Product Market Predatory Threats and Contractual Constraints of Debt*

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Abstract

We use a variant of the Hotelling (1929) model to illustrate that, when a firm faces a hard payment constraint, financially strong rivals may adopt predatory strategies to drive the firm out of the product market and hence obtain extra profit from enhanced market power later on. Predation is more likely to occur if the payment constraint is contingent on the firm's performance. The model predicts that firms facing higher predatory threats in the product market should be less likely to have predation-inducing covenants or the performance-sensitive payments in their bank loan contracts. Empirical evidence supports these model predictions. Using a sample of about 16,000 bank loans to U.S. borrowers in 1997-2008, we find that for small firms, higher predatory threats are associated with less use of financial covenants and performance-sensitive payments.

Keywords: *Financial constraints, Performance-pricing, Competition, Hotelling, HHI*

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1 Introduction

According to the "deep-pocket" theory of competition (e.g., Telser, 1966; Bolton and Scharfstein, 1990), a predatory strategy is the practice intending to drive competitors out of the market, or create barriers to entry for potential new competitors, for the purpose of earning additional benefits from enhanced market power later on.[1] In product markets, a financially weak firm may be subject to such predation risk, or predatory threats, from strong rivals. The threats may also significantly shape the firm's financial policies. Recent empirical studies find that predatory threats lead to higher level and higher marginal value of cash holdings, lower dividend payments, and more hedging (e.g., Haushalter, Klasa, and Maxwell, 2007; Hoberg, Phillips, and Prabhala, 2012; Chi and Su, 2013).

In this paper, we examine how predatory threats affect the design of debt contracts, in particular, the use of contractual constraints such as debt covenants. We use a variant of the Hotelling (1929) model to show that, when a firm faces a hard constraint, on which default means liquidation of the firm or termination of financing, rivals may adopt predatory strategies to induce default and obtain long-term benefits. It follows that firms with higher predation risk may be unwilling to accept predation-inducing constraints, such as debt covenants and performance-sensitive payments, in their debt contracts. This is further confirmed by empirical evidence.

In our theoretical model, two firms compete on a Hotelling line, on which consumers are evenly distributed. There are two periods. In every period, each consumer chooses whether to consume one unit of product from one of the two firms. Through consumption, the consumer obtains a utility U, but have to pay the price charged by the supplier and a transportation cost, which is equal to her distance from the supplier. When there is no payment constraint at the end of the first period, the optimal strategies of the two firms are independent across periods because no one is able to prey and drive the other out of the market. However, when

[1] In reality, one of the most frequently discussed predatory strategies is predatory pricing. According to OECD (2005), predatory pricing is the practice of offering goods or services at exceptionally low prices, thereby forfeiting some profit in order to drive competitors out of the market, discipline them, and/or deter entry. Generally speaking, pricing is considered predatory when it cannot be profitable unless competition is eliminated or at least restrained.

one firm faces a hard payment constraint but the other does not, predation may occur. By preying and driving the constrained firm out of the market, the predator obtains monopolist profit in the second period. Predation is more likely to occur if the two firms' products are more similar and/or if the product market has larger growth opportunities, because lower product similarity makes the prey's performance more sensitive to the predator's strategies, while larger growth opportunities increase the predator's profit from predation. Predation is also more likely when the payment is contingent on the firm's early performance, because the payment-performance sensitivity allows the predator to strategically increase the prey's payment requirement by lowering its performance.

The payment constraint in our model can be any kind of predation-inducing contractual constraints, e.g. in contracts with financiers, suppliers, buyers, employees or any other stakeholders. The notion of contract also applies to any implicit contract between two or more parties. For example, Bertrand (2004) find that product market competition has influence on constraints in employment contracts. In addition, the constraint is not necessarily stringent and predatory strategies do not necessarily aim to drive the prey out of the market. Predation may occur so long as it increases the business risk of the prey, not only the risk to exit but also the risk of being unable to fully exploit her future investment opportunities, and hence enhances the competitive advantage of the predator. For example, dividend payments are not a binding constraint, but the stock price of a firm usually decreases significantly following a reduction in dividend payments, especially for dividend omissions (see e.g., DeAngelo, DeAngelo, and Skinner, 2008). Predation that reduces the prey's dividend payment may therefore worsen her performance both in the stock market and in the product market.

Since contractual constraints can induce predation, firms that are subject to severe predatory threats, e.g. small firms, should manage this predation risk by accepting less predation-inducing contractual constraints. One implication is that firms facing higher predatory threats should use less debt financing than equity or internal funds. This is consistent with MacKay and Phillips (2005) in that product market interactions have effects on firm's financial structure, and with Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2012) in that firms facing higher product market threats hold more cash. In this paper, we focus on the effect from predatory threats on debt contracts, in particular, two prevalent contractual constraints of debt: covenants and performance-pricing. First, debt covenants are widely used to restrict the borrower from making decisions that would be detrimental to the lender (e.g., Smith and Warner, 1979; Bradley and Roberts, 2004; Chava, Kumar, and Warga, 2010). For example, financial covenants require the borrower to maintain certain financial ratios or performance measures. Recent empirical studies find that violations of debt covenants impose substantial losses on borrowers (e.g., Chava and Roberts, 2008; Nini, Smith, and Sufi, 2012). Second, debt with performance-pricing use a loan spread based on measures of the borrower's performance and are hence called performance-sensitive debt (PSD). Both performance-pricing and financial covenants can be taken advantage of by predators, so we call them predation-inducing constraints. Our model predicts that the higher predatory threats a firm is facing in the product market, the less likely the firm is to have financial covenants or performance-sensitive payments in its debt contracts.

We empirically test these model predictions using a sample of about 16,000 bank loans to U.S. borrowers in 1997-2008. Our main proxy for predatory threats is *product market fluidity* from Hoberg, Phillips, and Prabhala (2012), which captures the similarity between a firm's product characteristics and the comparable evolution of its rivals. Since product market fluidity takes rivals' actions into account, potential endogeneity problems are mitigated. We find that for small firms, the fluidity measure is significantly related to the use of debt covenants and performance-pricing. A one standard deviation increase in fluidity reduces the number of financial covenants in bank loans by 6% and reduces the probability of using performance-pricing by 18%, compared to their sample averages. This relationship is much weaker or even insignificant for large firms. We also use a dummy for single-segmented firms as another proxy for predatory threats. Intuitively, a multi-segmented firm is less likely subject to predation because its product markets and investment opportunities are diversified. We find that single-segmented small firms use significantly less performance-pricing and financial covenants than multi-segmented small firms. An alternative interpretation of the negative correlation between corporate diversification and the use of contractual constraints is that diversified firms have lower cash flow risk and hence lower probability to violate the constraints.[2] However, in our sample including only small firms, single-segmented and multi-segmented firms almost have the same level of cash flow volatility, indicating that cash flow risk is not a crucial driver of our results.

There is a free-rider problem of predation. If the predator has to share the benefit from predation with other competitors or free-riders, predation is less likely to occur. This means that having more competitors in the product market does not necessarily mean higher predatory threats. Traditional competitive economic theory does not consider predation and therefore predicts that the level of product market competition is increasing with the number of competitors (see e.g., Tirole, 1988, pp221-223). For this reason, market concentration, proxied by the Herfindahl-Hirschman Index (HHI), is frequently used as a measure of competition. A higher HHI indicates a lower level of competition (see e.g., Valta, 2012). However, Kovenock and Phillips (1997) find that strategic interactions are more prevalent in more concentrated markets, and Haushalter, Klasa, and Maxwell (2007) use market concentration as a proxy for predatory threats, with more concentrated markets being considered to have higher predatory threats. We illustrate that, under certain market structures, a larger number of competitors may reduce the chances of predation and hence reduce the intensity of competition, if the predator has to share the profit from predation with more competitors or free-riders. In this sense, predation can be a different dimension of product market competition from those captured by HHI. In our sample, HHI has no consistently significant empirical relationship with the use of debt covenants and performance-pricing.

We contribute to the intensive literature that studies the interactions between product market competition and firms' financial policies (e.g., Brander and Lewis, 1986; Bolton and Scharfstein, 1990).[3] First, Bolton and Scharfstein (1990) show that a firm with hard financial constraints, which emerge endogenously due to agency problems, could be subject to

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[2]For example, Opler, Pinkowitz, Stulz, and Williamson (1999) and Duchin (2010) find a negative correlation between corporate diversification and cash holdings. They interpret it as diversified firms being well positioned to smooth investment opportunities and cash flows, because both the opportunities and the outcomes of their divisions are not perfectly correlated.

[3]Also see e.g., Titman (1984), Opler and Titman (1994), Phillips (1995), Chevalier (1995a), Chevalier (1995b), Chevalier and Scharfstein (1996), Kovenock and Phillips (1997), Zingales (1998), Dasgupta and Titman (1998), Khanna and Tice (2000), Campello (2003, 2006), Khanna and Tice (2005), MacKay and Phillips (2005), Adam, Dasgupta, and Titman (2007), etc.

predation. Building on the Bolton and Scharfstein result, we show that the possibility and profit of predation are monotonically increasing in the product similarity between the prey and the predator, and in the growth opportunities of the product market. Our model setting is close to that of Khanna and Schroder (2010), who show that, when a "deep-pocket" incumbent benefits from rival exit, the optimal contract for financially weak competitors is "flatter" in order to manage predation risk, deviating from the standard debt contract with a kink at the face value of the debt. Concerning the design of the contract, our model delivers conceptually similar implications, but we focus on implied amendments of empirically observed debt contracts stemming from the cost of common constraints, and do not solve for the optimal contract. Second, several recent papers empirically study how product market competition affects firms' financial policies. For example, Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2012) report that higher predatory threats induce firms to adopt hedging strategies, hold more cash, pay less dividends, etc. It is also documented that product market competition raises the cost of debt (Valta, 2012) and the value of cash holdings (e.g., Chi and Su, 2013), while large cash reserves lead to systematic future market share gains at the expenses of industry rivals (Fresard, 2010). On the one hand, firms can mitigate predation risk both by reducing predation-inducing constraints in their contracts and by increasing cash holdings or hedging. On the other hand, firms with large cash holdings can prey on financially weak rivals to earn higher market shares. Therefore, our empirical findings are complementary to and consistent with these studies. Finally, we propose the free-rider problem of predation, which provides an explanation to the conflicting interpretations of HHI in the empirical literature.

We also contribute to the literature analyzing the design of loan contracts, especially on the use of covenants and performance-pricing. In line with Bolton and Scharfstein (1990), the literature argues that debt covenants, as one kind of financial constraints, are used to mitigate agency problems (see e.g. Smith and Warner, 1979; Chava and Roberts, 2008; Garleanu and Zwiebel, 2009; Roberts and Sufi, 2009). Empirically, it has been documented that the use of debt covenants are related to financial distress (Bradley and Roberts, 2004), growth potentials (e.g., Billett, King, and Mauer, 2007; Demiroglu and James, 2010), and managerial agency problems (Chava, Kumar, and Warga, 2010), etc. Similarly, it is reported that the use of performance-pricing in debt is related to prepayment probabilities and refinancing costs (Asquith, Beatty, and Weber, 2005), credit rating (Manso, Strulovici, and Tchistyi, 2010), corporate board structure (Francis, Hansan, Koetter, and Wu, 2012), etc. Complementary to these findings, we document that the use of debt covenants and performance-pricing also takes product market threats into account.

The remainder of the paper is organized as follows. In section 2, we construct the model and illustrate how payment constraints of a firm may induce predation by rivals and how performance-sensitive payments facilite predation. Section 3 discusses the free-rider problem of predation. Section 4 provides empirical evidence. Finally, section 5 concludes.

2 Payment Constraints and Predation

2.1 Model Setup

We consider product market interactions between two rival firms, A and B. There are three dates, denoted as date 0, 1 and 2 respectively. Let the product market be characterized by a Hotelling (1929) line, on which customers are evenly distributed with density, 1 and g, in the two periods respectively. The parameter, g, measures the growth opportunities of the market. Firms are suppliers and are also located on the line. In every period, each consumer chooses whether or not to consume one unit of the product from one firm. If consumption occurs, the consumer obtains a utility, U, but has to pay a transportation cost, or fit cost, equal to her distance from the supplying firm.

Without loss of generality, we assume that firm A lies to the left of firm B and the distance between them is α. We can think of α as an indicator of product similarity between the two firms. The smaller α is, the more similar the products of the two firms are.[4] At date 0, each firm chooses a pricing strategy, consisting of the prices in the two periods, to maximize its profit. Denote the pricing strategy of firm A as p_A^1 in the first period and p_A^2 in the second period, and similarly that of firm B as p_B^1 and p_B^2. In every period, if a

[4]"Product" in our model refers to the physical product as well as the associated services and nonphysical value of the product. For example, both Leveno and HP produce laptops with different properties (brands, services, color, setups, etc.), but they compete in the same laptop market.

consumer decides to consume, she chooses the optimal supplier based on the total cost of her consumption, including the price she pays and the transportation cost. For convenience, the cost of production and the discount rate are all normalized to zero.

We further assume that firm A faces a hard payment constraint D at date 1, which is either an interest payment or a due face-value payment of debt, while firm B does not. This is the case when, for example, firm A is debt financed but firm B is equity financed. If firm A is not able to meet the constraint, it will be terminated at date 1 and then firm B will be the monopolist in the product market. This asymmetry of financial conditions may induce predation.[5] It might be optimal for firm B to choose predatory strategies in the first period, driving firm A out of the market, and then to enjoy the monopolist profit in the second period.

Obviously, for sufficiently large α, there is no product market interaction between the two firms. Each firm is a monopolist in its local market and makes its decision independently. We call such an equilibrium the "local-monopoly equilibrium", denoted as (p_A^{1*}, p_B^{1*}) and (p_A^{2*}, p_B^{2*}). When α is below certain threshold, the two firms compete in the product market but, as long as D is sufficiently small, e.g. $D = 0$, predation cannot occur. We call this equilibrium without predation the "competitive equilibrium", denoted as (p_A^{1**}, p_B^{1**}) and (p_A^{2**}, p_B^{2**}). This case is similar to the traditional competitive economic theory. Finally, predation occurs at equilibrium for sufficiently low α and high D. We call such an equilibrium the "predatory equilibrium", denoted as (p_A^{1***}, p_B^{1***}) and (p_A^{2***}, p_B^{2***}). In the following, we consider the three cases of equilibria in turn.

2.2 Local Monopoly and Competitive Equilibria

As a starting point, consider the simplest case when the two firms are far away from each other so that they do not interact in the product market. In this case, there is no competition between them. Each firm is a monopolist in its *local* product market, choosing pricing

[5] In our model, the payment constraint is exogenously given. One may ask why firm A accepts the financial constraint if predation is possible. Bolton and Scharfstein (1990) argue that financial constraints emerge endogenously to mitigate agency problems, even in the presence of predation risk. We adopt their results here.

strategies independently to maximize its own profit in the two periods. Concerning this local-monopoly equilibrium, we have the following proposition.

Proposition 1: *The local-monopoly equilibrium, in which every firm behaves like a monopolist in its local market, occurs if and only if* $\alpha \geq U$*. In this case, the equilibrium pricing strategies are* $p_A^{1*} = p_A^{2*} = p_B^{1*} = p_B^{2*} = \frac{1}{2}U$ *and the equilibrium profits are* $\Pi_A^* = \Pi_B^* = \frac{1}{2}(1+g)U^2$.

Proof: See Appendix.

We now consider the competitive equilibrium without predation. Following Proposition 1, when $\alpha < U$, the two firms interact with each other. To exclude predation, we first assume that D is small enough. In this case, firm B is not able to drive firm A out of the market, so predation is not profitable. Decisions of the two firms are independent across periods. Given one firm's price in a period, the other firm will choose the optimal price to maximize its own profit in the same period. In equilibrium, every firm's price is the best response to the other firm's in a given period. We now analyze such an equilibrium without predation. Define firm A's *individual market* as the set of all consumers who earn a nonnegative surplus by consuming from firm A, and similarly define firm B's individual market. In the local monopoly equilibrium, the individual markets of the two firms do not overlap. We then obtain the second proposition.

Proposition 2: *When* $\alpha < U$*, the two firms compete at equilibrium but, as long as* D *is sufficiently small, there is no predation. For every period* $s, where s = 1$ *or 2,*

- i *If and only if* $0 < \alpha < \frac{6}{7}U$*, the individual markets of the two firms overlap at equilibrium. There is a unique competitive equilibrium,* $p_A^{s**} = p_B^{s**} = \frac{1}{5}\big(\alpha + 2U\big)$*, in which* $\Pi_A^{**} = \Pi_B^{**} = \frac{3}{50}(1+g)\big(\alpha + 2U\big)^2$.
- ii *If and only if* $\frac{6}{7}U \leq \alpha < U$*, the individual markets of the two firms do not overlap. There are infinite number of competitive equilibria. At the symmetric equilibrium when the marginal consumer lies in the middle of the two firms,* $p_A^{s**} = p_B^{s**} = U - \frac{1}{2}\alpha$*,* $\Pi_A^{**} = \Pi_B^{**} = \frac{1}{2}(1+g) \cdot \alpha(2U - \alpha)$.[6]

[6]The *marginal consumer* is defined as the one who is indifferent between consuming from the two firms.

Proof: See Appendix.

So far, the payment constraint of firm A has been irrelevant, because it is so low that firm B is not able to take advantage of it and hence predation cannot occur. This is the result of the traditional Hoteling (1929) model without financial constraints. Intuitively, there is a threshold, $\overline{D}$, above which it is optimal for firm B to prey. We will solve for $\overline{D}$ in the following section.

2.3 Payment Constraints and Predation

In a perfect capital market, it does not matter how the firm is financed (Modigliani and Miller, 1958, 1963). With market imperfections, e.g. agency problems, usually there exists an optimal financing strategy. Bolton and Scharfstein (1990) illustrate that, when the entrepreneur is able to partly divert cash flows, the optimal financial contract includes a hard payment constraint, which potentially triggers termination of financing or liquidation of the firm. This hard payment constraint aligns the firm's incentive with investors, but it induces predation. Rivals may choose predatory strategies to reduce the profit of the current firm. If the current firm is not able to meet the hard payment constraint, it will be terminated and then the rivals will obtain extra profit from enhanced market power in later periods. In practice, debt is associated with hard payment constraints, on which defaults may trigger liquidation.

We incorporate the insight from Bolton and Scharfstein (1990) by exogeously assuming a payment constraint of firm A. Given this constraint, firm B can choose between two potentially optimal strategies. One is not to prey, setting the first-period price equal to that of the competitive equilibrium, p_B^{1**}. The other strategy is to prey by choosing a sufficiently low price in the first period, for which the best response of firm A cannot meet the payment constraint. With a predatory strategy, firm B's profit in the first period will be lower than that in the competitive equilibrium, but can earn monopolist profit in the second period after firm A exits, which is higher than the profit in the competitive equilibrium.

Let's now solve for the threshold $\overline{D}$ of the payment constraint to induce predation. For convenience, we will focus on the simple case of α when there is a unique competitive equilibrium in the absence of predation, i.e. $0 < \alpha \leq \frac{6}{7}U$. Predation in the case when $\frac{6}{7}U < \alpha < U$ is similar, though multiple equilibria make the analysis more complicated. In addition, when $D \geq \frac{3}{50}\big(\alpha + 2U\big)^2$, firm A will always go bankrupt at date 1, no matter whether firm B preys. We thus consider only the case of $D < \frac{3}{50}\big(\alpha + 2U\big)^2$ in the following.

Proposition 3: *When $0 < \alpha \leq \frac{6}{7}U$, firm B will prey if and only if $\overline{D} < D < \frac{3}{50}\big(\alpha + 2U\big)^2$, where the threshold of payment $\overline{D}$ satisfies:*

$$\frac{3}{50}(1+g)\big(\alpha + 2U\big)^2 = \big(\sqrt{24\overline{D}} - \alpha - 2U\big)\big(2\alpha + 4U - \frac{17}{12}\sqrt{24\overline{D}}\big) + \frac{1}{2}gU^2. \tag{1}$$

Concerning $\overline{D}$, we have the following conclusions.

i $\partial\overline{D}/\partial\alpha > 0$ *and* $\partial\overline{D}/\partial g < 0$.

ii If $D \geq \overline{D}$, there is a unique predatory equilibrium, in which $p_A^{1***} = \frac{1}{3}\sqrt{6D}$, $p_B^{1***} = \sqrt{24D} - \alpha - 2U$, $p_B^{2***} = \frac{1}{2}U$. If $D < \overline{D}$, predation does no occur and we have the competitive equilibrium, described in Proposition 2.

Proof: See Appendix.

The payment constraint in our model can be generalized to many kinds of constraints, for example, in contracts with suppliers, buyers, employees or other stakeholders. Furthermore, the constraints are not necessarily stringent. As long as violations of the constraints cause losses for the prey, which subsequently enhance the competitive advantage of the predator, predation could occur. For example, a dividend payment is not a binding constraint, but the stock price of a firm usually decreases significantly following a reduction in dividend payment, especially for omissions (see e.g. DeAngelo, DeAngelo, and Skinner, 2008). In this case, rivals' predatory strategies may reduce the ability of the prey to maintain its dividend policy and hence induce losses. If the prey's CEO employment depends on the stock price, predation may induce a change of CEO, potentially benefiting the rivals.

If predation is observable, firm A under attack may negotiate with its counter-party who holds the claim. If negotiations can delay the payment or change the hard constraint to a soft one, predation is mitigated. However, in practice, predation is difficult to distinguish from legitimate and vigorous price competition.[7] Even if predation is present and hurts the target firm, it is difficult for outside investors to distinguish between alternative underlying reasons, such as management misbehavior or rival's predatory pricing, for the firm's bad performance. Even if renegotiation is possible, violations of payment constraints may cause significant losses for borrowers.

2.4 Performance-Sensitive Payment and Predation

Performance-sensitive payments are a widely observed debt feature. Manso, Strulovici, and Tchistyi (2010) report that, among bank loans to public firms in the 1995-2005 period in the Thomson Financial's SDC database, approximately 40% include performance-pricing provisions. We continue with analyzing this class of debt, which is often called performance-sensitive debt (PSD). Our main conclusion is that the use of performance-pricing facilitates predation. Intuitively, if the payment is contingent on the firm's early performance, it is easier for rivals to lower the performance through predatory strategies and hence raise its payment requirement, in order to make the firm default on the higher payment requirement.

We introduce an interim date t between date 0 and date 1, based on our model of predation in the previous section. Suppose that firm A's hard payment constraint is contingent on its date-t profit, which is publicly observable.[8] To simplify our analysis, we assume that the profit of firms and consumption of consumers accrues constantly over time. That is, every consumer will consume t units of the product before date t. Moreover, we assume that the required payment of firm A will be hD if its accrued profit at date t, π_A^t, is no more than tD, while the payment is lD if $\pi_A^t > tD$, where $0 < l < 1 < h$. In our simple model, the parameters, t, h and l, are exogenously given. But we assume that without predation, the *straight* debt with payment D and the PSD with payments, hD and lD, are equivalent when the contract was signed before date 0. That is, the parameters were set such that in the

[7] See, for example, the Office of the Chief Economist Discussion Paper, *A Three-Step Structured Rule of Reason to Assess Predation under Article 82*, by Miguel de la Mano and Benoit Durand (2005).

[8] In practice, performance pricing is usually based on borrower's credit rating or financial ratios, e.g., debt-to-EBITDA, leverage, or interest coverage (see e.g. Asquith, Beatty, and Weber, 2005).

absence of predation, the two debt forms are equivalent at the time when it was signed.

Let $0 < \alpha < \frac{6}{7}U$ and $\overline{D} < D < \frac{3}{50h}\big(\alpha + 2U\big)^2$. Namely, predation is the optimal choice of firm B as Proposition 3 shows and, in the absence of predation, firm A can meet the payment hD at date 1. If firm B preys but ignores the performance-pricing property of the payment constraint that firm A faces, its total profit will be the right-hand side of (1). Now we consider a new strategy of firm B: First, firm B chooses a low price before t to induce $\pi_A^t \leq tD$ and hence to raise firm A's date-1 payment to hD; second, firm B sets the price between date t and date 1, which drives firm A to default on the payment, hD. The two prices does not necessarily have to be the same. The following proposition shows that this new pricing strategy increases the probability of predation.

Proposition 4: *Suppose that the hard payment constraint of firm A is contingent on its date-t profit ($t < 1$). The payment is hD ($h > 1$), if the accrued profit of firm A at date t is no more than tD, and is lD otherwise. We have the following conclusions.*

i Firm B will prey if and only if $D > \widehat{D}$, where

$$\frac{3}{50}(1+g)\big(\alpha+2U\big)^2 = \frac{1}{2}gU^2 + t\cdot\Big(\sqrt{24\widehat{D}} - \alpha - 2U\Big)\Big(2\alpha + 4U - \frac{17}{12}\sqrt{24\widehat{D}}\Big) + (1-t)\cdot\Big(\sqrt{24\widehat{D}\cdot\frac{h-t}{1-t}} - \alpha - 2U\Big)\Big(2\alpha + 4U - \frac{17}{12}\sqrt{24\widehat{D}\cdot\frac{h-t}{1-t}}\Big). \quad (2)$$

ii Performance-pricing eases predation, i.e., $\widehat{D} < \overline{D}$.

iii Predation is more likely to occur for lower α, larger g, larger h and lower t, i.e. $\partial\widehat{D}/\partial\alpha > 0$, $\partial\widehat{D}/\partial g < 0$, $\partial\widehat{D}/\partial h < 0$ and $\partial\widehat{D}/\partial t < 0$.

Proof: See Appendix.

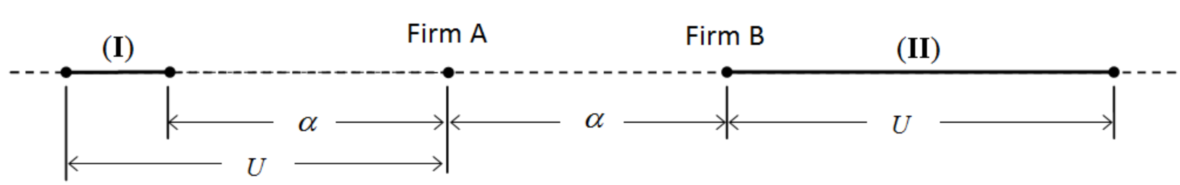
The interpretation of (2) is similar to (1). The key difference is that, in the case of the PSD, the first-period profit of firm B through predatory strategies includes two parts: before t and after t. Before t, firm B preys to worsen firm A's performance and hence to raise firm A's date-1 payment. After t, firm B can just set its price to maximize the profit in the current period.

3 The Free-rider Problem of Predation

In traditional competitive economic theory, such as the Cournot model, when predation is not considered, the more competitors the market has, the more competitive the equilibrium is. For this reason, market concentration, proxied by the Herfindahl-Hirschman Index (HHI), is frequently used as a measure of competition. An increase in HHI generally indicates a decrease in competition and an increase of market power. In this section, we will show that, if predation is considered as one dimension of competition in the product market, HHI is no longer an adequate measure of competition. Predation occurs only if the predator obtains extra profit from enhanced market power after the prey exits or incurs a big loss. If there are more competitors than the predator in the product market, the predator may have to share the profit of predation with these competitors or free-riders. This dilution effect of predation due to the free-rider problem may make predation less likely to occur. Therefore, a larger number of competitors or a lower HHI of the product market may reduce the likelihood of predation and hence reduce the intensity of competition. HHI, as a static and backward-looking measure of market concentration and an industry-level measure of competition, cannot fully capture the dynamic interactions between firms within an industry.

To give a simple illustration of how the free-rider problem affects predation, we consider one more competitor, firm C, in the product market. Following the analysis in section 2.3, assume $D > \overline{D}$ to allow for predation even in the absence of firm C. Without loss of generality, we consider only when firm B is closer to firm A than firm C is. This leaves us two possible cases, labeled as (I) and (II) in Figure 2. In (I), firm C is on the left-hand side of firm A and the distance between firm C and firm A, β_{I}, satisfies $\alpha \leq \beta_{\mathrm{I}} < U$. In (II), firm C is on the right-hand side of firm B and the distance between firm C and firm B, β_{II}, satisfies $0 < \beta_{\mathrm{II}} < U$.

Figure 2: Locations of Competing Firms



When firm C lies in (I), firm A competes with both firm B and firm C, but the latter two compete directly only if firm A exits the market. There are two subcases, $\alpha + \beta_{\mathrm{I}} \geq U$ and $0 \leq \alpha + \beta_{\mathrm{I}} < U$, which we analyze in turn. First, when $\alpha + \beta_{\mathrm{I}} \geq U$, from our reasoning in section 2.3, it is not difficult to see that the presence of firm C makes predation easier. This is because, as long as firm B chooses the same predatory strategy as that when firm C is absent, firm A will exit at date 1 and firm B (as well as firm C) will be the monopolist in its local market in the second period. That is, no matter whether firm C preys, predation from firm B occurs at least as likely as the case when firm C is absent. Notice further that, under firm B's predation, firm A's profit in the presence of firm C is lower than that in the absence of firm C due to firm C's competition or co-predation. Therefore, when $\alpha + \beta_{\mathrm{I}} \geq U$, the presence of firm C strictly raises the probability of predation.

In the case when $0 \leq \alpha + \beta_{\mathrm{I}} < U$, it is easier for firm B to drive firm A out of the market at date 1 due to the closer distance between firm A and firm C, but firm B and firm C have to share the post-predation profit in the second period. This dilution effect may hinder firm B's predation. From Proposition 2, if $\frac{6}{7}U \leq \alpha + \beta_{\mathrm{I}} < U$, there are multiple competitive equilibria in the second period, which complicates our analysis. We therefore, as usual, restrict our analysis to the symmetric equilibrium, in which the marginal consumer in the second period lies in the middle of firm B and firm C.

Lemma 1: *When $0 \leq \alpha + \beta_I < U$, the necessary and sufficient condition for predation is $D \geq \overline{D}_I$, where the threshold $\overline{D}_I$ satisfies*

$$\begin{aligned} \frac{1}{24}\Big(23\sqrt{D} - 2U - 6\alpha - 7\beta_I\Big)\Big(6U + 8\alpha + 7\beta_I - 21\sqrt{D}\Big) + \frac{3g}{50}\big(2U + \alpha + \beta_I\big)^2 \\ \geq \frac{3}{2}(1+g)\big(\frac{29}{132}\alpha + \frac{7}{132}\beta_I + \frac{4}{11}U\big)^2. \end{aligned} \tag{3}$$

Proof: See Appendix.

The left-hand side of (3) is firm B's profit if it preys, while the right-hand side is firm B's profit if it does not prey. Numerically, let $\alpha = 0.2$, $\beta_{\mathrm{I}} = 0.3$ and $g = 5$. If $D = 0.2$, the profit of not preying exceeds the profit of preying, so the presence of firm C makes predation more difficult. If $D = 0.15$, it is the opposite. The presence of firm C makes predation easier. Similarly, we can show that, when firm C lies in (II), it is also inconclusive whether the presence of firm C makes it more difficult for firm B to prey. In sum, we get the following proposition.

Proposition 5: *Under certain market structures, the presence of more competitors makes predation more difficult because the predator has to share the profit from predation with other competitors or free-riders. We call this the free-rider problem of predation.*

Due to the presence of financial constraints, predation could be the rational choice of some competitors in the product market. However, predation is not monotonically increasing with the number of competitors due to the free-rider problem. We show that predation is less likely to occur in certain cases when the predator has to share the benefit from predation with more competitors or free riders. Therefore, if predation is counted as one dimension of competition, market concentration or HHI is no longer an adequate measure of competition. Under certain market structures, a higher market concentration indicates a higher level of predation because the dilution effect of predation due to the free-rider problem is lower for a higher market concentration. Haushalter, Klasa, and Maxwell (2007) use HHI as a proxy for predatory threats. They interpret a higher HHI as a higher level of predatory threats or competition. From Proposition 5, we see that this may also be inappropriate, since the relationship between HHI and predation depends on specific market structures.

4 Empirical Evidence

4.1 Testable Implications

According to Proposition 3 in section 2.3, a hard constraint that exceeds the threshold $\overline{D}$, may induce predation in the product market. The higher the product similarity between the constrained firm and its rivals is and the larger the growth opportunities of the product market are, the higher predatory threats the constrained firm faces, i.e., $d\overline{D}/d\alpha > 0$ and $d\overline{D}/dg < 0$. A direct implication from the model is that firms facing higher predatory threats should use less debt financing than equity or internal funds. This is consistent with MacKay and Phillips (2005) in that product market interactions have effects on firm's financial structure, and with Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2012) in that firms facing higher product market threats hold more cash. In this paper, we focus on the effect from predatory threats on debt contracts, in particular, the use of two kinds of prevalent contractual constraints of debt: debt covenants and performance-pricing.

In practice, covenants are widely-used constraints in debt contracts. Empirical studies find that violation of covenants often leads to significant reduction (or sometimes termination) in funding availability (see e.g. Chava and Roberts, 2008) and substantial increase in funding costs (see e.g. Roberts and Sufi, 2009). There are two kinds of debt covenants: Financial covenants and negative covenants. Financial covenants require the borrower to maintain certain financial ratios or performance measures. This feature makes it possible for the predator, through predatory strategies, to harm the borrower's performance and hence make the target default on the financial covenants. Negative covenants prevent the borrower from certain actions such as excessive investments, distribution of dividends, asset sales, change in company control, misuse of excess cash flows, etc. One key difference between negative covenants and financial covenants is that borrowers are in no danger of violating negative covenants as long as they do not take the actions constrained by these covenants, regardless of the realization of the underlying conditions. Unlike financial covenants, many negative covenants cannot be easily taken advantage of by product market competitors through predatory strategies. For example, it is impossible for the predator to prey and make the target firm violate the negative covenant on dividend payment, because the violation on the dividend payment restriction depends solely on the firm's action. Among negative covenants, we identify three potentially predation-inducing constraints, including those restricting equity issuance, debt issuance, and asset sales.

Like covenants, performance pricing in bank loans has become increasingly popular in the past two decades. A traditional bank loan tyically has a fixed interest spread over a floating benchmark such as LIBOR or prime. Performance pricing instead has a spread based on measures of the borrower's performance such as a credit rating or the debt-to-EBITDA ratio.

From Proposition 4, performance-pricing links the payment constraint with the borrower's performance and hence makes it easier for predators to prey, i.e., $\widehat{D} < \overline{D}$. We thus conclude that firms facing higher predatory threats from the product market should be less likely to have performance-pricing in their debt contracts.

Furthermore, firm size plays an important role in determining rivals' predatory behavior. For simplicity, our model does not directly take relative firm size into account. We can think of a large firm as having more locations or lower transportation costs for customers, compared to a small firm. Consider the hypothetical example of competition between Walmart and a local independent grocery store. It is almost impossible for the local grocery store to profitably lower its price enough to prey on Walmart. Instead, we can easily imagine the opposite to occur. All else equal, predation is less costly for relatively small targets. Therefore, we expect the effect from predatory threats on the use of predation-inducing debt constraints is more pronounced for small firms.

To sum up, our main testable hypothesis is that firms facing higher predatory threats from the product market, i.e. those having higher product similarity with rivals and larger growth opportunities, are less likely to use performance-pricing and predation-inducing covenants in their debt contracts. This effect is more pronounced for small firms.

We also propose the free-rider problem of predation. Predation may be less likely to occur if the predator has to share the benefit from predation with other rivals. Due to this free-rider problem, lower market concentration, e.g. proxied by lower HHI, does not necessarily indicate a higher level of predation. We thus expect that the effect of HHI on the use of performance-pricing is different from that of proxies for predatory threats. This motivates our use of HHI as an explanatory variable in some specifications.

4.2 Data, Samples and Variables

4.2.1 Data and Sample

We obtain loan contract data from a 2011 extract of the Reuters Loan Pricing Corporation (LPC) DealScan database, which we merge with the CRSP-Compustat merged database (quarterly Compustat data) using the DealScan-Compustat Link Data originating from Chava and Roberts (2008). We obtain data related to firms' product market environment, including data on HHI, industry classification and product market fluidity, from the Hoberg-Phillips data library.[9]

Our sample covers the years from 1997 to 2008, for which the measure of predatory threats, product market fluidity, is available. There are 114,767 deal-year observations in the DealScan database for this period. Each deal or loan observation can consist of one or multiple facilities with different properties, e.g., revolving lines of credit, pro rata term loans or institutional term loans. We drop observations without borrower ID, total assets or fluidity information, and exclude financial firms and utilities. This results in a final unbalanced panel, consisting of 15,772 deals (22,086 facilities) issued by 4,419 firms. We refer to this sample as the full sample. Starting from the full sample, we also identify a subsample including deals issued only by small firms defined in the following way. For a given year, we rank all firms in the Compustat database according to book assets, and identify the smallest one-third of these firms as small firms. We then use the thresholds from this definition of small firms to determine whether the borrower of a given deal belongs to the "small" sample in the loan activation year. There are 1,757 loans (2,558 facilities) issued by 1,116 firms in our "small" sample, indicating that our full sample consists of relatively large firms of the Compustat database. This is similar to previous studies using DealScan, which includes mostly syndicated loans issued by large firms. Since asset size is changing over time, it is possible that the same firm is classified as small in one year but not small in a different year.

4.2.2 Variables and Proxies

The definitions of variables used in our analysis are summarized in table 1. Our main interest is to examine whether predatory threats affect the use of debt covenants and performance-pricing. Our first dependent variable is covenant intensity, proxied by the number of financial covenants ($FinCov$), or all predation-inducing covenants (Cov) defined later. Among debt covenants, financial covenants are directly linked to borrowers' performance, and are hence

[9] The data is available at http://www.rhsmith.umd.edu/industrydata/.

subject to predation risk. We consider financial covenants that are among the 17 main covenant types (see e.g., Freudenberg, Imbierowicz, Saunders, and Steffen, 2013). Unlike financial covenants, not all negative covenants can be taken advantage of by product market competitors through predatory strategies. For example, violations on the negative covenants restricting dividend payments totally depends on the borrower's own actions, so dividend payment constraints are not subject to predation risk. We identify three predation-inducing negative covenants, those restricting equity issuance, debt issuance, and asset sales. Following the literature, if a loan has no financial covenants recorded in DealScan, we take $FinCov$ of this loan as a missing value, and so is for Cov (e.g., Bradley and Roberts, 2004). To check whether this treatment distorts our conclusion, we also construct $FinCov0$ and $Cov0$, which respectively take the missing values of $FinCov$ and Cov as zeros.

Our second dependent variable is a dummy, PSD, that equals to one for loans with performance-pricing. A loan is defined as PSD if it consists of at least one facility with performance-sensitive payments. Similarly, non-PSD contracts does not have any facilities with performance-sensitive payments. There are two types of performance-pricing, interest-increasing and interest decreasing. The former asks for a higher interest rate when the specified performance deteriorates, while the later requires a lower interest rate when the performance improves. For interest-decreasing pricing is an option for borrowers. Although the payments are not sensitive to performance deterioration due to predation, borrowers have to pay a premium in advance to hold this option, while predation reduces the value of this option. Therefore, both types of PSD are relevant in our study.

Our main measure of product similarity is product market fluidity ($Fluidity$) from Hoberg, Phillips, and Prabhala (2012). Briefly, product market fluidity is based on firms product descriptions as found in 10-K's, utilizing rival's changes in such descriptions compared to the product description of a given firm. By definition, it is the dot product between a firm's own word usage and the comparable normalized aggregate change of the rivals. It identifies how rival's actions in terms of their product characteristics compare to a firm's product characteristics in a given year. Hoberg, Phillips, and Prabhala (2012) find that higher fluidity is associated with higher cash holdings and lower dividend payments. Chi and Su (2013) report that the value of cash holdings is higher for firms with higher product market fluidity. As a dynamic measure of product market interactions, fluidity captures the similarity between the firm's product change and the product evolution of its rivals. Since our model predicts that the possibility of predation is increasing in the product similarity between rivals, we consider fluidity as an ideal measure of predatory threats for the empirical examination of our model predictions. A firm's product market fluidity is increasing in the product market threats that it faces.

Our second measure of predatory threats is the dummy for single-segmented firms ($SingleSeg$). We compute this measure using data from the Compustat Segments files. Intuitively, a multi-segmented firm diversifies its product markets and investment opportunities, and should hence have lower product similarity with rivals. Opler, Pinkowitz, Stulz, and Williamson (1999) report that the number of business segments is negatively correlated with corporate cash holdings. They interpret the finding that diversified firms are more likely to have substantial assets that can be sold to finance investment opportunities, so they have lower levels of liquid assets (see also e.g., Duchin, 2010). That is, internal capital markets allow multi-segmented firms to alleviate financially constraints when cash flows are low, and hence drive the negative correlation between the number of business segments and corporate cash holdings. Alternatively, multi-segmented firms hold less cash because they diversify their investment opportunities and are hence less likely to be subject to predation risk. The cash flow risk in (Opler, Pinkowitz, Stulz, and Williamson, 1999; Duchin, 2010) and predation risk in our model may both play important roles in determining the firm's financial policies. We thus expect that the dummy, $SingleSeg$, has a negative correlation with the use of predation-inducing contractual constraints.

We control for firm's characteristics, loan characteristics and market conditions. First, in our model, growth opportunities are related to predatory threats. Larger growth opportunities raise the profit from predation in the second period and hence induce more predation. We measure growth opportunities using the market-to-book ratio ($Market\text{-}to\text{-}Book$), calculated as the sum of the market value of equity and book value of total debt, divided by total assets. We also control for the natural logarithm of the book value of assets ($lnAssets$), cash flow risk ($CashFlowRisk$), leverage ($Leverage$), profitability ($Profitability$), tangibility ($Tangibility$), etc. These are the commonly used explanatory variables in relevant research. We measure cash flow risk by the variance of EBITDA in the past eight quarters divided by the book value of assets. Firm leverage is the ratio of total debt to total assets, profitability is operating income before depreciation divided by total assets, and tangibility is the ratio of net PP&E to total assets.

The loan characteristics used in our regressions include the natural logarithm of the deal amount ($lnAmount$) and of the loan maturity ($lnMaturity$), as well as dummies for Loan-Purposes ($LoanPurpose$) and for whether the loan is a term loan ($TermLoan$), syndicated loan ($Syndication$), or secured loan ($Security$).[10] These contract variables may be jointly determined with the dependent variable, inducing potential endogeneity problems (e.g., Valta, 2012). We also report results from specifications where we eliminate all such variables.

We include year and industry dummies to control for market and industry conditions. Industry classifications are constructed by using 2-digit SIC codes. To separate the effect of predatory threats from that of market concentration (HHI), we conduct analyses including the TNIC HHI from Hoberg and Phillips (2011). We also use 3-digit SIC codes, and the FIC-300 HHI and the fitted HHI (Hoberg and Phillips, 2010a,b) as robustness checks.[11]

4.3 Empirical Methodology

To test whether predatory threats reduce predation-inducing constraints in debt contracts, our main approach is to run Probit regressions, where the dependent variable is the dummy for PSD (PSD), and Poisson regressions where the dependent variable is covenant intensity ($FinCov$ or Cov). The explanatory variables include the proxy for predatory threats and a set of controls including firm characteristics, loan characteristics, industry fixed-effects and year fixed-effects. Since small firms are more likely subject to predation, we expect that the

[10]Following Carey, Post, and Sharp (1998), we categorize LoanPurposes into four groups according to the primary purpose reported in the DealScan database: 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.

[11]For more information about these industry classifications, we refer to the above cited papers as well as the Hoberg-Phillips data library.

effect from predatory threats is more pronounced for small firms.

In DealScan, the performance-pricing feature is specified at the facility level, but our analysis is done at the loan level. A loan-level analysis, as opposed to facility-level analysis, is appropriate because it may be enough for the predator to take advance of the performance-pricing feature providing one facility in the loan has this feature. In addition, as Manso, Strulovici, and Tchistyi (2010) argue, because multiple facilities of the same loan cannot be treated as independent observations, a facility-level analysis produces standard errors that are improperly small. To check the robustness of our results, we also report results from analyses at the facility-level at the end of this section.

Endogeneity problems may bias our results. The seemingly most common source of endogeneity in studies of financing and product market competition is the joint determination of financial policy and product market strategy. In this paper, our main measure of predatory threats is *product market fluidity*, which takes actions of rival firms into account. This, as Hoberg, Phillips, and Prabhala (2012) point out, mitigates the potential endogeneity issue of financial policy and product market strategy being jointly determined. We also use the dummy for single-segmented firms to measure predatory threats. It is difficult to argue that the use of predation-inducing constraints induces a firm to have more segments, so the endogeneity problem using this measure is not severe.

4.4 Summary Statistics

Panel A of table 2 presents summary statistics for all firms in our full sample and across subsamples split according to the two proxies for predatory threats, $Fluidity$ and $SingleSeg$. All ratios are winsorized at the 1% level in each tail. There are 15,772 loans in our full sample. Each loan on average has 2.72 financial covenants and 3.47 predation-inducing covenants including financial covenants and the three types of negative covenants that are subject to predation risk. Around 45% of the observations have the performance-pricing feature. The mean fluidity is 6.69 and the median is 6.07. Around 51% loans are issued by single-segmented firms. The mean book assets for firms in our study is 4.9 billon USD, which is larger than the Compustat average for the same years and also larger than other studies using the DealScan database (e.g., Valta, 2012). The average leverage, profitability, market-to-book ratio and tangibility are 31%, 3%, 1.78 and 0.31, respectively. For loans in this sample, maturity has an average of approximately 48 months, the average loan amount is USD 424 million and 85% are syndicated.[12] These variables are similar to previous studies using the DealScan data.

Comparing the statistics across subsamples, we see that high-fluidity firms are more likely to be single-segmented, while single-segmented firms have a lower average fluidity, indicating that the two proxies of predatory threats do not capture the same aspects of predatory threats. This is also confirmed by the slightly positive correlation between Fluidity and SingleSeg (0.06). The use of performance-pricing is lower for high-fluidity and single-segmented firms (44% and 43%) than the others (47% and 48%). However, the use of covenants are inconsistent across the two measures.

In panel B, we present summary statistics for "small" firms only. Since the loans in the DealScan database are issued mainly by relatively large firms, there are only 1,757 loans in this "small" sample. On average, the fluidity measure for small firms (6.66) is not significantly different from the full sample (6.69), but small firms are more single-segmented (69%), and use less PSD (23%) and less predation-inducing covenants (2.99) than all firms together (respectively 47%, 45%, 3.47). Small firms also issue loans with smaller loan size, shorter maturity and lower probability of being syndicated. The average leverage, profitability, market-to-book ratio and tangibility are 22%, 0%, 2.13 and 0.24.

More importantly, we see that within the "small" sample, both high-fluidity and single-segmented firms use less PSD and covenants. This is consistent with our model predictions, but different from the results for all firms in the full sample. In particular, 19% of loans issued by small firms with high-fluidity are PSD, while the figure for small firms with low-fluidity is 26%. That is, for small firms, those with high-fluidity use 27% less performance-pricing than those with low-fluidity. Similarly, single-segmented small firms use 34% less performance-pricing than multi-segmented firms.

[12] We take a deal's maturity as the longest one among the maturities of all facilities in the deal.

4.5 Fluidity and Contractual Constraints

4.5.1 Fluidity and the Use of Predation-inducing Debt Covenants

As our model predicts, predatory threats reduce the use of predation-inducing constraints of debt. Financial covenants, which require the borrower to maintain certain financial ratios or performance measures, are especially subject to predation risk. We examine this effect by running Poisson regressions on the number of debt covenants. Results are shown in table 3. In all regressions, standard errors are clustered at the firm level and are corrected for heteroskedasticity.

First, as argued earlier, we expect the effect from predatory threats on the use of contractual constraints is more pronounced for small firms. Model (1) of the table shows results for the full sample, while (2)-(7) are for the "small" sample. As expected, we can see that our main proxy for predatory threats, $Fluidity$, has no significant effect on the use of covenants in the full sample, but its coefficient is significantly negative for small firms in all specifications. In model (2), higher fluidity leads to less use of financial covenants ($FinCov$). A one standard deviation increase of $Fluidity$ (3.02) on average reduces the number of financial covenants in small-firm bank loans by 6% (0.13), compared to the sample average (2.68). The loan variables in the regression such as maturity or amount may be jointly determined with the use of covenants, so we also run regressions without these loan variables to address the endogeneity concern in model (4). The results mitigate concerns that the joint determinance of contract terms does not change our conclusion.

Second, we propose the free-rider problem of predation, which indicates that market concentration (HHI) may capture different dimensions of product market competition than predation. To control for the effects from market concentration, we include the TNIC HHI in models except (3). The effect from predatory threats, measured by $Fluidity$, is significant after controlling for HHI, while HHI is not significantly related to the use of financial covenants. These findings are consistent with our argument on the free-rider problem of predation.

Third, data on covenants in the DealScan database are not of perfect quality. Some studies find that many loans without information on financial covenants or negative covenants in DealScan have these covenants in the contract. That is, the information on covenants are missing in the data collection process. In model (2)-(4), if a loan has no financial covenants in the DealScan database, we take it as a missing value (see also e.g., Bradley and Roberts, 2004). To check whether our results are driven by this assumption, we also run the same regressions with the number of financial covenants taking missing values as zero. Results are shown in model (5). All our previous findings are confirmed.

Finally, model (6) and (7) examine the use of all predation-inducing covenants, including financial covenants and three types of negative covenants, restricting equity issuance, debt issuance, and asset sales. The results are essentially the same as those for financial covenants only. Fluidity enters the regressions with a significantly negative coefficient.

As our model shows, the possibility of predation is also related to growth opportunities. With larger growth opportunities, the profit from predation is higher. Therefore, firms with larger growth opportunities should be less likely to use financial covenants. The empirical results are consistent with this prediction. In all the specifications, the coefficient of growth opportunities, *Market-to-Book*, is significantly negative. A few control variables also have significant coefficients across samples and specifications. Profitability always has a significantly positive coefficient across samples and specifications. High profitability could reduce the probability of covenant violation and hence raise the use of covenants. Covenants are use more often for loans with larger amount and term loans.

4.5.2 Fluidity and the Use of PSD

We examine whether predatory threats reduce the use of performance-pricing through cross-sectional Probit regressions, where the dependent variable is the dummy for PSD. Table 4 shows the results. We see from the table that the coefficient of *Fluidity* is significantly negative in all regressions and that this negative effect is more economically significant for small firms, indicating higher predatory threats reduces the use of PSD, especially for firms that are subject to predation risk. In particular, from model (3), a one-standard-deviation increase in fluidity for small firms (3.02) is associated with a reduction in the probability of the bank loan contract having performance-sensitive payments by about 18%, compared to the sample average (0.23). However, as we analyze earlier, large firms are less likely to be subject to predation, so predatory threats should have lower effects on the use of PSD for large firms. In model (1), *Fluidity* has a significantly negative effect on the use of PSD in the full sample, but a one standard deviation increase in fluidity reduces performance-pricing by only 5%, compared to the sample average (0.45). These results show that predatory threats from the product market reduces the use of performance-pricing, and this effect is more pronounced for small firms.

The results in model (1)-(4) are based on the loan or deal level. As we mentioned earlier, the performance-pricing feature is specified on the facility level. In model (5), we do our analyses on the facility level using the "small" sample, which consists of 2,558 facilities issued by 1,116 firms. Results are quantitatively and qualitatively similar to our previous results.

4.5.3 Fluidity and the Loan Spread: How Are Lenders Compensated for Less Constraints?

So far, we document that firms facing higher predation risk are likely to have less predation-inducing covenants in their bank loan contracts. In reality, the loan contract is negotiated between the borrower and the lender. Even in a competitive loan market, the lender has to be compensated. Then one question is: when less covenants are included in the contract to mitigate predation risk, how can the lender be compensated? Our conjecture is that the reduction of loan covenants is associated with higher interest payment. One may ask why the borrower facing predation risk accepts a higher interest payment, which is also a kind of contractual constraint, but refuses some covenants. In practice, interest payments are based on the drawn amount of loans, while covenants typically impose constraints on the entire firm. Therefore, comparing with a small increase in the loan spread, covenants are less desirable.

In this section, we investigate how predation risk affects the loan spread. Predation risk can affect the loan spread through two channels. First, predation increases credit risk, or default risk, and hence the spread of the loan. Second, in the presence of predation risk, the loan contract includes less contractual constraints to deter predation. In this case, a higher loan spread can be used to compensated the lender. Empirically, the effects of the two channels are combined together. Although we are not able to separate them, a positive correlation between spread and predation risk is consistent with our conjecture.

We regress the all-in-spread-drawn (AIS) on fluidity and the controls. AIS is typically considered as the total annual cost of the loan, including the interest spread and the annual fee. Table 5 show the results of OLS regressions. In all the four models, fluidity always has a significantly positive coefficient, showing that higher fluidity or perdition risk raises the cost of the loan. This is consistent with the Valta (2012) arguement that product market competition increases the cost of bank loans. In the table, model (1) is for the full sample, while model (2) is for small firms only. The coefficient of model (2) doubles that of model (1). The Wald test shows that the coefficient of model (2) is significantly higher than that of model (1) at 5% significance level. For small firms in model (2), a one-standard deviation of fluidity increases AIS by 19 bps, a 6% (7%) increase compared with the sample mean (median).

4.6 Business Segments and Contractual Constraints

We also use the dummy for single-segmented firms ($SingleSeg$) as the proxy for product similarity or predatory threats. A single-segmented firm competes in one product market and its investment opportunities are also less diversified. This induces higher product similarity with industry rivals, and is hence more vulnerable to predation risk. We thus expect $SingleSeg$ to have a negative effect on the use of covenants and performance-pricing. Table 6 reports the results.

From the table, we can see that $SingleSeg$ has similar effects with $Fluidity$ on the use of both PSD and predation-inducing covenants. Model (1)-(7) examine the use of covenants, while model (8)-(12) examine the use of performance-pricing. $Fluidity$ is not significant for the full sample in model (1), but it is significantly negative in model (2)-(7). From model (2), single-segmented small firms use significantly less financial covenants than multi-segmented small firms. Similarly, *SingleSeg* reduces the use of performance-pricing for all firms across samples, but the effect is doubled for small firms than the full sample.

There might be potential alternative explanations for the above empirical findings concerning the use of debt contractual constraints. For example, because multi-segmented firms are well diversified, their cash flow and hence financial ratios are less volatile than single-segmented firms, so they are less likely to violate covenants or trigger pricing grids and are hence more likely to accept covenants and performance-pricing. However, in our sample, single-segmented and multi-segmented firms almost have the same level of cash flow or earning volatility, indicating that cash flow risk is not a crucial diver of our results. Moreover, we control for cash flow risk, bankruptcy risk (Z-score), and other firm characteristics in our tests. We therefore believe that the negative relation of *SingleSeg* to the use of covenants and performance-pricing captures the effect of predatory threats on the use predation-inducting contractual constraints.

5 Conclusion

This paper uses a variant of the Hotelling (1929) model to illustrate that certain contractual constraints of debt, such as financial covenants or performance-pricing, makes the borrower's default subject to rivals' product market strategies and hence facilitates predation, especially when the borrower's product is similar to industry rivals. It follows that in order to mitigate the predation risk, firms facing higher predatory threats should be less likely to have performance-sensitive payments or predation-inducing covenants in their debt contracts. We empirically test these model predictions using a sample of about 16,000 bank loans to U.S. business borrowers in 1997-2008. The evidence supports our predictions. In particular, we show that for small firms which are subject to predation risk, higher predatory threats are associated with less use of performance-pricing and predation-inducing covenants.

Our findings indicate that the use of debt covenants and performance pricing takes product market predatory threats into account. This adds to the literature that studies the interactions between firm's financial policies and product market competition, as well as the design of debt contracts. For example, Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2012) show that higher predatory threats are associated with larger cash holdings, more hedging and lower payout ratios. Valta (2012) finds that product market competition raises the cost of debt. Complementary and consistent with these previous studies, our results suggest a different angle from which product market considerations are important in designing debt contracts.

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Appendix

Proof of Proposition 1

The optimization problem of firm A is $\max_{(p_A^1, p_A^2)} \Pi_A = 2p_A^1(U - p_A^1) + 2g \cdot p_A^2(U - p_A^2)$. This problem has a unique solution, $p_A^{1*} = p_A^{2*} = \frac{1}{2}U$ and $\Pi_A^* = U^2$. Similarly, $p_B^{1*} = p_B^{2*} = \frac{1}{2}U$ and $\Pi_B^* = U^2$. This is the maximum profit that a firm is able to obtain. If $\alpha \geq U$, obviously the two firms will set their prices to $\frac{1}{2}U$ and both earn U^2. No one has incentive to deviate. Therfore, if $\alpha \geq U$, $p_B^{1*} = p_B^{2*} = \frac{1}{2}U$.

Now we show that, if $p_A^{1*} = p_A^{2*} = p_B^{1*} = p_B^{2*} = \frac{1}{2}U$, $\alpha \geq U$. The proof is by contradiction.

Suppose $p_A^{1*} = p_A^{2*} = p_B^{1*} = p_B^{2*} = \frac{1}{2}U$ but $\alpha < U$. Obviously, the decisions of the firms are independent across periods, so we only consider the first period. Without loss of generality, let firm B stick to $p_B^{1*} = \frac{1}{2}U$ and consider a price deviation of firm A to $\frac{1}{2}U - \epsilon$, where ϵ is a small and positive number. Given that ϵ is a small enough, there is a marginal consumer who is indifferent between consuming form firm A and from firm B. Let x be the distance between this marginal consumer and firm A. We have $U - x - \left(\frac{1}{2}U - \epsilon\right) = U - (\alpha - x) - \frac{1}{2}U$ or $x = \frac{1}{2}(\alpha + \epsilon)$. The profit of firm A changes to

$$\pi_A^1 = \left(\frac{1}{2}U - \epsilon\right)\left[\frac{1}{2}(\alpha + \epsilon) + (\frac{1}{2}U + \epsilon)\right] = \left(\frac{1}{2}U - \epsilon\right)\left(\frac{1}{2}U + \frac{1}{2}\alpha + \frac{3}{2}\epsilon\right)$$

FOC: $\epsilon = \frac{1}{12}(U - 2\alpha)$. That is, if $\alpha < U$, firm A can deviate its price from $\frac{1}{2}U$ to $\frac{7}{12}U - \frac{1}{6}\alpha$ and earn a higher profit. This contradicts with $p_A^{1*} = \frac{1}{2}U$. **Q.E.D.**

Proof of Proposition 2-i

Note that, for any pricing strategies (p_A^1, p_B^1), the consumer who earns zero surplus by consuming the product from firm A lies $U - p_A^1$ away from firm A, while the one who earns zero surplus by consuming the product from firm B lies $U - p_B^1$ away from firm B. Therefore, if the individual markets of the two firms overlap at equilibrium, $(U - p_A^1) + (U - p_B^1) < \alpha$ or $p_A^1 + p_B^1 \geq 2U - \alpha$. In this case, there are two possibilities concerning the location of the marginal consumer. Either the marginal consumer lies in between the two firms, or she does not. We first exclude the second possibility as an equilibrium. The proof is by contradiction. Without loss of generality, suppose that at equilibrium, the marginal consumer lies on the left-hand side of firm A. Denote the distance between the marginal consumer and firm A as x. We have $U - x - p_A^{1**} = U - (\alpha + x) - p_B^{1**}$ or $p_A^{1**} = \alpha + p_B^{1**}$, which indicates that all consumers on the left-hand side of firm A is indifferent between consuming from the two firms. That is, all these consumers are marginal consumers. In this case, suppose that a proportion γ of marginal consumers will choose firm A, where $0 < \gamma < 1$. In this case, $\pi_A^{1**} = \gamma p_A^{1**}\left(U - p_A^{1**}\right)$. If firm A decreases its price, $p_B^{1**} + \alpha$, by an infinitely small amount δ, firm A will get all the consumers on its left-hand side and its profit will be larger than $p_A^{1**}\left(U - p_A^{1**}\right)$. That is, the marginal profit for firm A by increasing its price is positively infinite. Therefore, at equilibrium it is impossible to have $p_A^{1**} = \alpha + p_B^{1**}$. We get contradiction, so the marginal consumer cannot lie on the same side of the two firms.

Denote the distance between the marginal consumer and firm A as x. For given pricing strategies (p_A^1, p_B^1), $U - x - p_A^1 = U - (\alpha - x) - p_B^1$ or $x = \frac{1}{2}(\alpha + p_B^1 - p_A^1)$. The profit of firm A is $\pi_A^1 = p_A^1\big[\frac{1}{2}\big(\alpha + p_B^1 - p_A^1\big) + \big(U - p_A^1\big)\big]$. The optimization problem of firm A, for any given pricing strategy of firm B, is

$$\max_{p_A^1} \pi_A^1 = \frac{1}{2} p_A^1 \big(2U + \alpha - 3p_A^1 + p_B^1\big) \tag{4}$$

FOC: $p_A^1 = \frac{1}{6}\big(\alpha + 2U + p_B^1\big)$. This is the best response of firm A to any p_B^1. Similarly, the best response of firm B to any p_A^1 is $p_B^1 = \frac{1}{6}\big(\alpha + 2U + p_A^1\big)$. Combining both response functions, we get $p_A^{1**} = p_B^{1**} = \frac{1}{5}\big(\alpha + 2U\big)$ and $\pi_A^{1**} = \pi_B^{1**} = \frac{3}{50}\big(\alpha + 2U\big)^2$. Since $p_A^1 + p_B^1 \geq 2U - \alpha$, we have $\alpha < \frac{6}{7}U$. **Q.E.D.**

Proof of Proposition 2-ii

From the proof for proposition 2-i, we know that, if and only if $p_A^1 + p_B^1 \geq 2U - \alpha$, the individual markets of the two firms do not overlap. However, if $p_A^1 + p_B^1 > 2U - \alpha > U$ (since $\alpha < U$), the price of at least one firm is larger than $\frac{1}{2}U$. Because the profit function in price is quadratic and obtains the global maximum at $\frac{1}{2}U$, this firm can raise its own profit by reducing its price closer to $\frac{1}{2}U$ by a small positive amount, with which the individual markets still have no overlap. Thus, when the individual markets do not overlap at equilibrium and $\alpha < U$, there must be $p_A^{1**} + p_B^{1**} = 2U - \alpha$. In this case, the marginal consumer, who is indifferent between firm A and firm B, lies $U - p_A^{1**}$ away from firm A and $U - p_B^{1**}$ away from firm B. At the symmetric equilibrium when the marginal consumer lies in the middle of the two firms, $p_A^{s**} = p_B^{s**} = U - \frac{1}{2}\alpha$, $\Pi_A^{**} = \Pi_B^{**} = \frac{1}{2}(1 + g) \cdot \alpha(2U - \alpha)$.

Given $p_A^{1**} + p_B^{1**} = 2U - \alpha$ and $\alpha < U$, if $p_A^{1**} < \frac{1}{2}U$, firm A can increase this price to $\frac{1}{2}U$. Such an increase keeps the individual markets un-overlaped while it raises firm A's profit. This contradicts with p_A^{1**} being the equilibrium price. Therefore, $p_A^{1**} \geq \frac{1}{2}U$ and $p_B^{1**} \geq \frac{1}{2}U$. It follows that $p_A^{1**} = 2U - \alpha - p_B^{1**} \leq 2U - \alpha - \frac{1}{2}U = \frac{3}{2}U - \alpha$. In sum, $p_A^{1**} \in [\frac{1}{2}U, \frac{3}{2}U - \alpha]$ and similarly $p_B^{1**} \in [\frac{1}{2}U, \frac{3}{2}U - \alpha]$. Given that $p_A^{1**}, p_B^{1**} \in [\frac{1}{2}U, \frac{3}{2}U - \alpha]$ and $p_A^{1**} + p_B^{1**} = 2U - \alpha$, consider whether the firms have incentives to deviate. Obviously, neither firm has incentive to increase the price because this reduces its own profit. Therefore, the only profitable deviation is to reduce the price. Without loss of generality, suppose that firm A reduces the price by a small positive amount ϵ while firm B keeps p_B^{1**}. Because of the lower price of firm A, $p_A^{1**} - \epsilon$, there is market overlap now and the marginal borrower is closer to firm B than before. Let x be the distance between this marginal consumer and firm A. We have $U - x - (p_A^{1**} - \epsilon) = U - (\alpha - x) - p_B^{1**}$ or $x = \frac{1}{2}(\alpha + p_B^{1**} - p_A^{1**} + \epsilon)$. The profit of firm A is

$$\begin{aligned}\pi_A^1 &= (p_A^{1**} - \epsilon)\Big[\frac{1}{2}\big(\alpha + p_B^{1**} - p_A^{1**} + \epsilon\big) + \big(U - p_A^{1**} + \epsilon\big)\Big] \\ &= 2(p_A^{1**} - \epsilon)\Big(U - p_A^{1**} + \frac{3}{4}\epsilon\Big).\end{aligned}$$

$d\pi_A^1/d\epsilon = \frac{7}{2}\big(p_A^{1**} - \frac{4}{7}U\big) - 3\epsilon$. If $p_A^{1**} > \frac{4}{7}U$, $d\pi_A^1/d\epsilon > 0$ for small enough ϵ. That is, firm A can reduce p_A^{1**} to raise profit. This contradicts with p_A^{1**} being the equilibrium, so $p_A^{1**} \leq \frac{4}{7}U$ and $p_B^{1**} \leq \frac{4}{7}U$. It follows that $p_A^{1**} + p_B^{1**} = 2U - \alpha \leq \frac{8}{7}U$ or $\alpha \geq \frac{6}{7}U$. **Q.E.D.**

Proof of Proposition 3

A predatory strategy of firm B, p_B^1, is to reduce firm's date-1 profit no more than D. When $0 < \alpha \leq \frac{6}{7}U$, the best response of firm A to p_B^1 is $p_A^1 = \frac{1}{6}\big(\alpha + 2U + p_B^1\big)$ and the profit of firm A is $\pi_A^1 = \frac{1}{24}\big(2U + \alpha + p_B^1\big)^2$. Therefore, the optimal predatory strategy of firm B, p_B^{1***}, satisfies $\frac{1}{24}\big(2U + \alpha + p_B^{1***}\big)^2 = D$ or $p_B^{1***} = \sqrt{24D} - \alpha - 2U$. Note that, given $0 < \alpha \leq U$, $D < \frac{3}{50}\big(\alpha + 2U\big)^2 < \frac{1}{24}(\alpha + 3U)^2$, so $p_B^{1***} < U$. For the marginal consumer, we have $\alpha - x = \frac{1}{2}\big(\frac{7}{6}\alpha + \frac{1}{3}U - \frac{5}{6}p_B^{1***}\big)$. The profit of firm B in the first period is

$$\pi_B^{1***} = p_B^{1***}\Big[(\alpha - x) + (U - p_B^{1***})\Big] = \big(\sqrt{24D} - \alpha - 2U\big)\big(2\alpha + 4U - \frac{17}{12}\sqrt{24D}\big).$$

After firm A goes bankrupt at date 1, firm B will obtain the monopolist profit in the second period, $\pi_B^{2***} = \frac{1}{2}gU^2$, so the total profit in the two periods is

$$\Pi_B^{***} = \big(\sqrt{24D} - \alpha - 2U\big)\big(2\alpha + 4U - \frac{17}{12}\sqrt{24D}\big) + \frac{1}{2}gU^2.$$

Recall $\Pi_B^{**} = \frac{3}{25}\big(\alpha + 2U\big)^2$. If $\Pi_B^{**} < \Pi_B^{***}$, the optimal strategy of firm B is to prey in the first period. Therefore, the threshold $\overline{D}$ satisfies (1).

Finally, we need prove $\frac{d\overline{D}}{d\alpha} > 0$ and $\frac{d\overline{D}}{dg} < 0$. Let $y = \sqrt{24\overline{D}}$ or $\overline{D} = \frac{y^2}{24}$. From $\overline{D} < \frac{3}{50}\big(\alpha{+}2U\big)^2$, we have $y < \frac{6}{5}(\alpha + 2U)$. Take the derivative of (1) with respect to α,

$$\frac{d\overline{D}}{d\alpha} = \frac{y}{12}\frac{dy}{d\alpha} = \frac{y}{12} \cdot \frac{\frac{53}{25}(\alpha + 2U) - \frac{41}{24}y}{\frac{41}{24}(\alpha + 2U) - \frac{34}{24}y} > 0.$$

Similarly,

$$\frac{d\overline{D}}{dg} = \frac{y}{12}\frac{dy}{dg} = \frac{y}{12} \cdot \frac{\frac{18}{25}(\alpha + 2U)^2 - 6U^2}{41(\alpha + 2U) - 34y} > 0.$$

Proof of Proposition 4

From Proposition 3, the optimal price before t is $p_B^{t****} = p_B^{1***} = \sqrt{24D} - \alpha - 2U$. With this price, firm A's profit accrued before date t is exactly tD and the required payment will be hD at date 1. Between date t and date 1, the optimal predatory price of firm B, p_B^{1****}, should make firm A's profit within this period no more than $(h - t)D$. Note the length of this period is $1 - t$. Also following the reasoning in section 2.3, we get

$$p_B^{1****} = \sqrt{24D \cdot \frac{h-t}{1-t}} - \alpha - 2U. \tag{5}$$

The profit of firm B in the first period includes two parts as follows

$$\pi_B^{1****} = t \cdot p_B^{t****}\Big[(\alpha - x) + (U - p_B^{t****})\Big] + (1-t) \cdot p_B^{1****}\Big[(\alpha - x) + (U - p_B^{1****})\Big].$$

Note that

$$\pi_B^{1****} - \pi_B^{1***} = (1-t)\Bigg[\Big(\sqrt{24D \cdot \frac{h-t}{1-t}} - \alpha - 2U\Big)\Big(2\alpha + 4U - \frac{17}{12}\sqrt{24D \cdot \frac{h-t}{1-t}}\Big) - \Big(\sqrt{24D} - \alpha - 2U\Big)\Big(2\alpha + 4U - \frac{17}{12}\sqrt{24D}\Big)\Bigg].$$

When $D < \frac{3}{50}\big(\alpha + 2U\big)^2$, $\pi_B^{1****} > \pi_B^{1***}$. That is, if the date-1 payment of firm A is contingent on its date-t performance, firm B through predation can obtain a higher profit than that when the date-1 payment of firm A is unconditional.[13]

Since $\pi_B^{1****} > \pi_B^{1***}$, it is immediate to get that $\widehat{D} < \overline{D}$. We proved (i) and (ii). To prove (iii), let $y = \sqrt{24\widehat{D}}$ and $\gamma = \sqrt{\frac{h-t}{1-t}} > 1$. That is, $\widehat{D} = \frac{1}{24}y^2$ and $h = t + (1-t)\gamma^2$. Predation is necessary to make firm A default on the date-1 payment only when $\widehat{D} < \frac{3}{50h}\big(\alpha + 2U\big)^2$, so we have $y < \frac{6}{5h}(\alpha + 2U)$. From (2),

$$\frac{d\widehat{D}}{d\alpha} = \frac{y}{12}\frac{dy}{d\alpha} = \frac{y}{12} \cdot \frac{\frac{50+3g}{25}(\alpha + 2U) - \frac{41}{24}[t + (1-t)\gamma]y}{\frac{41}{24}(\alpha + 2U)[t + (1-t)\gamma] - \frac{34}{24}[t + (1-t)\gamma^2]y} > 0.$$

[13]In our reasoning, it seems that l does not play any role. This is not true because, as we assume earlier, l in our model is used to make the two contract forms, the straight debt and the PSD, equivalent when the contract was signed.

Similarly, we can get that $\frac{dy}{d\gamma} < 0$ and $\frac{d\gamma}{dh} > 0$, so $\frac{d\widehat{D}}{dh} = \frac{y}{12}\frac{dy}{d\gamma}\frac{d\gamma}{dh} < 0$. Comparing (1) and (2), we can easily get $\frac{d\widehat{D}}{dt} < 0$ because $\pi_B^{1****} > \pi_B^{1***}$. **Q.E.D.**

Proof of Lemma 1

If there is no predation, each firm at equilibrium chooses the best response to the prices of the other two in every period. This is just an extension of the case in section 2.2. Suppose the marginal consumer of firm A and B lies x away from firm A, while the marginal consumer of firm A and C lies y away from firm A. We have $x = \frac{1}{2}(p_B^1 - p_A^1 + \alpha)$ and $y = \frac{1}{2}(p_C^1 - p_A^1 + \beta_{\mathrm{I}})$. The optimization problems are

$$\max_{p_A^1} \pi_A^1 = p_A^1 \cdot (x+y) = p_A^1 \cdot [\frac{1}{2}(\alpha + \beta_{\mathrm{I}} + p_B^1 + p_C^1) - p_A^1]$$
$$\max_{p_B^1} \pi_B^1 = p_B^1 \cdot [(\alpha - x) + (U - p_B^1)] = p_B^1 \cdot \big(U + \frac{1}{2}\alpha + \frac{1}{2}p_A^1 - \frac{3}{2}p_B^1\big)$$
$$\max_{p_C^1} \pi_C^1 = p_C^1 \cdot [(\beta_{\mathrm{I}} - y) + (U - p_C^1)] = p_C^1 \cdot \big(U + \frac{1}{2}\beta_{\mathrm{I}} + \frac{1}{2}p_A^1 - \frac{3}{2}p_C^1\big)$$

The best response functions are

$$\begin{cases} p_A^1 = \frac{1}{4}\big(\alpha + \beta_{\mathrm{I}} + p_B^1 + p_C^1\big) \\ p_B^1 = \frac{1}{6}\big(2U + \alpha + p_A^1\big) \\ p_C^1 = \frac{1}{6}\big(2U + \beta_{\mathrm{I}} + p_A^1\big) \end{cases} \tag{6}$$

Solving this equation system, we can get the optimal pricing strategies when there is no predation. All results are summarized in column 2 of the table.

Now consider when firm B preys but firm C, as the free-rider, does not.[14] In the second period when firm A exits, obviously the profits of firm B and firm C are both $\frac{3}{50}g(2U + \alpha + \beta_{\mathrm{I}})^2$. In the following, we focus on the pricing strategy in the first period. Suppose firm B chooses a pricing strategy, p_B^1. From (6), we have

$$\begin{cases} p_A^1 = \frac{1}{23}\big(2U + 6\alpha + 7\beta_{\mathrm{I}} + 6p_B^1\big) \\ p_C^1 = \frac{1}{23}\big(8U + \alpha + 5\beta_{\mathrm{I}} + p_B^1\big) \end{cases} \tag{7}$$

[14]We ignore cases in which both firm B and firm C prey and in which firm B is the free-rider.

To prey, firm B will choose p_B^1 such that firm A's profit equals to D. That is

$$p_A^1 \cdot \left[\frac{1}{2}(\alpha + \beta_{\mathrm{I}} + p_B^1 + p_C^1) - p_A^1\right] = \frac{1}{529}\left(2U + 6\alpha + 7\beta_{\mathrm{I}} + 6p_B^1\right)^2 = D.$$

Thus the predatory pricing strategy of firm B equals to $\frac{23}{6}\sqrt{D} - \frac{1}{3}U - \alpha - \frac{7}{6}\beta_{\mathrm{I}}$. Given this predatory pricing strategy, the corresponding optimal strategies of firm A and firm C can be solved through (7) and are respectively, $\sqrt{D}$ and $\frac{1}{6}\left(\sqrt{D} + 2U + \beta_{\mathrm{I}}\right)$. We can further solve for the profits. The results are shown in column 3 of the following table.

In sum, we can get $\widehat{\Phi}$.

Equilibria when $\frac{6}{7}U \leq \alpha + \beta_{\mathbf{I}} < U$

Items	No Predation	B preys but C does not.
p_A^1	$\frac{7}{22}\alpha + \frac{7}{22}\beta_{\mathrm{I}} + \frac{2}{11}U$	$\sqrt{D}$
p_B^1	$\frac{29}{132}\alpha + \frac{7}{132}\beta_{\mathrm{I}} + \frac{4}{11}U$	$\frac{23}{6}\sqrt{D} - \frac{1}{3}U - \alpha - \frac{7}{6}\beta_{\mathrm{I}}$
p_C^1	$\frac{7}{132}\alpha + \frac{29}{132}\beta_{\mathrm{I}} + \frac{4}{11}U$	$\frac{1}{6}\left(\sqrt{D} + 2U + \beta_{\mathrm{I}}\right)$
π_A^1	$\left(\frac{7}{22}\alpha + \frac{7}{22}\beta_{\mathrm{I}} + \frac{2}{11}U\right)^2$	D
π_B^1	$\frac{3}{2}\left(\frac{29}{132}\alpha + \frac{7}{132}\beta_{\mathrm{I}} + \frac{4}{11}U\right)^2$	$\left(\frac{23}{6}\sqrt{D} - \frac{1}{3}U - \alpha - \frac{7}{6}\beta_{\mathrm{I}}\right)\left(\frac{3}{2}U + 2\alpha + \frac{7}{4}\beta_{\mathrm{I}} - \frac{21}{4}\sqrt{D}\right)$
π_C^1	$\frac{3}{2}\left(\frac{7}{132}\alpha + \frac{29}{132}\beta_{\mathrm{I}} + \frac{4}{11}U\right)^2$	$\frac{1}{24}(\sqrt{D} + 2U + \beta_{\mathrm{I}})^2$
p_A^2	$\frac{7}{22}\alpha + \frac{7}{22}\beta_{\mathrm{I}} + \frac{2}{11}U$	-
p_B^2	$\frac{29}{132}\alpha + \frac{7}{132}\beta_{\mathrm{I}} + \frac{4}{11}U$	$\frac{1}{5}(2U + \alpha + \beta_{\mathrm{I}})$
p_C^2	$\frac{7}{132}\alpha + \frac{29}{132}\beta_{\mathrm{I}} + \frac{4}{11}U$	$\frac{1}{5}(2U + \alpha + \beta_{\mathrm{I}})$
π_A^2	$\left(\frac{7}{22}\alpha + \frac{7}{22}\beta_{\mathrm{I}} + \frac{2}{11}U\right)^2$	-
π_B^1	$\frac{3}{2}\left(\frac{29}{132}\alpha + \frac{7}{132}\beta_{\mathrm{I}} + \frac{4}{11}U\right)^2$	$\frac{3}{50}(2U + \alpha + \beta_{\mathrm{I}})^2$
π_C^1	$\frac{3}{2}\left(\frac{7}{132}\alpha + \frac{29}{132}\beta_{\mathrm{I}} + \frac{4}{11}U\right)^2$	$\frac{3}{50}(2U + \alpha + \beta_{\mathrm{I}})^2$

Table 1: Variable Definitions

The table shows the notation and definition of variables used in our analysis. The variables are classified into four categories: dependent variables, borrower characteristics, loan characteristics and market and industry characteristics.

Variable	Definition
Dependent variables	
FinCov	Number of financial covenants
Cov	Number of covenants, including financial covenants and negative covenants that restrict equity issuance, debt issuance and asset sales.
FinCov0	Number of financial covenants, taking missing values of $FinCov$ as zero
Cov0	Number of covenants, including financial covenants and negative covenants that restrict equity issuance, debt issuance and asset sales, taking missing values of Cov as zero.
PSD	Dummy = 1 for performance-sensitive loans
PSD_F	Dummy = 1 for performance-sensitive facilities
Borrower characteristics	
Fluidity	Measure of product market threats based on product descriptions
SingleSeg	Dummy = 1 if the firm has only one business segment in the year
lnAssets	The natural logarithm of Total Assets measured in million U.S. dollar, i.e. $log(atq)$
Q	Market value / Total Assets, i.e. $(atq-(atq-ltq+txditcq)+(prccq*cshoq))/atq$
Leverage	Total Liabilities / Total Assets, i.e. $(dlcq+dlttq)/atq$
Profitability	EBITDA / Total Assets, i.e. $oibdpq/atq$
Tangibility	PP&E / Total Assets, i.e. $ppentq/atq$
CashFlowRisk	Variance of EBITDA calculated using observations in the past eight quarters in Compustat, divided by Total Assets.
Z-Score	The Altman's Z-Score $= 1.2*((actq-lctq)/atq)+1.4*(req/atq)+3.3*(piq/atq)+0.6*((prccq*cshoq)/ltq)+0.999*(saleq/atq)$
Loan characteristics	
lnMaturity	The natural logarithm of the deal maturity measured in months
lnAmount	The natural logarithm of the deal amount measured in million U.S. dollar
Syndication	Dummy = 1 for syndicated loans
Security	Dummy = 1 for secured loans
Term Loan	Dummy = 1 if the deal include a term loan
LoanPurpose	Dummies for the four LoanPurposes: acquisition purpose ("general or specific acquisition program" or "LBO loans"), recapitalization purpose("debt repayment/consolidation", "recapitalization" or "debtor-in-possession loan"), general purpose ("working capital" or "general corporate purpose") and others.
Market and industry characteristics	
HHI	The TNIC HHI developed in Hoberg and Phillips (2010a).
Industry	Dummies using the SIC two-digit industry classification
Year	Dummies for years 1997-2008

Table 2: Summary Statistics

The table presents summary statistics for the variables described in Table 1. The data are obtained by merging the DealScan database with the CRSP-Compustat databases. We drop observations without borrower ID, total assets, or fluidity information, and exclude financial firms and utilities. Panel A is for the full sample, and Panel B is for small firms only, which are defined as those with total assets lying in the lowest one-third among all firms in Compustat in the year.

Variable	All Obs.					Low Fluidity			High Fluidity			Multi-segmented			Single-segmented		
	Mean	Min	Max	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Panel A: Full Sample																	
Fluidity	6.69	0.33	24.11	3.28	15,772	4.16	1.26	7,889	9.23	2.67	7,883	6.49	3.25	7,650	6.94	3.34	6,752
SingleSeg	0.47	0.00	1.00	0.50	14,402	0.44	0.50	7,210	0.50	0.50	7,192	0.00	0.00	7,650	1.00	0.00	6,752
HHI	0.20	0.01	1.00	0.22	15,763	0.25	0.23	7,883	0.15	0.18	7,880	0.21	0.22	7,645	0.19	0.21	6,749
PSD	0.45	0.00	1.00	0.50	15,772	0.47	0.50	7,889	0.44	0.50	7,883	0.48	0.50	7,650	0.43	0.49	6,752
FinCov	2.72	1.00	8.00	1.16	9,738	2.70	1.13	4,882	2.75	1.19	4,856	2.69	1.17	4,656	2.75	1.14	4,330
Cov	3.47	1.00	10.00	1.86	9,980	3.40	1.80	4,968	3.54	1.92	5,012	3.49	1.90	4,764	3.43	1.79	4,442
DealAmount	424	0.00	30,000	1031	15,704	403	945	7,849	446	1110	7,855	493	1146	7,620	265	596	6,727
Maturity	47.88	1.00	420	29.75	14,644	46.84	28.48	7,339	48.92	30.94	7,305	47.12	28.96	7,112	48.77	30.98	6,243
Syndication	0.85	0.00	1.00	0.36	15,772	0.86	0.34	7,889	0.83	0.37	7,883	0.90	0.31	7,650	0.78	0.42	6,752
TermLoan	0.31	0.00	1.00	0.46	15,772	0.28	0.45	7,889	0.33	0.47	7,883	0.30	0.46	7,650	0.31	0.46	6,752
Assets	4916	1.78	466,001	191,44	15,772	4168	16279	7,889	5665	21608	7,885	5747	17665	7,650	1790	4505	6,752
Market-to-Book	1.78	0.23	12.74	1.29	14,024	1.62	0.97	6,791	1.92	1.52	7,233	1.64	1.01	6,688	1.94	1.56	6,221
Profitability	0.03	-0.33	0.13	0.04	14,587	0.03	0.03	7,232	0.02	0.05	7,355	0.03	0.03	7,021	0.03	0.05	6,306
Leverage	0.31	0.00	0.98	0.21	15,084	0.30	0.19	7,565	0.32	0.23	7,519	0.31	0.19	7,317	0.31	0.23	6,454
Tangibility	0.31	0.00	0.91	0.24	15,654	0.28	0.20	7,836	0.34	0.27	7,818	0.29	0.21	7,578	0.34	0.27	6,723
CashFlowRisk	0.01	0.00	0.87	0.02	15,353	0.01	0.02	7,654	0.02	0.03	7,699	0.01	0.02	7,470	0.02	0.03	6,559
ZScore	2.53	-12.6	67.4	4.56	14,315	2.35	2.87	7,142	2.71	5.76	7,173	2.23	3.25	6,829	2.99	5.89	6,256
Panel B: Small Firms																	
HHI	0.29	0.02	1.00	0.28	1,753	0.39	0.29	879	0.19	0.21	874	0.34	0.29	524	0.27	0.27	1,180
Fluidity	6.66	0.88	17.78	3.02	1,757	4.33	1.31	881	9.01	2.36	876	6.42	2.71	526	6.80	3.17	1,182
SingleSeg	0.69	0.00	1.00	0.46	1,708	0.69	0.46	859	0.69	0.46	849	0.00	0.00	526	1.00	0.00	1,182
PSD	0.23	0.00	1.00	0.42	1,757	0.26	0.44	881	0.19	0.39	876	0.29	0.46	526	0.19	0.39	1,182
FinCov	2.68	1.00	8.00	1.17	1,290	2.81	1.15	664	2.54	1.17	626	2.82	1.19	406	2.60	1.14	847
Cov	2.99	1.00	9.00	1.57	1,310	3.12	1.53	669	2.85	1.61	641	3.24	1.66	409	2.86	1.49	862
DealAmount	17.20	0.35	347	27.15	1,745	17.38	26.50	870	17.03	27.80	875	18.16	21.95	525	16.65	29.28	1,171
Maturity	35.82	1.00	276	26.64	1,630	37.87	27.39	813	33.77	25.73	817	38.25	26.23	490	34.70	26.99	1,092
Syndication	0.52	0.00	1.00	0.50	1,757	0.53	0.50	881	0.50	0.50	876	0.58	0.49	526	0.49	0.50	1,182
TermLoan	0.39	0.00	1.00	0.49	1,757	0.41	0.49	881	0.37	0.48	876	0.44	0.50	526	0.37	0.48	1,182
Assets	41.98	1.78	154	29.28	1,757	40.25	28.72	881	43.71	29.75	876	47.26	30.31	526	39.05	27.83	1,182
Market-to-Book	2.07	0.23	12.74	1.81	1,720	1.65	1.17	861	2.50	2.20	859	1.80	1.41	514	2.21	1.95	1,160
Profitability	0.00	-0.33	0.13	0.08	1,601	0.02	0.05	794	-0.02	0.09	807	0.01	0.06	470	-0.00	0.08	1,091
Leverage	0.22	0.00	0.98	0.20	1,724	0.24	0.20	864	0.19	0.20	860	0.21	0.19	522	0.22	0.21	1,157
Tangibility	0.24	0.00	0.91	0.22	1,756	0.24	0.21	881	0.24	0.24	875	0.23	0.19	526	0.25	0.24	1,182
CashFlowRisk	0.03	0.00	0.87	0.05	1,700	0.03	0.03	845	0.04	0.06	855	0.03	0.05	511	0.03	0.05	1,145
ZScore	2.77	-12.6	67.41	6.91	1,700	2.69	5.03	855	2.85	8.40	845	2.40	5.53	512	2.99	7.46	1,145

Table 3: Fluidity and the Number of Covenants

This table shows estimated marginal effects on the number of covenants from poisson regressions. We The proxy for product similarity is *Fluidity*, constructed in Hoberg, Phillips, and Prabhala (2012). The specifications differ in the dependent variable and the sample used in the regression, as indicated by column headers. The variable, *FinCov* (*Cov*), is the number of financial covenants (both financial covenants and three type of negative covenants, restricting debt issuance, equity issuance and asset sales). *FinCov*0 (*Cov*0) takes missing values of *FinCov* (*Cov*) as zero. The full sample covers loans issued to non-financial and non-utility U.S. borrowers in 1997-2008, obtained by linking DealScan with CRSP/Compustat. The "small" sample takes only loans from the full sample lent to firms with the smallest third of asset size in the Compustat database, split on a yearly basis. All regressions include year, industry (2-digit SIC code) fixed effects. Marginal effects for a given independent variable are calculated holding other variables constant at their average value. The pseudo R^2 is calculated as McFadden's (adjusted) R^2 from McFadden (1974). Standard errors are clustered at the firm level and corrected for heteroskedasticity. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. t-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Y Variable	FinCov	FinCov	FinCov	FinCov	FinCov0	Cov	Cov0
Sample	Full	Small	Small	Small	Small	Small	Small
Fluidity	0.008	-0.043***	-0.046***	-0.035**	-0.069***	-0.054***	-0.073***
	(1.24)	(-2.67)	(-2.68)	(-2.08)	(-3.90)	(-2.60)	(-3.74)
HHI	0.028	0.013		0.071	-0.032	-0.013	-0.033
	(0.95)	(0.09)		(0.52)	(-0.20)	(-0.07)	(-0.18)
Market-to-Book	-0.114***	-0.090***	-0.088**	-0.102***	-0.125***	-0.144***	-0.145***
	(-6.00)	(-2.58)	(-2.55)	(-3.07)	(-3.45)	(-3.34)	(-3.47)
lnAssets	-0.164***	0.094	0.101	0.179***	-0.007	0.118	0.004
	(-7.20)	(1.18)	(1.28)	(3.00)	(-0.09)	(1.19)	(0.05)
Profitability	2.459***	2.517***	2.454***	2.676***	3.373***	2.815***	3.792***
	(5.67)	(3.99)	(3.88)	(4.25)	(4.40)	(3.28)	(4.20)
Leverage	0.201**	-0.343	-0.327	0.101	-1.021***	0.132	-0.805**
	(2.04)	(-1.48)	(-1.40)	(0.48)	(-3.52)	(0.41)	(-2.32)
CashFlowRisk	-3.903***	0.006	0.026	-0.965	-1.107	0.474	-1.249
	(-3.71)	(0.00)	(0.02)	(-0.67)	(-0.76)	(0.31)	(-0.76)
Tangibility	-0.159	0.019	-0.004	-0.044	0.456	-0.476	0.141
	(-1.60)	(0.08)	(-0.02)	(-0.20)	(1.60)	(-1.44)	(0.41)
ZScore	0.022***	0.012	0.011	0.011	0.001	0.016	-0.003
	(3.95)	(1.35)	(1.32)	(1.32)	(0.13)	(1.46)	(-0.25)
Syndication	0.334***	-0.024	-0.031		0.044	0.209*	0.225**
	(6.67)	(-0.27)	(-0.34)		(0.46)	(1.87)	(2.09)
Security	0.420***	0.066	0.069		0.043	0.163	0.079
	(10.41)	(0.37)	(0.39)		(0.22)	(0.71)	(0.36)
lnMaturity	0.168***	0.174***	0.175***		0.129*	0.136	0.097
	(5.83)	(2.61)	(2.62)		(1.80)	(1.58)	(1.15)
lnAmount	0.066***	0.129**	0.129**		0.278***	0.310***	0.454***
	(2.73)	(2.24)	(2.23)		(4.41)	(4.37)	(6.60)
TermLoan	0.239***	0.134	0.141*		0.079	0.349***	0.285***
	(7.12)	(1.57)	(1.66)		(0.89)	(3.07)	(2.69)
LoanPurpose	Yes	Yes	Yes	No	Yes	No	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6577	996	992	1115	1258	1010	1258
pseudo R^2	0.035	0.027	0.027	0.020	0.069	0.058	0.106

Table 4: Fluidity and Performance-pricing

This table shows estimated marginal effects on the use of performance-pricing from cross-sectional Probit regressions. The proxy for product similarity is *Fluidity*, constructed in Hoberg, Phillips, and Prabhala (2012). The specifications differ in the dependent variable and the sample used, as indicated by column headers. The dummy variable, PSD (PSD_F), indicates whether the loan (facility) includes the performance-pricing feature. The full sample covers loans issued to non-financial and non-utility U.S. borrowers in 1997-2008, obtained by linking DealScan with CRSP/Compustat. The "small" sample takes only loans from the full sample lent to firms with the smallest third of asset size in the Compustat database, split on a yearly basis. All regressions include year, industry (2-digit SIC code) fixed effects. Marginal effects for a given independent variable are calculated holding other variables constant at their average value. The pseudo R^2 is calculated as McFadden's (adjusted) R^2 from McFadden (1974). Standard errors are clustered at the firm level and corrected for heteroskedasticity. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. t-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)
Y Variable	PSD	PSD	PSD	PSD	PSD_F
Sample	Full	Small	Small	Small	Small
Fluidity	-0.008***	-0.012**	-0.014**	-0.011**	-0.013**
	(-2.75)	(-2.41)	(-2.57)	(-2.17)	(-2.15)
HHI	-0.135	-0.033		-0.015	0.010
	(-1.37)	(-0.60)		(-0.31)	(0.16)
Market-to-Book	-0.019**	-0.014	-0.014	-0.011	-0.015
	(-2.37)	(-1.41)	(-1.39)	(-1.27)	(-1.43)
lnAssets	-0.085***	-0.022	-0.023	0.118***	-0.006
	(-9.14)	(-0.83)	(-0.85)	(6.02)	(-0.20)
Profitability	1.271***	0.823***	0.819***	1.015***	0.704**
	(6.16)	(3.31)	(3.29)	(4.11)	(2.44)
Leverage	-0.228***	-0.114	-0.104	0.024	-0.109
	(-5.34)	(-1.57)	(-1.42)	(0.38)	(-1.37)
CashFlowRisk	-0.951**	-0.299	-0.273	-0.467	-0.401
	(-2.55)	(-0.59)	(-0.55)	(-0.99)	(-0.72)
Tangibility	0.040	-0.024	-0.029	-0.026	-0.088
	(0.85)	(-0.33)	(-0.40)	(-0.38)	(-1.08)
ZScore	-0.000	-0.001	-0.001	-0.002	-0.002
	(-0.12)	(-0.61)	(-0.59)	(-1.15)	(-0.59)
Syndication	0.295***	0.036	0.035		0.072**
	(12.06)	(1.20)	(1.17)		(2.33)
Security	-0.091***	0.012	0.010		-0.003
	(-4.89)	(0.21)	(0.17)		(-0.04)
lnMaturity	0.128***	0.073***	0.073***		0.070***
	(10.56)	(3.69)	(3.72)		(3.35)
lnAmount	0.179***	0.168***	0.167***		0.154***
	(17.87)	(8.00)	(7.98)		(6.48)
TermLoan	-0.160***	-0.070***	-0.070***		-0.107***
	(-9.94)	(-2.62)	(-2.60)		(-3.51)
LoanPurpose	Yes	Yes	Yes	No	Yes
Industry	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
N	7806	1227	1223	1481	1801
pseudo R^2	0.260	0.280	0.278	0.149	0.249

Table 5: Fluidity and Loan Spread

This table shows estimated marginal effects on the loan spread (AIS) from OLS regressions. The proxy for product similarity is *Fluidity*, constructed in Hoberg, Phillips, and Prabhala (2012). The specifications differ in the sample used, as indicated by column headers. The full sample covers loans issued to non-financial and non-utility U.S. borrowers in 1997-2008, obtained by linking DealScan with CRSP/Compustat. The "small" sample takes only loans from the full sample lent to firms with the smallest third of asset size in the Compustat database, split on a yearly basis. All regressions include year, industry (2-digit SIC code) fixed effects. Marginal effects for a given independent variable are calculated holding other variables constant at their average value. The pseudo R^2 is calculated as McFadden's (adjusted) R^2 from McFadden (1974). Standard errors are clustered at the firm level and corrected for heteroskedasticity. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. t-values are shown in parentheses.

	(1)	(2)	(3)	(4)
Y Variable	AIS	AIS	AIS	AIS
Sample	Full	Small	Small	Small
Fluidity	3.264***	6.457***	5.613***	7.031***
	(5.40)	(3.65)	(3.32)	(4.16)
HHI	1.808	18.901		4.135
	(0.25)	(1.10)		(0.26)
Market-to-Book	-5.789***	-2.776	-2.812	-3.069
	(-2.97)	(-0.68)	(-0.68)	(-0.75)
lnAssets	-8.489***	-20.028**	-20.417***	-29.877***
	(-3.20)	(-2.58)	(-2.61)	(-4.96)
Profitability	-358.258***	-188.264***	-187.033***	-167.436**
	(-8.42)	(-2.70)	(-2.66)	(-2.35)
Leverage	115.694***	137.218***	139.794***	159.675***
	(11.27)	(4.54)	(4.71)	(5.46)
CashFlowRisk	235.906***	-16.294	-9.195	12.594
	(2.59)	(-0.12)	(-0.07)	(0.11)
Tangibility	-14.663	-32.264	-35.315	-51.085*
	(-1.47)	(-1.01)	(-1.12)	(-1.70)
ZScore	-0.536	-0.929	-0.891	-1.171
	(-0.98)	(-0.82)	(-0.79)	(-1.09)
Syndication	-14.193***	-7.275	-7.491	
	(-2.71)	(-0.76)	(-0.78)	
Security	79.212***	89.364***	88.168***	
	(21.98)	(5.01)	(4.86)	
lnMaturity	-18.690***	-18.962***	-18.973***	
	(-6.32)	(-2.74)	(-2.73)	
lnAmount	-13.531***	-3.808	-3.970	
	(-5.02)	(-0.56)	(-0.58)	
TermLoan	62.197***	36.501***	36.766***	
	(18.92)	(4.19)	(4.22)	
LoanPurpose	Yes	Yes	Yes	No
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	10728	1621	1623	1847
adj. R^2	0.420	0.176	0.176	0.152

Table 6: Business Segments and Predation-inducing Constraints

This table shows estimated marginal effects on the use of covenants and performance-pricing. The proxy for product similarity is *SingleSeg*, a dummy taking one if the borrower is a single-segmented firm. The various specifications differ in the empirical model, the dependent variable and the sample used in the regression, as indicated by column headers. The variable, *FinCov*, is the number of financial covenants, while *Cov* is thenumber of financial covenants and three type of negative covenants, those restricting debt issuance, equity issuance and asset sales. *PSD* is a dummy taking one if the loan has the performance-pricing feature. The full sample covers loans issued to non-financial and non-utility U.S. borrowers in 1997-2008, obtained by linking DealScan with CRSP/Compustat. The "small" sample takes only loans from the full sample lent to firms with the smallest third of asset size in the Compustat database, split on a yearly basis. Marginal effects for a given independent variable are calculated holding other variables constant at their average value. The pseudo R^2 is calculated as McFadden's (adjusted) R^2 from McFadden (1974). Standard errors are clustered at the firm level and corrected for heteroskedasticity. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. t-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Y Variable	FinCov	FinCov	FinCov	FinCov	FinCov0	Cov	Cov0	PSD	PSD	PSD	PSD	PSD_F
Sample	Full	Small	Small	Small	Small	Small	Small	Full	Small	Small	Small	Small
SingleSeg	-0.056	-0.179**	-0.189**	-0.252***	-0.243***	-0.261**	-0.295***	-0.039**	-0.082***	-0.085***	-0.080***	-0.075**
	(-1.61)	(-2.11)	(-2.23)	(-3.10)	(-2.66)	(-2.36)	(-2.73)	(-2.45)	(-2.97)	(-3.04)	(-3.08)	(-2.48)
HHI	0.007	0.128		0.138	0.148	0.119	0.160			0.011	0.017	0.047
	(0.23)	(0.89)		(1.04)	(0.94)	(0.64)	(0.88)			(0.24)	(0.38)	(0.82)
Market-to-Book	-0.108***	-0.100***	-0.097***	-0.106***	-0.143***	-0.151***	-0.162***	-0.020**	-0.024**	-0.024**	-0.017*	-0.024**
	(-5.61)	(-2.90)	(-2.79)	(-3.19)	(-3.78)	(-3.52)	(-3.78)	(-2.54)	(-2.09)	(-2.07)	(-1.83)	(-1.99)
lnAssets	-0.156***	0.060	0.072	0.141**	-0.065	0.083	-0.063	-0.086***	-0.046*	-0.044*	0.103***	-0.029
	(-6.68)	(0.76)	(0.92)	(2.36)	(-0.76)	(0.84)	(-0.64)	(-8.70)	(-1.74)	(-1.69)	(5.30)	(-0.93)
Profitability	2.566***	2.951***	2.837***	2.948***	4.069***	3.216***	4.564***	1.312***	0.833***	0.815***	1.050***	0.681**
	(5.82)	(4.60)	(4.37)	(4.59)	(5.26)	(3.72)	(5.08)	(6.28)	(3.46)	(3.35)	(4.41)	(2.44)
Leverage	0.185*	-0.176	-0.177	0.192	-0.860***	0.349	-0.612*	-0.205***	-0.081	-0.076	0.060	-0.068
	(1.83)	(-0.79)	(-0.78)	(0.94)	(-3.04)	(1.12)	(-1.84)	(-4.68)	(-1.14)	(-1.06)	(0.96)	(-0.85)
CashFlowRisk	-3.954***	-0.658	-0.669	-1.616	-1.572	-0.148	-1.678	-0.819**	-0.243	-0.225	-0.431	-0.461
	(-3.64)	(-0.46)	(-0.48)	(-1.06)	(-1.06)	(-0.09)	(-1.01)	(-2.11)	(-0.47)	(-0.44)	(-0.92)	(-0.79)
Tangibility	-0.131	0.056	0.044	-0.002	0.540*	-0.401	0.227	0.044	-0.020	-0.023	-0.028	-0.082
	(-1.27)	(0.24)	(0.19)	(-0.01)	(1.90)	(-1.23)	(0.68)	(0.88)	(-0.28)	(-0.32)	(-0.41)	(-1.01)
ZScore	0.023***	0.015	0.014	0.012	0.004	0.020*	0.001	0.000	-0.001	-0.000	-0.002	-0.001
	(3.95)	(1.63)	(1.57)	(1.47)	(0.45)	(1.79)	(0.05)	(0.06)	(-0.21)	(-0.19)	(-0.74)	(-0.25)
Syndication	0.326***	0.006	-0.001		0.084	0.226**	0.257**	0.296***	0.049*	0.049		0.078**
	(6.39)	(0.07)	(-0.01)		(0.87)	(2.02)	(2.37)	(11.77)	(1.65)	(1.64)		(2.45)
Security	0.416***	0.095	0.104		0.083	0.198	0.122	-0.093***	-0.010	-0.010		-0.002
	(10.12)	(0.56)	(0.61)		(0.44)	(0.91)	(0.59)	(-4.86)	(-0.18)	(-0.17)		(-0.03)
lnMaturity	0.177***	0.162**	0.162**		0.090	0.125	0.047	0.125***	0.066***	0.066***		0.063***
	(5.98)	(2.42)	(2.42)		(1.26)	(1.44)	(0.57)	(9.75)	(3.20)	(3.19)		(2.89)
lnAmount	0.059**	0.114**	0.112**		0.278***	0.292***	0.456***	0.181***	0.170***	0.169***		0.162***
	(2.39)	(2.00)	(1.96)		(4.41)	(4.13)	(6.62)	(17.20)	(8.05)	(8.03)		(6.74)
TermLoan	0.241***	0.125	0.133		0.091	0.330***	0.293***	-0.164***	-0.072***	-0.070***		-0.104***
	(6.86)	(1.46)	(1.55)		(1.00)	(2.85)	(2.72)	(-9.71)	(-2.66)	(-2.62)		(-3.35)
LoanPurpose	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6,115	967	963	1085	1,225	980	1,225	7,250	1,197	1,193	1,444	1,756
pseudo R^2	0.034	.0.027	0.027	0.021	0.069	0.056	0.105	0.267	0.285	0.283	0.151	0.254