loans and revolvers may also have impact on the default risk of the loan. Thus, I include the deal size as a control variable.

covenants ($Cove$), performance-pricing property ($PPricing$)[21] or financial ratios ($FRatio$),[22] and whether it is a refinance loan ($Refin$) or an amendment loan ($Amend$).[23] These non-price loan characteristics have available data in DealScan. They affect the default risk and the prepayment risk of the loan and hence have impact on the use of upfront fees.[24] Usually, these non-price features of the loan are fixed before the syndication process. This justifies the use of the non-price loan characteristics as control variables (Ivashina (2009)).

I also control for the dummies for loan types (ITL) and loan purposes ($Purpose$). I categorize term loans into two types: traditional term loans ("term loan A") and institutional term loans (ITLs: term loan B, C, D, etc). A large proportion of institutional term loans are sold in the secondary markets, while traditional terms loans are mostly held by the originators. This difference may have potential impact on loan renegotiation and hence on the use of upfront fees. Furthermore, the dummy ITL co-moves with Syn. In the "DealScan sample", for non-syndicated loans, only about 3% are institutional, while more than 21% of syndicated loans are ITLs. To exclude the effect due to the co-movement of the two dummies, I include an interaction term, $SynITL = Syn * ITL$, in the regressions. Following Carey, Post, and Sharp (1998), loan purposes are categorized into four groups: general purposes ("working capital" and "general corporate purpose"), recapitalization ("debt repayment/consolidation", "recapitalization", and "debtor-in-possession loan"), acquisition ("general or specific acquisition program" and "LBO loans") and others.

Borrower characteristics include log of borrower sales ($LogSales$) in million U.S. $ and dummy variables indicating whether the loan has a credit rating ($Rating$) and whether the loan is from a public firm ($Public$). These three variables are commonly used as proxies for in-

[21]Performance pricing explicitly makes the interest charged on a bank loan a function of the borrower's current credit rating or of their financial ratios such as debt-to-EBITDA, leverage, or interest coverage by having the interest rate in the contract vary directly with changes in measures of financial performance (see e.g. Asquith, Beatty, and Weber (2005)). In so doing, performance pricing expands the importance of accounting information in debt contracts and potentially reduces the contracting costs of private debt.

[22]Loans in DealScan may include financial covenants that set constraints on financial ratios including leverage, fixed charge coverage, interest rate coverage, and cash flows. Thus, the variable $FRatio$ to some extent reflects borrower risk.

[23]Most loans in Dealscan are not the initial originated loan but refinanced or amended loans.

[24]Seniority is also an important loan characteristic. In DealScan, almost all loans are senior (more than 99.7%), so I do not include seniority as a control. Robustness check (not reported in the paper) shows that seniority has no any substantial influence on the results.

formation asymmetry. In regressions using the DealScan-Compustat sample, I further control for borrower risk measured by book leverage ($Leverage$), borrower's investment opportunities proxied by market-to-book ratio (Q), profitability ($Proft$), and tangibility ($Tangb$).[25] I also use total assets ($LogAssets$) from Compustat instead of sales from DealScan to measure firm size, because a large proportion of observations of the sales information from DealScan is inconsistent with that from Compustat. Following Roberts (2010), the borrower characteristics are defined as follows. Book leverage is defined as total debt divided by total assets, where total assets use the item, "Total Assets", in Compustat and total debt is defined as the sum of "Long-Term Debt" and "Debt in Current Liabilities". Market-to-book ratio is defined as the sum of the market value of equity and total debt divided by total assets. It measures the future investment opportunities, which should have a negative effect on the use of upfront fees. Profitability is measured by return on assets, equaling to "Operating Income Before Depreciation" divided by total assets. Tangibility is defined as the net PP&E to total assets ratio.

Finally, the regressions also include the year dummies and industry dummies to control for market conditions. There are 63 industry dummies using the 2-digit SICs excluding regulated and financial industries.

3.2.4 Tests and Results

In the "DealScan sample", around 17% of the term loans include an upfront fee, which is approximately 32% of the all-in-spread of these loans. For the other 83% of the loans, the item for upfront fee contains a missing value (marked as "N/A"). According to the LPC customer service, when no data was collected or provided for the upfront fee item, LPC leaves it as a "N/A". This motivates me to check whether the missing values of the upfront fee in DealScan are zero upfront fees or random missing values. I then split the "DealScan sample" into two subsamples. One contains all the observations with missing upfront fees, while the other contains all observations with non-missing upfront fees. Table 3 presents the difference-in-difference tests between the two subsamples. The results show that the two

[25] I also run regressions (results not reported in the paper) using credit rating score ($Score$) as the measure of borrower risk. Credit rating score is a discrete variable, equaling 1 for S&P rating "AAA", 2 for "AA+", 3 for "AA", and so on. The number of observations reduces a lot, but the results have no substantial change.

subsamples are significantly different. This suggests that a "N/A" for the upfront fee variable in DealScan does not necessarily mean a random missing value. To allow for the possibility that "N/As" for the upfront fee item in DealScan include both random missing values as well as zero upfront fees, I run two OLS regressions by considering "N/As" as zero upfront fees ("OLS Model 1") and random missing values ("OLS Model 2") respectively, and a Logit regression ("Logit Model") by replacing "N/As" with zeros and the non-"N/As" with ones.

The results are reported in Table 4. In the first regression, the "OLS Model 1", the coefficient for prepayment risk ($Spread$) is significantly positive at the 1% level. A 100 bps increase in the interest spread is associated with a 5.3 bps higher average upfront fee. This is consistent with the model prediction that a higher prepayment risk requires high lump-sum fees to compensate the lender up front. The coefficient for syndicated loans, Syn, is negative and significant also at the 1% level, suggesting that syndicated loans are less likely to include an upfront fee (vs. traditional bank loans). This supports my conjecture that loans with higher refinancing costs have lower prepayment risk and hence require lower upfront fees. The coefficient for Syn shows that on average, a 8 bps lower upfront fee is required for a syndication loan than a comparable traditional bank loan. This contradicts with the traditional view that upfront fees are used to compensate the lender for only fixed costs associated with originating the loan.

Several of the other variables also have an effect on the size of the upfront fee. The upfront fee tends to be lower for refinance loans ($Refin$), possibly because the prepayment risk is lower after the loan has been renegotiated. The tranche size ($LogTran$) and the deal size ($LogDeal$) both enter the regression with a positive coefficient. Larger loans in general have a higher prepayment risk and hence require higher upfront fees. Maturity ($LogMatu$) has a significantly negative effect, while security ($Secu$) and financial ratios ($FRatio$) have a significantly positive effect. Because these three variables are also correlated with borrower risk, the significant effects may reflect the other risk factors than the prepayment risk.

In the Logit Model, the effects from prepayment risk and refinancing costs are both significant and have the same direction with those in the "OLS Model 1". A 100bps increase in the interest spread increases the probability of the loan to include an upfront fee by 0.13, and a syndicated loan has around 0.46 lower average probability to include an upfront fee than a traditional bank loan. In the "OLS Model 2", the coefficient for *Spread* is significantly positive with a much higher magnitude (17 bps) but for *Syn* is insignificant.

To control for more borrower characteristics, I further run similar regressions on the DealScan-Compustat sample. The results are reported in Figure 5. After controlling for more borrower characteristics, the effects from *Spread* and *Syn* are still significant and consistent with those found on the DealScan sample. The DealScan-Compustat sample includes larger firms compared to the DealScan sample. That is, the significant results hold even when limiting the sample to large firms. Furthermore, for the DealScan-Compustat sample, firm profitability ($Proft$) in the Logit Model and firm size ($Logassets$) in the "OLS Model 1" have significantly negative effects. Ceteris paribus, firms with higher profit and/or larger assets are less likely to end up with the downside, so credit rationing is less likely to occur and hence the upfront fee is less demanded.

3.2.5 Extensions

The Influence of the 2007-2009 Financial Crisis

The financial crisis between 2007 and 2009 had a significant influence on the credit markets, e.g. both the level of loan prices and the design of loan contracts. After the crisis occurred in 2007, the economy continues recovering but loan prices are still at historically high level. In this economic climate, new issued loans have higher probability to prepay due to potentially improved credit quality in the future. This makes prepayment risk of even greater concern for the lender. Note that in my model, when the net future interest payment at t exceeds the refinancing cost, the borrower will prepay the loan. Thus, any increase in the loan price should translate into an increase in the upfront fee, while the interest spread over some range is relatively sticky due to credit rationing. I thus conjecture that the effect on the use of upfront fee from prepayment risk should be much more profound during and after the financial crisis.

Hypothesis II: prepayment risk has greater influence on the use of upfront fees in the period of financial crisis.

To test Hypothesis II, I construct a dummy variable, *Crisis*, which equals one in 2007-2011. I also include in the regressions an interaction term between *Crisis* and *Spread*, $SprCrs = Crisis * Spread$. In this specification, the year dummies are excluded. Table 6 and 7 report the results. Again, the size of upfront fees is positively correlated with the loan spread (*Spread*) and negatively correlated with refinancing costs (*Syn*). As predicted by Hypothesis II, the loan spread has a significantly greater impact on the size of upfront fees since the financial crisis. In the period 1987 to 2006, a 100bps increase in the loan spread increases the upfront fee by 9bps, while it increases the loan spread by 34bps between 2007 and 2011. The other regressions give similar results. In sum, the marginal effect of the loan spread in the period between 1987 and 2006 on average triples that in the period between 2007 and 2011. This finding confirms Hypothesis II.

Beyersdorf and Palacios (2008) report that during and after the 2007-2009 financial crisis, some C&I loans have call provisions or have original issue discounts (OIDs) in pricing, i.e. sell below par.[26] The discount from par in the new issue market is offered as a spread enhancement (Standard&Poor's (2009)). For example, a loan may be issued at 99 bps to pay par. Thus, the OID plays a similar rule to an upfront fee in deterring prepayments.

Revolver Credit Loans

A syndicated deal contract may include multiple tranches, e.g., a revolver credit line, a term loan A, a term loan B, etc. The above analysis considers only term loans. Another common form of loans is a revolving credit, which is a line of credit where the customer pays a commitment fee and is then allowed to use the funds when needed. Corporate revolving credit facilities are typically used to provide liquidity for a company's day-to-day operations. Except upfront fees, most of the loan characteristics within a deal such as amount, spread and maturity are specified at tranche levels. In DealScan, if an upfront fee is charged on the entire amount of the deal, LPC will put that fee only on the revolving credit. Then the above regression results using only term loans may be biased if many term loans miss the upfront fee information only because they are issued together with a revolving credit.

[26] Denis Beyersdorf and Luis Palacios, 2008, *Overview of DealScan Data, a Joint Presentation by Thomson Reuters and WRDS*, available at `https://wrds-web.wharton.upenn.edu/wrds/ds/dealscan/company/index.cfm`.

To identify such an effect, I first check whether the sharp drop of the number/proportion of term loans with upfront fee information in the 2004-2011 period is because most term loans are issued with a revolver credit line that includes an upfront fee. Figure 1 reports the proportion of both revolvers and term loans with upfront fee information in the data. From the figure, we see that the proportions exhibit a similar pattern over time. I then check two ratios: one is the ratio of the total number of revolvers to that of term loans; the other is the ratio of the number of revolvers with upfront fee information to that of term loans with upfront fee information (see Figure 2). Although the two ratios and their differences vary over time, it is not clear whether these differences are significantly different.

I further run several regressions to control for a potential bias considering the following. I first include both term loans and revolver credit lines (both "Revolver/Line >= 1 Yr." and "Revolver/Line < 1 Yr." in DealScan) in the regressions. The starting sample now has 64,555 term loans and 22,143 revolver credit lines. Table 8 and 9 report the results. Second, if a term loan has no upfront fee information in the "DealScan Sample" but accompanied by a revolver credit line in the same deal that includes an upfront fee, I take the upfront fee of the credit line as that for the term loan and then run the regressions. The results are reported in Table 10. In these regressions, the results are consistent with those in Table 4 and 5. This shows that the effect from putting the upfront fee for a deal only on the credit line of the deal does not change our main conclusions concerning the use of upfront fees.

4 Why Prepayments Are Penalty-free?

So far, I document that, for borrowers with high observed risk and low refinancing costs, non-price instruments and/or lump-sum fees are necessary to incentive-compatibly deter prepayments and hence eliminate credit rationing. However, the use of non-price instruments such as collateral may trigger some additional costs (see e.g. Berger, Frame, and Ioannidou (2011b)). First, if the lender and the borrower have divergent valuations of the pledged assets, there is a deadweight loss due to the inefficient delivery of collateral in default (Barro (1976)). Second, the borrower loses the full control of the pledged assets to the lender, and may not be able to make the best use of these assets. Finally, the lender bears costs of screening, monitoring and repossessing the pledged assets. Compared to collateral, lump-sum fees for liquidity constrained firms are even more costly, a shortened maturity is associated with higher roll-over costs and restrictive covenants reduce borrower's financial flexibility.

It is natural to think of a prepayment penalty as a substitute for the non-interest terms to reduce inefficiency. In practice, however, most private debt agreements do not carry any prepayment penalty, while non-price instruments are widely observed debt features. This suggests that keeping the option of penalty-free prepayments for the borrower in C&I loans must be a rational choice of the contract parties. To my knowledge, no other paper discusses this issue in the literature. I make the first attempt to fill this gap in this section. It is worth noting that the main predictions of the model are materially independent of the reasons for penalty-free prepayments.

4.1 Financial Flexibility

The option of penalty-free prepayments grants the borrower financial flexibility to capture valuable future investment opportunities and hence to maintain her competitive advantage in the product markets. According to Graham and Harvey (2001), among all factors that affect firm's financing policy, CFOs value financial flexibility the most.

Beyond the simple purpose of replacing the current loan by a cheaper loan, prepayments may occur for other reasons, e.g. the arrival of new investment opportunities and takeovers, or the change of the previous business plan adapting to the uncertain competitive environment. Therefore, although a penalty can eliminate prepayment risk due to the borrower fleeing to cheaper funding, it imposes additional costs on the borrower to make new investments and to modify business plans . One could consider a penalty contingent on the purpose of prepayments. This is the case in mortgage markets, where refinancing due to home movements can be easily separated from those due to changes of the market interest rate. However, it is generally difficult and costly for the lender to distinguish the purposes of prepayment for C&I loans. Consequently, to avoid inappropriately penalizing refinancing with other purposes than fleeing to cheaper funding, the optimal choice is to exclude prepayment penalty in the contract ex ante.

Moreover, the option of penalty-free prepayments enables the borrower to mitigate agency problems, e.g. a debt overhang (Myers (1977)) and risk-shifting (Jensen and Meckling (1976)). If prepayment is not possible or charged with high penalties, the borrower may have to pass up some positive NPV projects that reduce borrower risk. That is, the borrower may choose only the risky projects or pursue asset substitution. Then over time, such a "reclassification effect" of project selection leaves the lender with only risky borrowers. If prepayments are penalty-free, the borrower may restructure the loan at any time to fit Instead of prepayment penalty, non-price instruments such as collateral mitigate risk-shifting.

Given that both non-interest terms and prepayment penalties are costly, there is a trade-off between the two dimensions of financial flexibility: callability and constraints on the non-price loan instruments. The option to call the loan freely at any time has important value for firms with large growth opportunities and firms facing intensive competition. For these firms, non-pricing credit rationing is a way to grant the borrower the call option, while compensating the lender with seniority, security, restrictive covenants, etc. For the largest firms with few investment opportunities and in less competitive industries, the gain from the free-call option cannot offset the costs from the restrictions on the non-price instruments. For these firms, it is optimal to give up the free-call option to relax restrictions on the non-price instruments and instead rely on bond markets as a main funding source.

4.2 Adverse Selection

Adverse selection could be another reason to allow for penalty-free prepayments. The credit rationing model in Section 2 assumes ex-ante symmetric information. Now consider ex-ante asymmetric information concerning the quality of the project. Following our model setup, let further suppose that there are two types of projects, the H-type and the L-type, which differ only in the probability of the good signal. The H-type has a date t good signal with probability h, while the L-type has a date t good signal with probability l. Let the proportion of the H-type be λ and of the L-type be $1 - \lambda$. Then the average project has a probability of success, $p = \lambda h + (1 - \lambda)l$. For simplicity, assume that the accrued interest before t small and hence can be ignored. Let the contract be (R, C, d), where d is the prepayment penalty. In the pooling equilibrium, the lender's participation constraint is still (10). The borrower's incentive constraint is binding as

$$gR + (1-g)(D+C) = 1 + \alpha + d. \tag{14}$$

Ex ante, the expected payment of the H-type is

$$Q_H = 1 + \frac{h-s}{g-s}(\alpha + d) = 1 + \frac{h-s}{s}(1 - D - C). \tag{15}$$

Given (15), we can see that the H-type will always prefers collateral to penalty. Similarly the L-type always prefers penalty to collateral. Intuitively, prepayment penalty penalizes the H-type more than the L-type because it triggers only in good states, while collateral penalizes the L-type more than the H-type because it delivers only in default. Therefore, prepayment penalty in a loan contract results in adverse selection, but collateral do not. In a competitive credit market, any contract that pools different risks should exclude prepayment penalty.

The conclusions here are based on imperfect risk-sorting or at least partial-pooling. If a family of incentive-compatible contracts can be designed to separate the risk (Rothschild and Stiglitz (1976)), there is neither adverse selection nor cross-subsidization and credit rationing. For example, collateral (Bester (1985), Besanko and Thakor (1987a,b), etc.) and fees (Thakor and Udell (1987) and Shockley and Thakor (1997)) can be the sorting devices. If the contract with collateral does sort out the risk perfectly, penalties can be used to deter prepayments. In this sense, the above argument here is based on imperfect risk-sorting. There are reasons undermining risk-sorting. For example, adverse selection and moral hazard may coexist (Stiglitz and Weiss (1992)), borrower types are very close to each other, sorting devices such collateral are costly and constrained for some borrowers, or the proportion of the L-type of borrowers is relatively small, etc.

In the literature, Stiglitz and Weiss (1981) also illustrates how credit rationing can occur due to adverse selection. There are at least two key differences between the Stiglitz and Weiss (1981) model and mine. *First*, adverse selection in the Stiglitz and Weiss (1981) model is driven by increasing the interest rate or the collateral requirement (Wette (1983)). To reach this conclusion, they assume that the expected return of the L-type is a mean-reserving spread of that of the H-type. When increasing the interest rate, the H-type drops out of the borrower group first resulting a hump-shaped expected return function of the lender. However, in my model, the H-type first-order-stochastic-dominates the L-type. Then when increasing the interest rate, it is the L-type who drops out first, so there is neither adverse selection nor credit rationing (De Meza and Webb (1987); Su (2011)). Instead, adverse selection occurs if the loan contract includes a prepayment penalty. *Second*, I consider debt refinance to capture the dynamic behavior of the two contract parties. As renegotiation and prepayments are widely observed in practice, I believe that the time-inconsistency problem has substantial influence on the design of loan contracts. The Stiglitz and Weiss (1981) model is a one-period model, so renegotiation is irrelevant.

4.3 Time Inconsistency

Although prepayment penalty is rarely observed in practice, upfront fees are relatively common as shown in the previous section. By construction, the upfront fee reduces the interest payment similar to a prepayment penalty paid in advance. To illustrate the point, let us analyze the difference between the use of prepayment penalty and upfront fees. Assume a project specified as in Subsection 2.1, with an initial loan that has a face value of "1". To simplify our analysis, assume that there is no refinancing cost, no accrued interest before t, and no uncertainty after t. The last assumption ensures $g = 1$, $b = 0$ and $s = p$. In the following table, the payment schedules of three different types of contracts are compared conditional on the good signal.

Payments to the Lender Conditional on the Good Signal

Contract	**Face Value**	**Date 0**	**Date t**	**Date 1**
Perfect Commitment	1	0	0	R^*
With Penalty	1	0	$1+\gamma$	0
With Upfront fee	1	δ	1	0

The first contract represents the first-best case with perfect commitment. The other two contracts include a prepayment penalty and an upfront fee, respectively, to compensate the lender for prepayment risk. Ex ante, the lender's expected loss conditional on the bad signal is $(1-s)(1-D)$, so the lender has to be compensated with the same amount when the signal is good. This can be done through an interest rate, R^*, in the first-best case, a prepayment penalty, γ, or an upfront fee, δ. Note that $R^* - 1 = \gamma = \delta = (1-s)(1-D)/s$. That is, the only difference between prepayment penalty and the upfront fee for the lender is when the "cost" of prepayment is charged.

What is the difference for the borrower between paying the "penalty" at the time of prepayment and paying in advance? One possible reason for paying the upfront fee in advance is that it reduces the loan size. As a result, the borrower has to invest more internal funds or exert more effort to achieve the optimal investment level. A lower loan amount is associated with a lower interest rate and hence lower prepayment risk. Prepayment penalty does not have such an effect. More importantly, prepayment penalty induces the time-inconsistency problem in the sense that ex-ante optimal contract may not be optimal ex post (Kydland and Prescott (1977)). When the contract is signed at date 0, the future payoff of the project is uncertain so that the risk premium including both fees and interest is *forwarding-lookingly* fair. In contrast, when the signal arrives, the borrower has better outside options and hence more bargain power. If the lender rejects prepayments or renegotiations and still forces the borrower to pay the currently unfairly high interest, the lender might lose a good reputation. To maintain a good reputation and keep a good borrower-lender relationship, the lender prefers an upfront fee to a penalty as compensation for the option of prepayments. In an extreme case for small businesses, if the borrower is denied to prepay the loan, she might choose to walk away (e.g., Hart and Moore (1994)). This may force the lender to accept prepayments ex post and then induce credit rationing ex ante for borrowers with severe hold-up problems. The influence of human capital is larger for small firms and firms with high R&D investment, especially start-ups. For this reason, venture capital widely uses non-compete and vesting provisions to mitigate hold-up problems (e.g., Kaplan and Strömberg (2003)).

4.4 Debt Prepayment Penalties in Practice

In practice, different debt forms, especially those with high interest rates, exhibit specific properties to deal with prepayment risk.

C&I Bank Loans

C&I bank loans rarely include prepayment penalty, but the competitive bid loan is an exception. Competitive bid loans cannot be prepaid without lender consent. A competitive loan is typically requested within a loan commitment by the borrower. Each lender in the syndication has the option, but not the obligation, to propose an amount and interest rate in response to the request. Unlike traditional revolving loans, the competitive bid loan is made only by the winning lender. According to Taylor and Sansone (2007), competitive bid loans are typically available only to large, investment grade borrowers and have a limited loan amount for each lender. On the one hand, these loans are priced at thin spreads over a base lending rate, so the prepayment risk is trivial. On the other hand, the borrowers have relatively low future investment opportunities so that the free-call option is not of great importance for them. As a result, competitive bid loans almost always forbid prepayments or include penalties. The penalties probably compensate the lender for reinvestment risk.

Moreover, institutional term loans occasionally contain a prepayment penalty. Unlike traditional term loans which have an amortizing payment schedule, ITLs usually have balloon payment schedules and hence are associated with higher prepayment risk.[27] A small proportion of ITLs includes prepayment penalties typically set on a sliding scale, for instance, 2% in year one and 1% in year two (Standard&Poor's (2009)). Finally, some ITLs with the free-call option are traded at a discount in the secondary market. This discount is equivalent to an upfront fee of the same loan traded at par. ITLs are usually issued by large firms for which financial flexibility and adverse selection are not crucial, so penalties or discounts are feasible to deter prepayments.

In addition, after the 2007-2008 financial crisis, the economy continues recovering but loan prices are still at historically high level. In this situation, new issued loans have higher probability to prepay due to potential improved credit quality in the future, which makes it difficult for the lender to deal with prepayment risk. We thus can see that some C&I loans have call provisions, including prepayment penalties, or have original issue discounts (OIDs) in pricing. The discount from par at loan is offered in the new issue market as a spread

[27] In a balloon payment schedule, most of the debt is paid only towards the end of the agreement. The debt is inflated like a balloon due to compound Interest accumulating on the large sum.

enhancement (Standard&Poor's (2009)). For example, a loan may be issued at 99 bps to pay par. The OID plays an equivalent rule to an upfront fee in deterring prepayments.

Finally, syndicated loans have multiple lenders and thus are associated with higher refinancing or renegotiation costs, allowing for higher interest rates. For this reason, syndications are more likely distributed to leveraged borrowers with speculative credit grades comparing to traditional bank loan borrowers to investment-grade borrowers.

Mortgage Bank Loans

Although most C&I bank loans are callable without penalty or premium, this is not the case for mortgage bank loans. Mayer, Piskorski, and Tchistyi (2011) reports that 72% of subprime mortgage loans before the 2007-2009 crisis include prepayment penalties. One of the main reasons for this fact is that mortgages have fixed rates so that prepayments may occur due to changes of the market interest rate. Moreover, there are crucial differences between the C&I bank loan market and the mortgage market. First, financial flexibility and investment opportunities in the same sense for business firms are almost irrelevant for the mortgage customers. Mortgage customers are mostly individual families, whose incomes usually come from salaries or other sources that are not affected by prepayment penalties on their mortgages. Unlike individuals, business borrowers are facing an uncertain and competitive market environment. To maintain a competitive advantage, financial flexibility is of great importance (e.g. Graham and Harvey (2001)). Second, prepayment penalty for mortgages can be contingent on the purpose of refinance. Lenders are easy to know the purpose of mortgage refinance at the refinancing time. For instance, the two main impetuses of mortgage refinance, home movements and changes of the market interest rate, are both observable. Therefore, prepayment penalty in mortgages can be contingent on the purposes of refinance. Correspondingly, there are two kinds of penalties in mortgage lending, hard and soft. A hard prepayment penalty requires a penalty fee if the borrower sells or refinances his home before the set time has lapsed, while a soft one restricts the borrower only from refinancing the property before the time period is up. As I argued earlier, C&I loans mostly have floating rate, so the main impetus to refinance the loan is not the changes of the market interest rate. The purposes of refinance may not be easy to detect at the refinancing time, so only non-contingent prepayment penalty can be imposed on C&I loans, which impedes the borrower's financial flexibility.

High-yield Bonds

Bond holders are hardly subject to prepayment risk, because the free-rider problem due to the widely dispersed holding structure of bonds hampers renegotiations, so the refinancing costs are extremely high. One exception is callable bonds which give issuers the option to call. The majority of callable bonds are issued by government sponsored entities for whom default and credit rationing are almost irrelevant issues. Even issued by firms, callable bonds usually specify a call premium to compensate the lender for prepayment risk, which is like a prepayment penalty.[28] Then why do these issuers not hold the financial flexibility to prepay the debt freely? In general, bond issuers are large firms with little growth opportunity so that the option of penalty-free prepayments for these firms is not as important as that for SMEs. For example, Gilson and Warner (1998) reports that junk bonds which are used to pay back bank loans are usually issued by medium and large firms, whose assets are comprised largely of tangible assets-in-place and relatively few intangible growth opportunities. The average market-to-book ratio is 1.19 and the median is 1.06.

Usuries

Usuries have very high interest rates, even over 100% annually, so the prepayment risk is high. To prevent prepayments, usuries usually have very short maturities and the high interest is frequently deducted in advance like an upfront fee or an OID. At the maturity date, the borrower only needs pay back the principal, leaving no benefit for prepayments.

Venture Capital

Venture capital also has special features to deal with prepayment risk. Venture capitalists usually provide the entrepreneur with very limited capital up front to see a new product from its early test-marketing stage to full-scale production (see e.g., Kaplan and Strömberg (2003)). This stage-by-stage financing is like shortening contract maturities. Venture

[28] Like mortgages, most bonds have fixed-rates, so the call premium is mainly to compensate the investors for prepayment risk due to unexpected changes of market interest rate.

capitalists also share control right with entrepreneurs, which reduces information asymmetry. Most contract use convertible provisions that deter strategic prepayments. Moreover, the "no-compete" provision in venture capital contracts reduces the bargain power of the entrepreneur and hence impedes renegotiations. For these reasons, venture capitalists can pursue very risky investments and secure their high profit from the upside of the investments.

5 Conclusion

To explain the rationale for credit rationing, the literature resorts to various agency problems, e.g., adverse selection, risk-shifting, costly state verification, money diversion and hidden effort. This paper argues that non-price credit rationing is a natural consequence of penalty-free prepayments in C&I loan markets.

Given that the borrower keeps the option to prepay the loan without penalty, the lender cannot recoup her investment because voluntary prepayments limit her gains from the upside of the investment project. If the downside NPV of the project is negative, ex ante the two contract parties are not able to to sign a mutually beneficial loan agreement by altering the interest rate alone, resulting in credit rationing. To finance the investment, the loan interest rate must be low enough to incentive-compatibly deter prepayments. One way to reduce the interest rate is to use non-price instruments such as collateral. For borrowers with higher observed risk or lower refinancing costs, the minimum requirement of collateral is higher. This inference is consistent with extant empirical evidence (e.g. Berger, Frame, and Ioannidou (2011a,b)). Another way is to employ a non-linear pricing approach, in which the price of the loan is split into two parts, the interest rate and a lump-sum fee such as an upfront fee. The minimum required fee is higher for loans with higher prepayment risk and a lower refinancing cost. Using a sample of over 64,555 loans issued by U.S. borrowers between 1987 and 2011, I provide evidence supporting this prediction. In particular, loans with higher spreads (measuring prepayment risk) are more likely to include upfront fees, while loans with higher refinancing costs, e.g. syndication loans (vs. traditional bank loans), are associated with lower upfront fees.

Since non-price instruments and lump-sum fees are associated with various deadweight costs, one could imagine that prepayment penalty could be a feasible substitute. In practice, however, prepayment exclusions and prepayment penalties are extremely rare. I argue that the main rationale to allow penalty-free prepayments is to maintain the borrower's financial flexibility to capture future investment opportunities, to mitigate adverse selection, and to solve the time-inconsistency problem in financial contracting.

In general, voluntary prepayments in C&I loan markets have attracted little attention in the prior literature. I make a first step to explain why prepayments are penalty-free for C&I loans and to identify the role of collateral and fees in deterring prepayments, thus easing financing.

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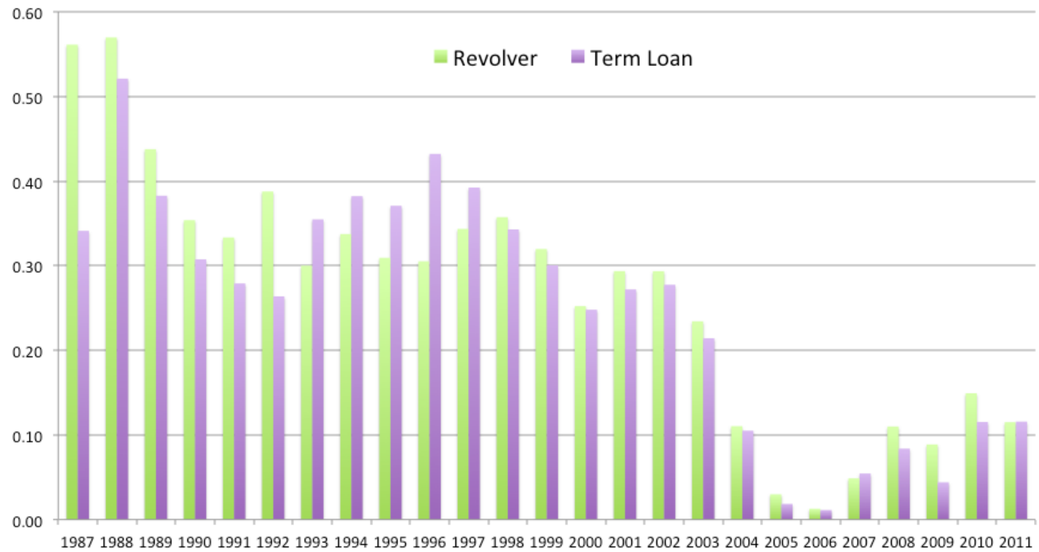

Figure 1: The Proportion of Terms Loans/Revolvers with Upfront Fee Information in DealScan

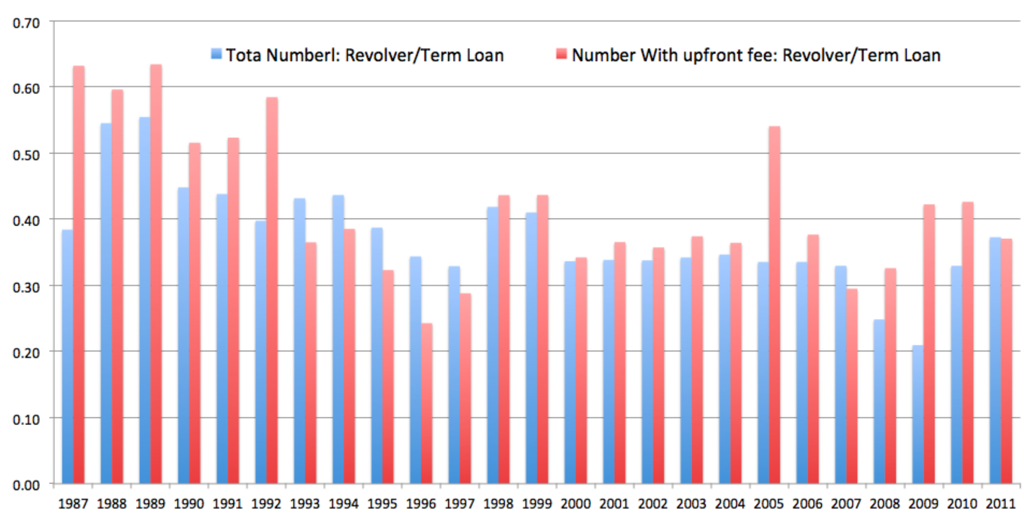

Figure 2: Comparing the Numbers of Revolvers and Term Loans

Table 1: Variable Description

The table shows the notation and definition of variables used in the analysis. Loan types include traditional term loans (term loan A) and institutional term loans (ITLs: term loan B, C, D, etc.). Loan purposes include general purposes (working capital and general corporate purposes), recapitalization (debt repayment/consolidation, recapitalization, and debtor-in-possession loans), acquisition (general or specific acquisition program and LBO loans), and Others. Credit rating score (*Score*) is a discrete variable, equaling 1 for S&P rating "AAA", 2 for "AA+", 3 for "AA", and so on.

Items	**Description**
Dependent Variable	
$UfFee$	Upfront fee measured in bps
Loan Characteristics	
$Spread$	Interest spread or margin of the term loan, measured in bps
AIS	The loan price or all-in-spread drawn measured in bps
$Synd$	Dummy =1 for syndicated loans
ITL	Dummy =1 for institutional term loans (ITLs)
$Crisis$	Dummy =1 in the period from 2007 to 2011
$LogDeal$	The logarithm of the deal size measured in U.S. $
$LogTran$	The logarithm of the tranche size measured in U.S. $
$LogMatu$	The logarithm of the tranche maturity measured in months
$Secu$	Dummy =1 for secured loans
$Cove$	Dummy =1 for loans with covenant(s)
$Refin$	Dummy =1 for refinance loans
$Amend$	Dummy =1 for loans with amendments
$Guar$	Dummy =1 for loans with a guarantor
$PPricing$	Dummy =1 for performance-sensitive loans
$FRatio$	Dummy =1 for loans with financial ratios.
$Purpose$	Dummy =1 for "general purposes", =2 for "recapitalization", =3 for "acquisition".
Borrower Characteristics	
$Rating$	Dummy =1 for borrowers with rating
$Public$	Dummy =1 for listed borrowers
$LogSales$	The logarithm of firm sales measured in U.S. $
$LogAssets$	The logarithm of firm total assets measured in U.S. $
$Leverage$	Book leverage = Total Debt / Total Assets
$Score$	Rating Score of the borrower by the rating agencies
Q	Average Q = Market value / Total Assets
$Proft$	Profitability = EBITDA / Total Assets
$Tangb$	Tangibility = PP&E / Total Assets
Market Conditions	
$Year$	Year dummy
$Industry$	Industry dummy

Table 2: Summary Statistics

The table presents the summary statistics for all the variables in Table 1. The "DealScan Sample" includes 64,555 term loans that are issued by U.S. companies in 1987-2011 excluding loans to regulated and financial industries identified with the 2-digit SIC 40-45, 49, 60-69 and 90-99. I also trim the upfrontfee-AIS ratio at the 1% and 99% levels to exclude potential outlier bias. The "DealScan-Compustat Sample" contains loans from the "DealScan Sample" with accounting information available in Compustat. There are 24 years (1987-2011) and 61 industry categories.

		DealScan			**DealScan-Compustat**	
Items	**Obs.**	**Mean**	**Med.**	**Obs.**	**Mean**	**Med.**
Dependent Variable						
$UfFee$	10,908	84.11	62.5	3,603	83.92	59.85
Loan Characteristics						
$Spread$	44,168	270.91	250	12,328	285.56	255
AIS	39,686	278.23	260	11,681	275.68	255
$Synd$	64,555	0.858	1	14,113	0.780	1
ITL	64,555	0.188	0	14,113	0.237	0
DealSize	39,880	355	102	13,142	479	130
TrancheSize	39,811	163	50	13,029	196	50
Maturity	59,701	67.17	60	13,398	59.13	60
$Secu$	28,403	0.858	1	9,999	0.918	1
$Cove$	61,464	0.166	0	14,049	0.471	0
$Refin$	24,528	0.776	1	8,446	0.825	1
$Amend$	64,555	0.110	0	14,113	0.136	0
$Guar$	64,555	0.077	0	14,113	0.077	0
$PPricing$	64,555	0.083	0	14,113	0.247	0
$FRatio$	64,555	0.094	0	14,113	0.111	0
Borrower Characteristics						
$Rating$	64,555	0.188	0	14,113	0.403	0
$Public$	64,555	0.182	0	14,113	0.619	1
Sales	19,996	1,730	238	11,027	1,610	3033
Assets				12,960	7,765	514
$Leverage$				12,413	0.441	0.398
Q				10,066	1.642	1.306
$Proft$				11,698	0.028	0.030
$Tangb$				12,863	0.319	0.272

Table 3: Differences between Subsamples with and without Upfront Fee Information

The table presents the differences between subsamples of the "DealScan sample". The "DealScan Sample" includes 64,555 term loans that are issued by U.S. companies in 1987-2011 excluding loans to regulated and financial industries identified with the 2-digit SIC 40-45, 49, 60-69 and 90-99. I also trim the upfrontfee-AIS ratio at the 1% and 99% levels to exclude potential outlier bias. The first subsample of the "DealScan sample" contains observations with missing upfront fees, while the second subsample contains observations with non-missing upfront fees. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

Items	Difference	t-value
Dependent Variable		
$UfFee$	$15.6100***$	9.08
Loan Characteristics		
$Spread$	$9.1499***$	4.98
AIS	$-24.0290***$	-12.09
$Synd$	$0.0113***$	3.03
ITL	$-0.0165***$	-3.98
DealSize	$-8.0800***$	-3.95
TrancheSize	$-2.1700***$	-3.31
Maturity	$3.0997***$	8.81
$Secu$	$0.0228***$	4.64
$Cove$	$-0.0786***$	-17.79
$Refin$	$-0.0327***$	-4.77
$Amend$	$0.0190***$	-6.30
$Guar$	$-0.0570***$	-16.60
$PPricing$	$-0.0549***$	-15.80
$FRatio$	$-0.0525***$	-14.67
Borrower Characteristics		
$Rating$	$-0.0624***$	-14.11
$Public$	$-0.0778***$	-17.43
Sales	$45.5000***$	-3.82

Table 4: The Use of Upfront Fees - DealScan Sample

The table presents results of regressions on the "DealScan Sample". All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" in the sample and one otherwise. In the first OLS model, all "N/As" are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	OLS Model 1		**Logit Model**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0530***	14.01	0.0013***	6.42	0.1704***	14.31
Synd	−8.0590***	−3.37	−0.6106***	−5.41	5.9729	1.06
ITL	−2.4393	−0.29	0.2460	0.62	−18.0226	−0.91
SynITL	1.0722	0.12	−0.4748	−1.18	−0.5486	−0.03
LogDeal	0.1449	0.16	0.0783	1.63	−1.1243	−0.44
LogTran	2.6006***	3.46	0.0475	1.18	4.9538**	2.33
LogMatu	−6.2100***	−5.41	−0.0814	−1.40	−13.0866***	−4.13
Secu	7.3149**	2.85	0.2270	1.61	19.3309**	2.49
Cove	0.4313	0.27	0.1092	1.22	−9.0880*	−1.87
Refin	−4.0332**	−2.35	−0.2671***	−2.85	−5.1069	−0.97
Amend	−1.3568	−0.89	−0.1449*	−1.70	0.0823	0.02
Guar	0.5936	0.31	0.0160	0.14	−2.3478	−0.38
PPricing	−1.1507	−0.81	−0.0176	−0.23	−7.8011*	−1.84
FRatio	6.1765***	3.69	0.4972***	5.25	2.7150	0.54
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	1.0278	0.63	0.0765	0.88	−2.1311	−0.42
Public	0.2213	0.18	0.0556	0.85	−3.3644	−0.95
LogSales	−0.5355	−0.99	−0.0062	−0.22	−0.1165	−0.08
Market Conditions						
Year	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Adj. R^2.	0.1190		0.1445		0.2939	
Obs.	7,222		7,208		1,677	

Table 5: The Use of Upfront Fees - DealScan-Compustat Sample

The table presents results of regressions on the "DealScan-Compustat Sample". All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	OLS Model 1		**Logit Model**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0543***	10.10	0.0013***	4.70	0.1517***	9.60
Synd	−7.2886**	−2.40	−0.5326***	−3.56	4.9629	0.68
ITL	−0.8537	−0.08	−0.0573	−0.10	−31.8298	−1.07
SynITL	−1.0670	−0.09	−0.0928	−0.16	18.1850	0.61
LogDeal	2.7564**	2.08	0.1339*	1.88	3.4751	0.96
LogTran	2.5724**	2.45	0.0061	0.11	6.8696**	2.44
LogMatu	−0.0796	−0.05	0.1287	1.61	−6.3774	−1.45
Secu	6.4994**	2.10	0.4368	2.31	28.7367***	2.75
Cove	−1.9343	−0.77	0.1435	1.03	−9.1016	−1.26
Refin	−8.9700***	−3.57	−0.4142***	−3.06	−10.4226	−1.47
Amend	−1.1812	−0.59	−0.0454	−0.40	−3.6344	−0.59
Guar	−0.2903	−0.12	−0.1577	−1.03	11.5080	1.39
PPricing	−2.3974	−1.28	0.0209	0.20	−13.6445**	−2.49
FRatio	3.7916	1.50	0.5845***	4.14	−8.3116	−1.16
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	−0.0337	−0.01	−0.0640	−0.49	3.3525	0.45
Public	−1.0793	−0.56	0.1312	1.30	−9.113 * 8	−1.72
LogAssets	−3.3475***	−3.08	−0.0750	−1.29	−7.2804**	−2.48
Leverage	−3.7808	−1.19	−0.1105	−0.63	−3.3837	−0.39
Q	−0.3727	−0.58	−0.0167	−0.45	−1.3672	−0.87
Proft	−24.0577	−1.30	−2.7438***	−2.72	22.6615	0.42
Tangb	−5.5532	−1.18	−0.0813	−0.32	−6.5238	−0.56
Market Conditions						
Year	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Adj. R^2.	0.1116		0.1284		0.3137	
Obs.	3,714		3,679		886	

Table 6: The Influence of the Financial Crisis - DealScan Sample

The table presents empirical results on the "DealScan Sample" when the effect from the financial crisis is considered. All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	Logit Model		**OLS Model 1**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0006***	2.87	0.0338***	8.20	0.1305***	10.32
Synd	−0.9042***	−8.80	−15.4010***	−6.75	0.7300	0.14
Crisis	−0.6596***	−3.76	−20.958***	−6.26	−33.1228***	−2.77
SprCrs	0.0022***	5.59	−0.1081***	12.87	0.2104***	8.10
ITL	−0.1477	−0.40	−8.1194	−0.94	−14.1732	−0.73
SynITL	−0.1666	−0.44	4.6461	0.53	−0.9768	−0.05
LogDeal	0.0560	1.27	−0.2459	−0.27	−1.7690	−0.71
LogTran	−0.0226	−0.61	1.8671**	2.48	5.2660**	2.56
LogMatu	−0.1388***	−2.58	−7.7028***	−6.73	−15.3907***	−5.04
Secu	0.1132	0.85	4.3792	1.69	16.7425**	2.21
Cove	0.1938***	2.65	0.2722	0.18	−7.3046*	−1.80
Refin	−0.0415	−0.50	−1.1650	−0.69	−3.8610	−0.78
Amend	−0.0413	−0.42	−0.5238	−0.35	0.4038	0.09
Guar	−0.3221***	−2.97	−2.2751	−1.21	0.7347	0.12
PPricing	0.0807	1.11	−0.1816	−0.13	−8.1021*	−1.95
FRatio	0.1913**	2.33	3.7797**	2.32	4.5040	0.97
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	0.1043	1.03	0.1716	0.10	−4.3308	−0.88
Public	0.0246	0.33	0.5080	0.41	−2.0698	−0.61
LogSales	0.0104	0.30	−0.0081	−0.02	0.4315	0.31
Market Conditions						
Industry	Yes		Yes		Yes	
Adj. R^2.	0.0438		0.0721		0.3140	
Obs.	7,208		7,222		1,677	

Table 7: The Influence of the Financial Crisis - DealScan-Compustat Sample

The table presents empirical results on the "DealScan-Compustat Sample" when the effect from the financial crisis is considered. All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	Logit Model		**OLS Model 1**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0010***	3.61	0.0402***	6.92	0.1120***	6.79
Synd	−0.6933***	−4.95	−10.9689***	−3.72	−1.4778	−0.21
Crisis	−0.3529	−1.48	−15.7041***	−3.64	−51.0471***	−3.35
SprCrs	0.0015***	2.58	0.0931***	8,08	0.2583***	7.37
ITL	−0.4942	−0.74	−4.5071	−0.40	−16.6916	−0.58
SynITL	0.1278	0.23	0.7356	0.06	9.9587	0.34
LogDeal	0.1944***	2.90	3.2414***	2.46	4.1859	1.18
LogTran	−0.0693	−1.31	1.6380	1.57	5.8348**	2.10
LogMatu	0.1291*	1.67	−0.8351	−0.57	−10.2187**	−2.41
Secu	0.3745**	2.08	4.9238	1.58	22.0243**	2.15
Cove	−0.1302	−1.20	−4.7973**	−2.20	−4.6845**	−0.83
Refin	−0.2554**	−2.06	−7.0093***	−2.85	−9.8798	−1.50
Amend	−0.0187	−0.18	−1.6685	−0.86	−4.0511	−0.71
Guar	−0.3897***	−2.71	−2.5359	−1.02	11.7652	1.46
PPricing	0.0729	0.74	−1.5128	−0.80	−11.2193**	−2.08
FRatio	0.3204*	2.51	2.2631	0.91	−3.5274	−0.53
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	−0.0867	−0.69	0.8504	−0.35	−1.8191	−0.25
Public	−0.0273	−0.28	−3.2993*	−1.74	−11.5427**	−2.27
LogAssets	−0.1136**	−2.06	−3.4172***	−3.14	−5.8138**	−2.03
Leverage	−0.0753	−0.47	−2.6546	−0.84	−2.6514	−0.31
Q	−0.0381	−1.14	−0.6219	−0.97	−1.4881	−0.98
Proft	−2.5081***	−2.73	−20.8465	−1.13	6.3301	0.12
Tangb	0.0212	0.09	−5.2265	−1.11	−16.0918	−1.24
Market Conditions						
Industry	Yes		Yes		Yes	
Adj. R^2.	0.0625		0.0923		0.3189	
Obs.	3,679		3,714		886	

Table 8: Include Revolver Credit Loans - DealScan

The table presents results of regressions on the sample including 64,555 term loans and 22,143 revolver credit lines from DealScan that are issued by U.S. companies in 1987-2011 excluding loans to regulated and financial industries identified with the 2-digit SIC 40-45, 49, 60-69 and 90-99. I also trim the upfrontfee-AIS ratio at the 1% and 99% levels to exclude potential outlier bias. All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	Logit Model		**OLS Model 1**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0016***	8.69	0.0597***	18.94	0.1887***	20.03
Synd	−0.7838***	−8.85	−11.1857***	−6.39	2.7612	0.71
ITL	0.0481	0.12	−5.8297	−0.74	−26.4697	−1.51
SynITL	−0.2895	−0.73	2.9632	0.37	4.7727	0.27
LogDeal	0.0841**	2.16	0.7528	1.12	0.7237	0.39
LogTran	0.0785**	2.46	2.3291***	4.26	3.5814**	2.39
LogMatu	−0.0807*	−1.74	−3.5821***	−4.19	−5.3246**	−2.39
Secu	0.0963	0.90	4.1987**	2.27	14.0871***	2.68
Cove	0.1664**	2.29	1.0644	0.88	−8.2158**	−2.34
Refin	−0.2925***	−3.92	−4.1793***	−3.28	−4.1414	−1.12
Amend	−0.1150*	−1.76	−0.5371	−0.49	1.7591	0.54
Guar	−0.0584	−0.68	−1.0239	−0.75	−2.5864	−0.61
PPricing	0.0469	0.78	−0.0027	−0.00	−7.0074**	−2.36
FRatio	0.5001***	6.85	6.1967***	5.10	1.2765	0.36
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	0.0501	0.74	1.0839	0.93	−0.2093	−0.06
Public	0.0495	0.97	−0.3280	−0.36	−4.9970*	−2.04
LogSales	−0.0180	−0.75	−0.5562	−1.35	0.0036	0.00
Market Conditions						
Year	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Adj. R^2.	0.1460		0.1163		0.2875	
Obs.	11,829		11,840		2,772	

Table 9: Include Revolver Credit Loans - DealScan-Compustat

The table presents results of regressions on the sample including both term loans and revolver credit lines from DealScan that have accounting information in Cmmpustat and that are issued by U.S. companies in 1987-2011 excluding loans to regulated and financial industries identified with the 2-digit SIC 40-45, 49, 60-69 and 90-99. I also trim the upfrontfee-AIS ratio at the 1% and 99% levels to exclude potential outlier bias. All the variables are described in Table 1. The dependent variable is the upfront fee. The results include two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	Logit Model		**OLS Model 1**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0016***	6.35	0.0637***	14.18	0.1804***	14.46
Synd	−0.6672***	−5.70	−9.8791***	−4.43	4.0101	0.78
ITL	−0.2571	−0.46	−4.3801	−0.42	−41.4621	−1.59
SynITL	0.0487	0.09	0.9276	0.09	25.7303	0.98
LogDeal	0.1801***	2.99	2.8621***	2.76	2.4451	0.91
LogTran	0.0416	0.94	2.0608***	2.72	4.0889**	2.10
LogMatu	0.0871	1.39	1.5603	1.41	0.3377	0.11
Secu	0.2939**	2.03	4.0652*	1.80	19.4149***	2.75
Cove	0.1658	1.47	−0.4819	−0.25	−8.1140	−1.56
Refin	−0.4719***	−4.39	−8.7580***	−4.69	−8.7384*	−1.74
Amend	0.0063	0.07	−0.5676	−0.39	−1.4153	−0.34
Guar	−0.1612	−1.37	−1.7337	−0.96	4.1295	0.72
PPricing	0.0308	0.38	−1.3450	−0.97	−11.3801***	−2.97
FRatio	0.5378***	4.96	4.1040**	2.25	−6.4560	−1.29
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	0.0051	0.05	0.3233	0.19	1.1077	0.21
Public	0.1375*	1.75	−0.9048	−0.64	−10.6866***	−2.97
LogAssets	−0.1269***	−2.65	−2.4240***	−2.94	−2.1009	−1.00
Leverage	−0.1843	−1.31	−3.5694	−1.49	1.0630	0.17
Q	−0.0272	−0.88	−0.4014	−0.81	−1.3489	−1.18
Proft	−3.6609***	−4.30	−44.5819***	−3.10	3.7626	0.10
Tangb	−0.0720	−0.36	−4.0680	−1.18	−7.2068	−0.76
Market Conditions						
Year	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Adj. R^2.	0.1358		0.1191		0.3182	
Obs.	6,099		6,136		1,479	

Table 10

The table presents results of regressions on the sample obtained from the DealScan Sample, taking the upfront fee of the credit line as that for the term loan, if a term loan has no upfront fee information in the "DealScan Sample" but accompanied by a revolver credit line in the same deal that includes an upfront fee. All the variables are described in Table 1. The dependent variable is the upfront fee. I run two OLS regressions and one Logit regression. In the Logit model, the upfront fee is a binary dummy variable, equaling zero for a "N/A" and one otherwise. In the first OLS model, all "N/As" in the sample are considered as zero. In the second OLS model, all "N/As" are considered as random missing values. ***, **, and * indicate p-values of 1%, 5% and 10%, respectively.

	Logit Model		**OLS Model 1**		**OLS Model 2**	
Variables	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**t-value**
Loan Characteristics						
Spread	0.0015***	8.52	0.0619***	19.04	0.1727***	19.68
Synd	−0.9250***	−10.56	−13.7919***	−7.64	0.9973	0.27
ITL	−0.0798	−0.21	−5.5470	−0.68	−20.332	−1.22
SynITL	0.2456	0.63	6.7841	0.83	5.1620	0.31
LogDeal	0.1415***	3.74	1.6144***	2.32	0.3519	0.20
LogTran	0.0313	1.02	1.7841***	3.16	3.605 **	2.58
LogMatu	−0.0225	−0.49	−2.7523***	−3.12	−5.6505***	−2.64
Secu	0.0539	0.51	3.5925*	1.88	14.9840***	3.01
Cove	0.2399***	3.41	2.1369*	1.70	−7.1337**	−2.17
Refin	−0.2682***	−3.71	−4.0141***	−3.05	−5.3081	−1.55
Amend	−0.1072*	−1.70	−0.3693	−0.32	2.7024	0.90
Guar	−0.1270	−1.53	−1.9653	−1.40	−1.8165	−0.46
PPricing	−0.0326	−0.56	−1.0776	−0.99	−6.3434**	−2.32
FRatio	0.5802***	8.32	7.2962***	5.82	1.5219	0.47
Purpose	Yes		Yes		Yes	
Borrower Characteristics						
Rating	0.0457	0.69	1.0233	0.85	0.3317	0.10
Public	0.0582	1.17	−0.4669	−0.50	−5.2495**	−2.29
LogSales	−0.0140	−0.60	−0.4716	−1.11	0.1520	0.15
Market Conditions						
Year	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Adj. R^2.	0.1517		0.1237		0.2746	
Obs.	11,829		11,840		3,097	