Product Market Threats and Financial Contracting: Evidence from Performance-Sensitive Debt*

Einar Kjenstad[†] Xunhua Su[‡] Han Xia[§]

Abstract

This paper examines how product market threats shape financial contracting. Bolton and Scharfstein (1990) suggest that while performance-sensitive terms in debt contracts mitigate incentive misalignment between creditors and borrowers, they make a borrower more vulnerable to rivals' competitive strategies in product markets, which would decrease the borrower's operating performance and make performance-sensitive terms more likely to become binding, thus raising its cost of capital. As a result, an optimal response of financial contracting to product market threats is to lower the performance sensitivity of the contracts. We find strong empirical support for this prediction. Product market threats significantly moderate the use of performance sensitive terms in bank loan contracts; this effect is more pronounced when the benefit of a lowered performance sensitivity in mitigating the adverse effect of product market threats outweighs its cost in exacerbating borrowers' incentive problems. Our findings reveal the role of an under-explored, yet important element – product market threats, in shaping financial contracting.

Keywords: product market threats, financial contracting, product market fluidity, bank loans, performance-sensitive debt, performance pricing

JEL: G20, G21, G30, G32, L10, L20

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[†]Simon Business School, University of Rochester. Einar.Kjenstad@simon.rochester.edu

[‡]Department of Finance, Norwegian School of Economics. Xunhua.Su@nhh.no

[§]School of Management, University of Texas at Dallas. Han.Xia@utdallas.edu

1 Introduction

Information frictions and incentive problems between creditors and borrowers shape debt contracting. Both theoretical and empirical studies find that financial institutions, such as banks, employ contractual terms that are directly or indirectly linked to the performance of borrowers to mitigate the borrower-creditor incentive misalignments (e.g., Jensen and Meckling, 1976; Smith and Warner, 1979; Aghion and Bolton, 1992; Dewatripont and Tirole, 1994; Rajan and Winton, 1995; Kaplan and Strömberg, 2003; Nini, Smith, and Sufi, 2009; Roberts and Sufi, 2009; Demiroglu, James, and Kizilaslan, 2009; Demiroglu and James, 2010). Ex ante, these performance-sensitive terms benefit borrowers by helping them secure financing in the financial market.

In the product market, however, performance-sensitive terms incur a cost: They make a firm more vulnerable to rivals' competitive strategies. This is because rivals' competitive strategies tend to lower the firm's operating performance, and a declining performance makes performance-sensitive terms more likely to become binding, triggering an increase in the firm's cost of capital or even termination of financing. This intuition is first posited in Fudenberg and Tirole (1986) and Bolton and Scharfstein (1990). In particular, in a theoretical framework, Bolton and Scharfstein (1990) show that in the presence of high product market threats, an optimal response of financial contracting is to lower the sensitivity of contractual terms to firm performance. A lowered performance sensitivity reduces the adverse effects that rivals' competitive strategies can carry out on a firm, and helps the firm avoid premature financial distress and exit, benefiting both the firm and investors.

This theoretical prediction points to an important force arising from firms' product market that would shape the design of debt contracting. While the existing empirical literature largely focuses on how information frictions and incentive problems in financial markets affect debt contracts, we study this alternative force from product markets.

We empirically examine the effect of product market threats on the performance sensitivity of bank loan contracts, as well as the nuances of this effect based on interactions between product markets and financial markets. In the spirit of Bolton and Scharfstein (1990), we focus on a performance-sensitive term in bank loan contracts that would make a borrower more vulnerable to rivals' competitive strategies in product markets – interest-increasing performance pricing. Interest-increasing performance pricing is a widely used contract term that automatically raises loan interest rates upon borrowers' declining performance, as indicated by various financial ratios or debt ratings. It practically puts a trigger to deepen a borrower's indebtedness that would become binding when rivals' product market threats depress borrower performance.[1] Hence, the use of interest-increasing performance pricing in bank loans provides an ideal testing ground for the framework in Bolton and Scharfstein (1990).

We capture product market threats faced by a firm using the firm's product market fluidity, as by Hoberg, Phillips, and Prabhala (2014). The fluidity measure builds on textual analyses of firms' product descriptions in 10-K filings, and captures changes in other firms' products relative to the firm's own products. The more others move around a firm's product space, the more instable the firm's product market environment is and the greater threats the firm faces from its rivals. This firm-level fluidity measure hence identifies the market threats that arise out of rivals' strategic actions on the product market space – an important characteristic of product market threats suggested in Bolton and Scharfstein (1990).

We study 17,819 bank loans borrowed by 4,742 industrial firms between 1997 and 2013. We find that product market threats significantly shape debt contracting. Loan contracts of firms facing greater product market threats are less likely to incorporate interest-increasing performance pricing, and they use a narrower range of performance pricing terms that make interest increase less responsive to borrowers' performance deteri-

[1] As we discuss in detail in Section 2.2., in our sample, the average range of potential interest rate change in an interest-increasing performance pricing amounts to 52% of the initial rate of a loan contract.

oration. This evidence supports Bolton and Scharfstein (1990) and suggests that product market threats significantly decrease the performance sensitivity of loan contracts. The economic magnitude of this effect is substantial. For instance, a one-standard-deviation increase in product market threats faced by a borrower makes the loan 18% less likely to incorporate an interest-increasing performance pricing term (relative to the sample average). This magnitude is obtained after controlling for a comprehensive set of firm, loan, and industry characteristics.

More importantly, the nuances of this effect corroborate the trade-off framework in Bolton and Scharfstein (1990), which suggests that an optimal contract ought to balance the benefit of a lowered performance sensitivity in mitigating the adverse effects of product market threats against its cost in exacerbating borrower-creditor interest conflicts.

First, we show that product market threats play a more significant role in lowering performance sensitivity when incentive problems between borrowers and creditors are a less severe concern (so the cost of reduced performance sensitivity in exacerbating borrower-creditor interest conflicts is relatively low). This happens when a borrower has abundant pledgeable collateral, and hence lower incentive misalignments (e.g., Chan and Thakor, 1987; Boot, Thakor, and Udell, 1991; Jimenez, Salas, and Saurina, 2006), when the bank has an established lending relationship with the borrower, which in turn alleviates adverse selection and conflicted interests (e.g., Petersen and Rajan, 1994; Puri, 1996; Boot, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2011), or when the borrower is able to access public debt markets, and hence has lower overall information asymmetry and agency problems (e.g., Diamond, 1984; Denis and Mihov, 2003). In contrast, when borrower-creditor incentive conflicts are more severe, the effect of product market threats in reducing performance sensitivity is economically trivial.

Second, we show that product market threats play a more important role in lowering performance sensitivity when these threats are more detrimental for borrowers' prospectus (so the benefit of lowered performance sensitivity in mitigating the adverse effects of market threats is relatively high). This happens when a firm has low research and development (R&D) expenses, and hence a low capability of differentiating itself in the face of competitive threats (e.g., Sutton, 1991; Aghion, Bloom, Blundell, Griffith, and Howitt, 2005; Hoberg and Phillips, 2015), or when a firm is in deeper financial distress, and hence is more vulnerable to product market threats (e.g., Bhagat, Moyen, and Suh, 2005; Kaplan and Zingales, 1997; Cleary, 1999). Taken together, these cross-sectional findings point to the evident force in loan contracts that is designated to mitigate the adverse effects of product market threats, particularly when they are relatively important.

We further show that this force is warranted. From a general perspective, we document that product market threats have a material negative impact on firms' performance. Firms facing larger product market threats see a substantial decline in future profitability, an increase in indebtedness, and a deterioration in credit quality. These negative developments justify the lowered performance sensitivity of loan contracts in response to product market threats that we document.

Our cross-sectional analyses based on the trade-off framework of Bolton and Scharfstein (1990) help rule out a few alternative explanations for our findings. For example, one may argue that high product market threats induce firms to improve corporate governance and other managerial monitoring efforts, which in turn permit favorable loan contract terms, including the less use of interest-increasing performance pricing. Hence, our results simply reflect (unobservable) managerial monitoring, creating an endogeneity problem. If this is the case, however, the effect of product market threats in lowering performance sensitivity should be stronger for firms that have more severe agency problems – that is, when the improved managerial governance and monitoring are most valuable in solving creditor-borrower incentive problems. This is opposite to our cross-sectional findings. One may also argue that a firm's success in product markets invites rivals to follow the firm's lead, resulting in high product market fluidity. Meanwhile, the firm's success makes lenders more lax about using interest-increasing performance pricing terms. However, if product market fluidity simply reflects a firm's underlying success, then its effect in lowering the use of performance pricing should be weaker when market threats are more detrimental, because in this case lenders would be more cautious and less comfortable in giving lax terms. This is again opposite to our cross-sectional findings.[2]

Furthermore, we use an instrumental variable analysis to explicitly address the above endogeneity concerns. The instrument we use for a firm's product market threats is based on whether the firm's close rivals have a deep pocket, as measured by their cash holdings. Existing studies suggest that cash-rich rivals use their deep pockets to finance competitive strategies that challenge a firm's business prospects and market share (e.g., Fresard, 2010). Hence, if a firm's close rivals are deep-pocketed, the firm is more likely to face greater market threats. We therefore expect (and verify) that our instrument satisfies the relevance criterion. On the other hand, the cash richness of the firm's rivals is unlikely to be directly related to contract terms (including the use of performance pricing) between the firm and its lender, unless through the channel of product market threats. Therefore, our instrument reasonably satisfies the exclusion criterion. Using an instrumental variables analysis, we confirm the previous findings.

Lastly, we examine the effect of product market threats on the use of interest-decreasing performance pricing in loan contracts. Unlike interest-increasing performance pricing, interest-decreasing performance pricing offers borrowers an option to lower interests in case of performance improvement. These terms, therefore, do not make a borrower vulnerable to rivals' competitive strategies as interest-increasing performance pricing does. Following the intuition of Bolton and Scharfstein (1990), product market threats should be less relevant in shaping the use of these terms. Consistent with this prediction, we show that product market threats have a trivial effect in affecting the use of interest-decreasing performance pricing.

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[2] In addition, this possibility is not supported by Manso, Strulovici, and Tchistyi (2010), who suggest that successful firms should be *more* likely to use interest-increasing performance pricing as a signal of their superior quality.

Our findings contribute to several recent studies that explore explanations for the use of performance-sensitive terms, i.e., performance pricing, in bank loans. Manso, Strulovici, and Tchistyi (2010) find that in a setting of asymmetric information, high-quality firms use performance-sensitive debt as a signaling device to distinguish themselves from low-quality firms. A more recent study by Begley (2012) further confirms this intuition. In a setting of moral hazard between banks and borrowers, Asquith, Beatty, and Weber (2005) show that banks are more likely to use interest-increasing performance pricing to reduce borrower agency problems. In a setting of conflicts of interest between firm managers and shareholders, Tchistyi, Yermack, and Yun (2011) find that performance pricing provides a channel for managers to increase firms' financial risk and equity volatility, which in turn increases the value of stock options held by management. Performance-sensitive contracts hence enable executives to transfer value to themselves at the expense of shareholders. While these studies focus on incentive conflicts between creditors and borrowers or between management and shareholders – frictions that exist in financial markets, we extend this line of literature by considering how product markets affect the performance sensitivity of debt contracts.

To this end, our paper is broadly related to the literature that examines the linkage between product markets and financial markets. This literature investigates how interactions between product markets and financial markets influence firm leverage (e.g., MacKay and Phillips, 2005), corporate governance (e.g., Giroud and Mueller, 2010), cash holdings (e.g., Haushalter, Klasa, and Maxwell, 2007; Hoberg, Phillips, and Prabhala, 2014), and cost of financing (e.g., Valta, 2012), among others. We contribute to this literature by examining how these interactions shape the design of bank loan contracts. This contribution adds to the large literature that examines determinants of various loan contract terms, including maturity, collateral requirement, and ownership structure, among others (e.g., Berger and Udell, 1995; Berger, Espinosa-Vega, Frame, and Miller, 2005; Jimenez, Salas, and Saurina, 2006; Qian and Strahan, 2007). In this paper, we focus on a widely used, yet less explored contract term – performance pricing, to examine the performance sensitivity of loan contracts and its relation with product market threats, in the spirit of Bolton and Scharfstein (1990).

Our analyses benefit from recent developments in the literature that employs textual analyses on firms' product descriptions to study the dynamics of firms' product markets and their effects on firm financial policies (e.g., Hoberg and Phillips, 2010a, 2015; Hoberg, Phillips, and Prabhala, 2014). For example, Hoberg, Phillips, and Prabhala (2014) show that in the presence of high product market instability and threats, firms become more conservative and hold more cash or cut payouts. Our results indicate that product market threats lead to more conservative debt contracts, as reflected in the reduced performance sensitivity. To this extent, our findings echo the intuition in Hoberg, Phillips, and Prabhala (2014), as well as in a few related studies, including Fresard (2010) and Chi and Su (2015).

The rest of the paper proceeds as follows. Section 2 introduces our data sources and sample construction; we also report the descriptive statistics. In Section 3, we report our empirical analyses on the effect of product market threats in shaping borrowers' private debt contracting, in particular, the use of interest-increasing performance pricing. Section 4 examines the real impact of product market fluidity on borrowers' future performance. We investigate the effect of product market threats on the use of interest-decreasing performance pricing in Section 5. Section 6 concludes.

2 Data, Sample Construction and Summary Statistics

2.1 Data and Sample Construction

We obtain bank loan data from the Reuters Loan Pricing Corporation (LPC) DealScan database. DealScan is widely used in existing studies on bank loans. It contains comprehensive information on loan contracts, including whether a loan contains performance pricing terms, and if so, the detailed pricing grids in the performance that designate how interest rates will change with changes in borrowers' performance.[3] In our main analyses, we focus on the existence of performance pricing as the key variable of interest. In later tests, we also use the range of performance pricing, that is, the degree of interest changes in response to performance changes to further confirm our results. We describe detailed definition of this variable in Section 4.

DealScan records loan terms at the facility level. We focus on term loan and revolving loan tranches, and exclude tranches recorded as other instruments, including leases, notes, bridge loans, and bankers' acceptances. Following existing studies on performance pricing (e.g., Manso, Strulovici, and Tchistyi, 2010), we perform our analyses at the loan level, which may include multiple tranches, and treat each loan as an individual observation. In the majority of cases, all tranches in a loan share the same characteristics, such as maturity, primary loan purposes, covenants, and performance pricing terms. In a few cases otherwise, we take the characteristics of the largest tranche in terms of dollar values as the characteristics of the loan .

To capture the product market threats faced by each firm, we employ the firm's product market fluidity measure, as developed in Hoberg, Phillips, and Prabhala (2014). This measure is constructed using a textual analysis of firms' production descriptions in 10-K filings to the Securities and Exchange Commission. Intuitively, the measure quantifies how much rivals' product descriptions change relative to a firm's own product description, and hence captures the evolvement of rivals' actions in the firm's product market space. As a result, it identifies product market instability and potential product market threats faced by each firm, which arise out of rivals' strategic moves – an important characteristic of market threats as suggested in Bolton and Scharfstein (1990).

The market fluidity measure starts from 1997, one year after the inception of Edgar.

[3]See Appendix A and Appendix B in Asquith, Beatty, and Weber (2005) for examples of performance pricing terms in bank loan contracts.

Mathematically, Hoberg, Phillips, and Prabhala (2014) utilize a product description vocabulary from all public firms' product descriptions, as built in Hoberg and Phillips (2010b) and Hoberg and Phillips (2015), and calculate a cosine similarity between the vector identifying a firm's own word usage and a vector identifying the aggregate change in the word usage of other firms. Following the notations in Hoberg, Phillips, and Prabhala (2014), let J_t be a scalar equal to the number of unique words used in all product descriptions in a given year t, $W_{i,t}$ be an ordered Boolean vector, with a length of J_t, identifying which words are used by firm i in a given year t, and $N_{i,t}$ be the normalized $W_{i,t}$ (to unit length). Product market fluidity is then defined as

$$PMF_{i,t} = \left\langle N_{i,t} \cdot \frac{D_{t-1,t}}{\|D_{t-1,t}\|} \right\rangle,$$

where $D_{t-1,t}$ is defined by $D_{t-1,t} = |\sum_i (W_{i,t} - W_{i,t-1})|$. The fluidity measure is both time-varying and firm specific. A higher value suggests that the change in the words used in other firms' descriptions moves more around the firm's own words in a given year, and hence indicates greater product market instability and high market threats from rivals. The fluidity measure up to 2013 is available on Hoberg and Phillips' data library.

To construct our sample, we merge the Dealscan loan sample with Compustat for firms' accounting information, using the link file based on the matching process in Chava and Roberts (2008). We drop loans to borrowers that do not have basic accounting information (such as total assets) from Compustat. We exclude loans to utility companies and financial institutions (firms with a two-digit SIC of 49 and 60-69), because these firms' financial contracting and product market environment might be different from industrial firms. We also restrict our sample to the period when the market fluidity measure and information on performance pricing are available. These steps generate a sample of $17,819$ loans, borrowed by $4,742$ industrial firms between 1997 and 2013. They constitute the primary sample for our following analyses.

We next construct a numbers of variables that might be correlated with the use of performance pricing and product market fluidity. They serve as control variables in our analyses. Specifically, we measure firm size by the natural logarithm of a firm's book value of assets (*logAssets*). We measure firms' investment opportunities by the market-to-book ratio (*Market-to-Book*), calculated as the sum of the market value of equity and book value of total debt, divided by book value of assets. *CashFlow* is defined as operating income before depreciation divided by total assets. *Leverage* is the ratio of total debt to total assets. Interest Coverage ($InterestCov$) is defined as the ratio of interest expenses to EBITDA. Tangibility is the ratio of net PP&E to the value of total book assets. To measure industry concentration, we include the Text-based Network Industry Classifications Herfindahl index (*HHI*) as in Hoberg and Phillips (2015), calculated using a dynamic industry classification based on each firm's product descriptions from annual 10-K filings.[4]

In terms of loan characteristics controls. We generate the natural logarithm of the deal amount to firm assets (*logAmount*), the natural logarithm of the loan maturity ($logMaturity$), an indicator variable for whether the loan is a secured loan ($Secured$), and an indicator variable for the existence of financial covenants ($FinCov$). In addition, we generate dummies for loan purposes and include loan purpose fixed effects in our analyses. We categorize loan purposes 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. The definitions of all firm and loan characteristics are reported in Appendix I.

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[4]See Hoberg and Phillips (2015) for more details. As a robustness test, we also calculate HHI using the two-digit or three-digit SIC industry classifications. We find similar results using these alternative measures in all analyses.

2.2 Summary statistics

Table 1 presents descriptive statistics of the key variables for our analyses. In Panel A, we first report statistics of the dummy variable, *Increasing PP*, indicating whether a loan contract includes an interest-increasing performance pricing term. Among the 17,819 loan contracts in our sample, 5,706 loans (approximately 32%) contain an interest-increasing performance pricing. This ratio is comparable with the one reported in Asquith, Beatty, and Weber (2005), and suggests that interest-increasing performance pricing is a commonly used term in bank loans. In an interest-increasing performance pricing, the range of potential changes in interest rates, that is, the average difference between the maximum interest rates specified in a performance pricing and the interest rates charged at the inception of a loan contract is 47 basis points. This range amounts to approximately 52% (median 33%) of the interest rate charged at the inception. It suggests interest-increasing performance pricing has a potentially large impact on borrowers' interest payments when it becomes binding due to borrowers' declining performance.

The second row of Table 1 Panel A reports descriptive statistics for *Fluidity*. It has a mean (median) of 6.49 (5.81), with a standard deviation of 3.34. These statistics are comparable with Hoberg, Phillips, and Prabhala (2014). In terms of other firm characteristics, the average size of our sample borrowers is 5.7 billion U.S. dollars. The average market-to-book, cash flow, leverage, interest coverage, and tangibility are 1.74, 3%, 31%, 18%, and 32%, respectively. The *HHI* measure is on average 0.24, with a standard deviation of 0.21. In addition, our sample loans have an average amount of 487 million U.S. dollars, a maturity of approximately 45.4 months. 72% of the loans are secured and 62% have a financial covenant. These variables are similar in magnitudes to existing studies.

In Panel B of Table 1, we compare firm and loan characteristics between firms that have low product market fluidity (below the sample median) and the ones with high product market fluidity (above the sample median). Notably, loan contracts of firms with high product market fluidity are less likely to have an interest-increasing performance pricing term than the other group (0.30 versus 0.34). This difference is statistically significant at the 1% level. It is consistent with the prediction in Bolton and Scharfstein (1990) that greater product market threats tend to decrease the sensitivity of loan contracts to borrower performance. This pattern is further confirmed in Table 2, which shows that overall, *Fluidity* and *Increasing PP* exhibit a negative correlation. These patterns provide preliminary support of our hypothesis in a univariate setting.

The rest of Table 1 Panel B shows that firms with high product market fluidity exhibit different characteristics from those with low fluidity. For example, they are larger in size, and have higher growth opportunities, cash flow, and tangibility. They also tend to be in less concentrated industries. Their loans are on average larger, and (slightly) more likely to be secured and have financial covenants.

3 The effect of product market threats on loan performance sensitivity

3.1 Baseline analyses

Bolton and Scharfstein (1990) predict that in the presence of high product market threats, an optimal response in financial contracting is to lower the sensitivity of contractual terms to borrower performance, e.g., through the less use of interest-increasing performance pricing in our context of bank loan contracts. This prediction arises because the less use of interest-increasing performance pricing mitigates the adverse effects rivals' competitive strategies can carry out on a borrower, which would depress the firm's performance and in turn raise the chance that these performance-sensitive terms becoming binding. As a result, the lowered contract sensitivity helps borrowers avoid premature financial distress and exit, benefiting both the borrower and the creditor.

To test this prediction, we start by examining the relation between product market fluidity and the use of interest-increasing performance pricing. Specifically, we estimate the following Probit model:

$$Pr(Increasing\ PP_{i,t} = 1) = \Phi(\alpha + \beta_1 \cdot Fluidity_{i,t} + \Gamma \cdot \mathbf{X}'_{i,t} + \Omega \cdot \mathbf{Y}'_{i,t-1} + Fixed\ Effects + \epsilon_{i,t}) \tag{1}$$

The dependent variable, $Increasing\ PP_{i,t}$, equals 1 if a loan to borrower i, arranged in year t, has an interesting-increasing performance pricing, and 0 otherwise. $Fluidity_{i,t}$ measures the product market fluidity of borrower i in year t, and captures its rivals' moves on product market space between $t-1$ and t. $\mathbf{X}_{i,t}$ is the set of loan characteristics control variables. $\mathbf{Y}_{i,t-1}$ is the set of borrower characteristics control variables, measured at one-year lag. All characteristics are windsorized at the 1% and 99% tails. In various specifications, we include year fixed effects and two-digit SIC industry fixed effects to control for potential time trends and industry patterns of product market competitiveness. We cluster standard errors at the firm level as suggested by Petersen (2009).

In Equation (1), the key variable of interest is $Fluidity$. We expect it to have a negative coefficient, β_1, which would show that loans of borrowers facing higher product market threats are less likely to use interest-increasing performance pricing. Table 3 presents the regression results. In column (1), we report the most parsimonious specification, and include $Fluidity$ as the only dependent variable. Consistent with our hypothesis, $Fluidity$ is negatively related to the use of interest-increasing performance pricing, as indicated by the coefficient -0.015. This effect is statistically significant at the 1% level, with a t-statistic of -3.65.

In columns (2) to (6), we include firm and loan characteristics controls, as well as year and industry fixed effects in the estimations. We consistently find a negative relation between product market fluidity and the use of interest-increasing performance pricing. The economic magnitude of this relation is sizable. For example, based on column (6), a one-standard-deviation increase in *Fluidity* corresponds to a 5.3 percentage points decrease in the probability of observing an interest-increasing performance pricing. In comparison, the average use of interest-increasing performance pricing in our sample is 32%, as shown in Table 1.

Other control variables have expected signs. Consistent with the predictions in Manso, Strulovici, and Tchistyi (2010), larger and more established firms (as captured by a high *logAssets* and a low *Market-to-Book*), and firms with high cash flows and low leverage are more likely to signal their high quality by committing to linking their interest payments to performance. These firms thus see more frequent use of interest-increasing performance pricing terms. Among loan characteristics, loans that have a longer maturity, a larger amount, and ones that tend to have financial covenants (all of which arguably suggest more severe agency problems) are associated with more use of performance pricing to counter these problems. On the other hand, secured loans, which are less subject to the inventive problems, see less use performance pricing.

3.2 The trade-off in Bolton and Scharfstein (1990)

Bolton and Scharfstein (1990) derive that the effect of product market threats in shaping contract sensitivity to performance should not be random or uniform. Instead, it varies based on a trade-off: While lowered performance sensitivity mitigates potential adverse effects of product market threats, it exacerbates the asymmetric information problem, or interest conflicts, between creditors and borrowers. Hence, the optimal contract balances these two forces, depending on their relative importance.

More specifically, given the same level of product market threats faced by a firm, if the firm has less severe incentive problems (i.e., the cost of a reduced performance sensitivity in exacerbating borrower-creditor incentive conflicts is low), the optimal contract should put more weight on lowering performance sensitivity to avoid the adverse effects of market threats. Similarly, given the same level of incentive problems, when product market threats become more detrimental for a firm's prospectus, the optimal contract should concern more about lowering the sensitivity of the contract to mitigate the impact of these threats.

3.2.1 Severity of incentive conflicts between creditors and borrowers

To test these predictions, we start by examining whether the relation between product market fluidity and loan performance sensitivity varies with the severity of incentive conflicts between creditors and borrowers. We employ multiple measures to capture the extent of interest conflicts between creditors and borrowers. First, we consider whether a borrower has abundant collateral at the time of borrowing. Pledgeable collateral represents assets available to banks when their interests are at risk, which are typically senior and secured. The existing literature shows that collateral helps align incentives between creditors and borrowers (e.g., Chan and Thakor, 1987; Boot, Thakor, and Udell, 1991; Jimenez, Salas, and Saurina, 2006; Roberts, 2015). Hence, firms with ample pledgeable collateral should be subject to less severe interest conflicts, and should see a stronger effect of potential market threats in lowering performance sensitivity of loan contracts. Following Roberts (2015), we measure firms' pledgeable collateral as the sum of property, plant, and equipment (PP&E), inventory, cash and equivalents, and receivables, scaled by total book assets.

Columns (1) to (3) of Table 4 present the analyses. In columns (1) and (2), we first partition our sample into two groups based on whether a firm has a high level of pledgeable collateral (above the sample median) or a low level of pledgeable collateral (below the sample median). In all specifications we include but do not tabulate the same set of firm and loan characteristics controls as those in Table 3. These two columns suggest that the effect of *Fluidity* on the use of interest-increasing performance pricing is concentrated on firms with abundant collateral, and is not significant for their counterparts. This contrast is economically significant. Based on column (1), a one-standard-deviation increase in *Fluidity* corresponds to an 10 percentage points decrease in the probability of observing an interest-increasing performance pricing, whereas this magnitude is less than 1 percentage point in the other group, as shown in column (2). In columns (3), we employ the full sample, and augment Equation (1) by including an interaction between *Fluidity* and *Collateral*. The negative and statistically significant coefficient of the interaction term confirms the findings in columns (1) and (2). That is, the effect of product market threats in lowering performance sensitivity of loan contracts is significantly stronger for firms with high pledgeable collateral than for firms with low collateral.

Second, we consider whether a borrower of a loan has an established relationship with the lending bank to gauge the extent of agency problems between borrowers and creditors. Borrower-bank relationship alleviates information asymmetry between the two parties and results in lower adverse selection and conflicted incentives (e.g., Petersen and Rajan, 1994; Puri, 1996; Boot, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2011). An established lending relationship should therefore contribute to a stronger effect of product market threats in lowering loan performance sensitivity. Following this intuition, we trace each firm's borrowing history with lenders and calculate the frequency (i.e., the number of loans) of the firm borrowing from the lead bank of a loan in the past ten years (denoted as *Borrowing Freqneucy*).[5] More frequent borrowing activities with the same bank indicate a stronger borrower-lender relationship.

Columns (4) to (6) of Table 4 present the analyses. Columns (4) and (5) separately examine loans borrowed by firms with and without a relationship with the lead banks (i.e., loan with *Borrowing Freqneucy*>0 versus *Borrowing Freqneucy*=0).[6] Consistent with our expectation, the effect of product market threats in lowering contract sensitivity is statistically significant for relationship loans, but indistinguishable from zero for non-relationship loans. The economic magnitude of this contract is again sizeable. For relationship loans, a one-standard-deviation increase in *Fluidity* is associated with 5.7

[5]If a loan is arranged by multiple lead banks, we use the borrowers' borrowing frequency with the most frequent lead lender as the *Borrowing Freqneucy* of the loan.

[6]In our sample, approximately 60% of loans are relationship loans.

percentage points decrease in the probability of observing an interest-increasing performance pricing term for relationship loans, but only 3 percentage points for the other group. In column (6), we estimate a similar specification as in column (3), now including the interaction term between *Fluidity* and *Borrowing Freqneucy*. The coefficient of this term is again negative and statistically significant, as we expected.

Third, from a more general perspective, we consider whether a borrower is able to access public bond markets to measure the severity of incentive problems between borrowers and creditors. Firms that have access to bond markets generally show lower information asymmetry and interest conflicts (e.g., Diamond, 1984; Denis and Mihov, 2003; Sufi, 2007). These firms should therefore see a more pronounced relation between potential market threats and loan performance sensitivity. Following Faulkender and Petersen (2006), we use whether a borrower has an S&P issuer credit rating to capture its access to public bond markets.

Columns (7) to (9) report the analyses. They again confirm our findings in columns (1) to (6): Product market threats play a more significant role in lowering performance sensitivity when firms are able to access bond markets, and hence when there are less severe incentive problems between creditors and borrowers. This interpretation is demonstrated by both a sub-sample analysis in columns (7) and (8), and a full-sample estimation with the interaction term between *Fluidity* and *Rating Dummy* (which equals 1 if a borrower has an outstanding S&P issuer credit rating, and 0 otherwise) in column (9).

3.2.2 The extent of adverse effects of product market threats

Next, we examine whether the relation between product market threats and loan performance sensitivity is stronger when borrowers' prospects are more prone to the adverse effects of product market threats. We employ multiple measures to capture how detrimental product market threats are for firms' prospective business.

First, we consider firms' investments in intellectual capital. Firms that have limited

R&D investment are less capable of differentiating themselves in face of competitors' product rivalry (e.g., Sutton, 1991; Aghion, Bloom, Blundell, Griffith, and Howitt, 2005; Hoberg and Phillips, 2015). These firms are therefore more vulnerable to market threats, and should see a stronger effect of product market threats in lowering loan performance sensitivity. Following Chan, Lakonishok, and Sougiannis (2001) and Hirshleifer, Hsu, and Li (2013), we capture firms' investment in intellectual capital using R&D capital, calculated as the 5-year cumulative R&D expenses assuming an annual depreciation rate of 20%.[7]

Columns (1) to (3) of Table 5 present the analyses. Because of the recent debates on how to interpret blank R&D expenses recorded in standard data sources (e.g., Koh and Reeb, 2015), we drop observations where borrowers have zero R&D capital in a given year, and condition our analyses on borrower-years with positive observed R&D investment. Columns (1) and (2) first report a sub-sample analysis for firms with high R&D investment (i.e., R&D capital above the sample median) and those with low R&D investment (i.e., R&D capital below the sample median). As expected, the effect of *Fluidity* on the use of interest-increasing performance pricing is stronger for firms with low R&D investment (albeit not statistically significant at the 10% level), compared to firms with high R&D investment. For firms with low R&D capital, a one-standard-deviation increase in *Fluidity* corresponds to a 6.7 percentage points decrease in the probability of observing an interest-increasing performance pricing , but only a 2.3 percentage points for the others. The interaction term between *Fluidity* and *R&D Capital* in column (3) confirms that the contrast of the *Fluidity* effects between the two groups is statistically significant.

Second, we consider the financial status of a borrower to measure its vulnerability to product market threats. Firm experiencing financial distress are likely more constraint

[7]Specifically, a firm's R&D capital in year t equals $(RD_t + 0.8 * RD_{t-1} + 0.6 * RD_{t-2} + 0.4 * RD_{t-3} + 0.2 * RD_{t-4})/Sales$, where RD and $Sales$ are a firm's research and development expenses and total sales as reported in Compustat.

in their investment policies and have lower free cash flow and sales growth (e.g., Bhagat, Moyen, and Suh, 2005; Kaplan and Zingales, 1997; Cleary, 1999). These firms are therefore more susceptible to the negative impact of product market threats. They should thus see a stronger effect of product market threats in reducing the performance sensitivity of loan contracts. We capture the extent of a firm's financial distress using Altman's Z-Score. A higher value of *Z-Score* indicates a healthier financial condition, and a lower value indicates financial distress.

As expected, columns (4) to (6) of Table 5 show that borrowers in deeper financial distress (i.e., with a *Z-Score* below the sample median) are less likely to have interest-increasing performance pricing in response to higher market threats, whereas firms in low financial distress (i.e., with a *Z-Score* above the sample median) does not see a similar significant effect. This finding is again confirmed in column (6), which shows a positive and significant coefficient for the interaction term between *Fluidity* and *Z-Score*.

Overall, our cross-sectional analyses provide strong support for the trade-off prediction in Bolton and Scharfstein (1990). These findings corroborate our baseline analyses in Section 3.1, and point to the substantial role of product market threats in shaping financial contracting.

3.3 Addressing endogeneity concerns

The cross-sectional analyses we present in Section 3.2 help us rule out a few alternative explanations for our findings. For example, it is possible that high product market threats induce firms to improve corporate governance and other managerial monitoring effort. The resulted lower agency problems in turn permit more favorable contracting terms from banks, including the less use of interest-increasing performance pricing. Therefore, our results simply reflect the improved managerial monitoring (unobservable to econometricians), creating an endogeneity problem. If this this case, however, the effect of product market threats in lowering loan performance sensitivity should be stronger when firms have more severe agency problems, i.e., when the improved managerial governance and monitoring are most valuable in solving creditor-borrower incentive problems. This prediction is opposite to Bolton and Scharfstein (1990), as well as to our cross-sectional findings.

It is also possible that a firm may undergo notable success on the product market. This success invites rivals to follow the firm's lead and create products close to the firm's portfolio, generating a high product market fluidity. Meanwhile, the firm's success makes lenders more comfortable in using lax loan terms, such as the less use of performance pricing, due to the firm's lucrative prospects and lower likelihood of financial distress. In this case, our findings are simply driven by the firm's underlying success. However, if market fluidity merely reflects the underlying success, then its effect in lowering the use of interest-increasing performance pricing should be less pronounced when a firm is more vulnerable to market threats; this is because in this case, lenders should be more cautious and less comfortable in giving lax terms, despite the firm's current success. This is again opposite to our cross-sectional findings. In addition, Manso, Strulovici, and Tchistyi (2010) suggests that successful firms (firms with a more lucrative prospects) should be *more* likely to use performance pricing so that they can signal their high quality by voluntarily linking interest payments to performance.

Nevertheless, we explicitly address the endogeneity concern using an instrumental variable analysis. The instrument we use for a firm's product market threats is based on whether the firm's close rivals have a deep pocket, as measured by their cash holdings. Fresard (2010) document that cash-rich rivals take advantage of their deep pockets to finance competitive strategies that challenge a firm's prospectus and gain market share. Hence, deep-pocketed rivals would impose higher potential market threats to the firm. This intuition ensures that our instrument satisfies the relevance criterion.

On the other hand, because our instrument is constructed using the cash richness of a firm's rivals, rather than the firm itself, it is unlikely to have a direct relation with the contract terms between the firm and its lender, unless through the channel of market threats. For example, a bank is not likely to consider the cash holdings of a borrower's rivals and accordingly determine the use of performance pricing, unless through the anticipated product market threats brought forth by deep pocketed peers, which would in turn affect this borrower's ability to repay debt. It is also reasonable to believe that rivals' cash holdings affect the cash policies of a firm itself (which further affect the firm's loan contract terms) largely through the anticipated market threats arising from deep pocketed rivals. (Chevalier and Scharfstein (1996) and Leary and Roberts (2014) share a similar argument regarding firms' leverage decisions.) Therefore, our instrument reasonably satisfies the exclusion criterion.[8]

To construct the instrument, we first select each firm's 10 closest rivals at the time of borrowing, based on the product similarity measure developed by Hoberg and Phillips (2010b) and Hoberg and Phillips (2015). This measure is a cosine similarity between two firms' product descriptions in their 10-K filings. At each point of time, if two firms have a large overlap in the words they use to describe their products, then they are considered as having a high product similarity, and hence close rivals. At the time of each firm's borrowing, we select the 10 firms that have the highest product similarity with this firm as its ten closest rivals.[9]

We next calculate the collective cash holdings of the 10 close rivals, divided by their collective book value of assets, as the overall cash richness of a firm's close rivals. This variable is our instrument for the firm's product market fluidity. Alternatively, we can also first calculate each of the 10 rival's cash holdings scaled by its total assets, and then

[8]However, one may argue that peers' cash holding policies might reflect certain industry-level characteristics, which would directly affect a firm's cash holdings without the channel of market threats. As we will discuss below, we select each firm's close (top 10) rivals based on the similarity of products they offer, instead of size. Hence, given the small number of rivals we examine, it is not likely that these rivals' characteristics would represent industry-level characteristics. In addition, as we show below, we control for industry fixed effects throughout our analyses.

[9]In unreported results, we use five and 50 closest rivals to construct our instrument. We find qualitatively similar results.

take the mean of the ten individual cash-holdings-to-asset ratios as the instrument. In the following, we only report results based on the overall cash-richness instrument, but we find similar results using the alternative approach. A higher value of the instrument indicates that the firm's rivals have a deeper pocket, and hence should be associated with larger product market fluidity, i.e., higher product market threats.

Table 6 presents the results of the instrumental variable analysis. Columns (1) to (3) report the first-stage regressions, which correspond to the specifications in the second-stage regressions in columns (4) to (6), respectively. In the first stage, we regress *Fluidity* on *Rival Cash Richness* (i.e., the instrument), as well as all other control variables used in the second stage. In all first-stage regressions, our instrument is positively and significantly correlated with product market fluidity, as expected. The coefficient estimates of the instrument are significant at the 1% level. The F-statistics of the first-stage regressions range from 147 to 180. Therefore, our instrument is not likely to be a weak instrument. The coefficient estimates in the second stage are likely unbiased and the inferences based on them are reasonably valid.

In the second stage, we repeat our baseline analyses in Table 3, but replace the key independent variable with the instrumented *Fluidity*. Its coefficient estimates remain negative and significant at the 1% level for all specifications. The economic magnitudes of the effect are comparable to (and often larger than) the ones in Table 3. Overall, these results confirm the effect of product market threats in shaping the sensitivity to performance of firms' loan contracts.

Before we conclude this section, we consider another possibility that could bias our results. That is, a firm's management, which sets the firm's financial policies that would impact loan contract terms, also choses product market strategies that would shape the landscape of their competitive environment. In this case, the relation between loan performance sensitivity and product market threats simply reflects these underlying management decisions. This concern, however, is mitigated by the market fluidity measure we use in our analyses. This is because the fluidity measure captures market threats arising out of moves by other firms, rather than the firm itself. Hence, as pointed out in Hoberg, Phillps, and Prabhala (2014), the fluidity measure is relatively exogenous to each firm's own management decisions.

3.4 Alternative measures of contract sensitivity to performance

Besides considering the existence of interest-increasing performance pricing as a measure of loan performance sensitivity, we use an alternative measure that captures the degree of potential interest changes in response to borrowers' performance change. We follow Asquith, Beatty, and Weber (2005) and calculate the range of interest change in an interest-increasing performance pricing term. That is, the difference between the maximum interest rate as specified in a performance pricing and the interest rate charged at the inception of a loan contract. Intuitively, this variable captures the maximal increase in interest rates that can be set off by a firm's weakening performance. A higher range makes a firm more vulnerable to rivals' competitive strategies. Hence, in face of higher market fluidity, we should expect the loan contract to have a smaller range of interest change.

Table 7 reports regression results using this alternative measure as the dependent variable. The range of interest change has a positive value for loans with an interest-increasing performance pricing term, and is zero for loans that do not have an interest-increasing performance pricing. Because it is bounded by zero, we use a Tobit model, in lieu of the previous Probit model, for estimation. Columns (1) and (2) report baseline specifications corresponding to columns (5) and (6) in Table 3. Column (3) reports the second-stage regression of the instrumental variable analysis, corresponding to column (6) of Table 5. Columns (4) to (13) report cross-sectional analyses based on the measures of severity of incentive conflicts and the adverse effects of market threats, as in Table 4 and Table 5.

The results in this table corroborate our previous findings. First, in the baseline analyses, product market fluidity has a significant effect in lowering the range of potential interest change to borrower performance, and hence, the sensitivity of a loan contract. According to column (2), a one-standard-deviation increase in $Fluidity$ is associated with a decrease in the the range of potential interest change by 12.3 basis points, representing 26% of the sample mean (47 basis points). Second, this effect is further confirmed using an instrumental variable analysis, assuring a causal relation. Third, this effect is particularly strong when the incentive problems between creditors and borrowers are of a less concern (columns (4) to (9)), and when market threats have a more detrimental impact on borrowers' prospectus (columns (10) to (13)). These cross-sectional observations are indicated by the mostly significant coefficients of the interaction term between $Fluidity$ and the various measures as in Table 4 and Table 5. Overall, our results are consistent with the trade-off framework in Bolton and Scharfstein (1990).

4 Real effects of product market threats on firm performance

Our results so far document the notable force in loan contracts that is designated to mitigate the adverse effect of product market threats faced by borrowers. Is this force warranted? That is, from a general perspective, does high product market fluidity indeed lead to a decline in the borrower future performance? We answer this question by examining the real effects of product market fluidity.

Specifically, analyze whether high market fluidity is associated with deterioration in firm future performance. We consider three aspects of performance: profitability, indebtedness, and credit worthiness. These aspects constitute the most common specifications in performance pricing terms (see e.g., Asquith, Beatty, and Weber, 2005). Therefore, they represent the most relevant aspects to uncover whether product market fluidity warrants the moderated use of performance pricing we document.

We measure firms' profitability using return on assets and measure firms' indebtedness using leverage. We use firms' S&P issuer credit ratings to measure their credit worthiness. Following the existing literature, we convert credit ratings to numerical numbers, and let a AAA rating equal 1, a AA+ rating equal 2, and so forth. Hence, a higher credit rating number indicates a higher probability of default and lower credit quality. For each firm-year, we calculate the change of these variables in the next one, two, and three years, respectively. We then estimate the following regression specification:

$$Change_{i,t} = \beta_0 + \beta_1 \cdot Fluidity_{i,t} + \Omega \ \cdot \mathbf{Y}'_{i,t-1} + Fixed\ Effects + \epsilon_{i,t}. \quad (2)$$

Different from Equation (1) that is estimated at the loan level, Equation (2) is estimated using the panel data that consist of all firm-years of firms that have borrowed a loan during our sample period between 1997 and 2013. $Change_{i,t}$ is the one-, two-, or three-year change in one of the three performance measures, for each firm i in year t. $\mathbf{Y}_{i,t-1}$ is the set of firm characteristics. In all specifications, we include year fixed effects, two-digit-SIC industry fixed effects, and S&P credit rating fixed effects. The coefficients of interest are again the coefficients of *Fluidity*, which captures whether product market fluidity is associated with materialized changes in firm future performance. As before, we windsorize all control variables at the 1% and 99% tails, and cluster standard errors at the firm level.

Table 8 reports the results. Firms facing larger product market fluidity clearly see a significant decline in profitability, an increase in indebtedness, and a deterioration in credit worthiness. The economic magnitudes of these effects are substantial. Taking the one-year horizon as an example, a one-standard-deviation increase in *Fluidity* responds to a decrease in profitability that amount to 30% of the sample mean, an increase in leverage that equals 30% of the sample mean, and 0.2 notch downgrades in credit ratings (i.e., a one-notch downgrade for one out of five firm-years).[10] The economic magnitudes are persistent in longer horizons.

Overall, product market fluidity appears to have real impacts on firms' future performance. These real effects warrant the force to mitigate adverse effects of product market threats in debt contracting, and justify the documented lowered performance sensitivity in response to high market threats.

5 Interest-decreasing performance pricing

In this section, we consider the effect of product market threats on the use of interest-decreasing performance pricing in loan contracts. Different from interest-increasing performance pricing that would explicitly raise borrowers' interest payments, interest-decreasing performance pricing offers borrowers an option to lower their interests in case of performance improvement. Thus, interest-decreasing performance pricing arguably make does not make a borrower more susceptible to rivals' competitive strategies. As such, based on product market fluidity should be less relevant in shaping the use of these terms.

Table 9 examines this intuition. In column (1), we first perform a baseline analysis as in Equation (1), but replace the dependent variable with an indicator for whether there is an interest-decreasing performance in a loan contract. This column shows that although market threats lower the use of interest-decreasing performance pricing, the magnitude of this effect is trivial, both statistically and economically. A one-standard-deviation increase in *Fluidity* is only associated with 1.6 percentage point decrease in the probability of observing an interest-decreasing performance pricing, representing only about 4% of the average use of interest-decreasing performance pricing in our sample.

In columns (2) to (5), we perform the cross-sectional analyses as in Table 4 and

[10] A one-notch downgrade is a downgrade from, e.g., AA to AA-.

5. To conserve space, we only report analyses using a borrower's pledgeable collateral to capture the severity of interest conflicts between borrowers and creditors, and analyses using a borrower's intellectual investments (R&D capital) to capture the extent of adverse effects of market threats on its prospectus. We find similar results using other dimensions as in Table 4 and 5. These columns show that the influence of market threats in the use of interest-decreasing performance pricing does not vary significantly (or even in the opposite direction) with the severity of incentive problems, or with a borrower's vulnerability to market threats.

In column (6), we employ the alternative measure that captures the range of interest changes in response to changes in performance. That is, we calculate the difference between the interest rates charged at the inception of a loan contract and the minimum interest rates as specified in a performance pricing. This variable is positive for loans with an interest-decreasing performance pricing term, and is zero for loans without an interest-decreasing performance pricing. We estimate a Tobit model and show in column (6) that there product market threats do not seem to moderate the use of interest-decreasing performance pricing.

6 Conclusion

In this paper, we empirically examine the role of product market threats in shaping financial contracting. Our analyses build on the theoretical framework of Bolton and Scharfstein (1990), who show that in order to mitigate the adverse effects of product market threats, an optimal response in financial contracting is to lower the sensitivity of contractual terms to firm performance.

We examine a widely used performance-sensitive term in bank loan contracts, interest-increasing performance pricing, which would make borrowers more vulnerable to rivals' competitive strategies. We capture product market threats faced by a firm using the firm's product market fluidity, which identifies the firm's product market instability and threats arising out of rivals' moves around the firm's product space. We find strong empirical support for the predictions in Bolton and Scharfstein (1990). Loan contracts of firms facing greater product market threats have significantly lower sensitivity to firm performance: They are less likely to incorporate interest-increasing performance pricing terms, or have a narrower range of performance pricing that makes interest change less responsive to performance change.

Furthermore, we find that the effect of product market threats in shaping loan performance sensitivity varies with the severity of incentive conflicts between creditors and borrowers, as well as borrowers' vulnerability to market threats. The effect is more pronounced when borrower-creditor incentive problems are less severe, and when product market threats can impose a more detrimental consequence for a firm's prospectus. These cross-sectional results point to the trade-off framework in Bolton and Scharfstein (1990). That is, while lowered contract sensitivity mitigate adverse effects of potential market threats, it exacerbates interest conflicts between creditors and borrowers; the optimal contract would balance these two forces depending on their relative importance.

From a general perspective, we further show that firms facing high product market fluidity experience a material decline in its future profitability, an increase in indebtedness, and a deterioration in credit quality. These real effects of product market fluidity warrant the reduced loan performance sensitivity that we document.

Overall, our findings document that product markets play an important role in shaping debt contracting. While existing studies find that information frictions on financial markets shape the design of debt contracts, we extend this line of research by considering how interactions of product markets and financial markets affect financial contracting.

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Appendix I: Variable Definitions

Variable	Definition
Increasing PP	Dummy variable that equals one if a loan contract incorporates an interest-increasing performance pricing term, and zero otherwise.
Fluidity	A measure of product market instability and threats faced by a firm, constructed by Hoberg, Phillips, and Prabhala (2014) based on firm product descriptions in 10-K filings. It measures the cosine similarity between the vector identifying a firm's own word usage and a vector identifying the aggregate change in the word usage of other firms. Let J_t be a scalar equal to the number of unique words used in all product descriptions in a given year t, $W_{i,t}$ be an ordered Boolean vector, with a length of J_t, identifying which words are used by firm i in a given year t, and $N_{i,t}$ be the normalized $W_{i,t}$ (to unit length). Product market fluidity is defined as $Fluidity_{i,t} = \left\langle N_{i,t} \cdot \frac{D_{t-1,t}}{\|D_{t-1,t}\|} \right\rangle$, where $D_{t-1,t}$ is defined by $D_{t-1,t} = \mid \sum_i (W_{i,t} - W_{i,t-1}) \mid$.
logAssets	The natural logarithm of total assets measured in million U.S. dollar, i.e., $log(atq)$.
Market-to-Book	The market-to-book ratio, i.e., $(atq - (atq - ltq + txditcq) + (prccq * cshoq))/atq$.
Leverage	Total liabilities scaled by total assets, i.e., $(dlcq + dlttq)/atq$.
CashFlow	EBITDA scaled by total assets, i.e., $oibdpq/atq$.
Tangibility	PP&E (property, plant, and equipment) scaled by total assets, i.e. $ppentq/atq$.
InterestCvg	Interest coverage, defined as interests over EBITDA, i.e., $xintq/oibdpq$.
HHI	Text-based Network Industry Classifications Herfindahl index as in Hoberg and Phillips (2015), calculated using a dynamic industry classification based on each firm's product descriptions from annual 10-K filings. See Hoberg and Phillips (2015) for more details.
Collateral	Proxy for pledgable collateral defined as the sum of PP&E (property, plant, and equipment), inventory, cash and equivalents, and receivables, scaled by total book assets, i.e., $(ppentq + invtq + cheq + rectq)/atq$.

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Variable	Definition
(*continued from the previous page...*)	
Borrowing-Frequency	The number of loans a borrower of a given loan has borrowed from the same lead bank that arranged this loan in the past ten years. If a loan is arranged by multiple lead banks, we use the borrower's borrowing frequency with the most frequent lead lender as the *Borrowing Freqneucy* of the loan.
Rating Dummy	A dummy variable that equals 1 if a firm has an outstanding S&P issuer credit rating during a certain year, and 0 otherwise.
R&D Capital	The 5-year cumulative R&D expenses, scaled by sales, assuming an annual depreciation rate of 20%. That is, a firm's R&D capital in year t equals $(RD_t + 0.8 * RD_{t-1} + 0.6 * RD_{t-2} + 0.4 * RD_{t-3} + 0.2 * RD_{t-}4)/Sales$, where RD and $Sales$ are a firm's research and development expenses and total sales as reported in Compustat.
Z-Score	Altman's Z-Score calculated as *1.2*Working Capital/Total Assets + 1.4*Retained Earnings/Total Assets + 3.3*Earnings Before Interest & Tax/Total Assets + 0.6*Market Value of Equity/Total Liabilities +1.0*Sales/Total Assets.*
logMaturity	The natural logarithm of the loan maturity measured in months.
logDealAmount	The natural logarithm of the loan amount scaled by firm total assets.
Secured	Dummy variable that equals 1 if a loan is secured, and zero otherwise.
FinCov	Dummy variable that equals 1 if a loan has financial covenants, and zero otherwise.

Table 1: Summary Statistics

This table presents the loan-level summary statistics for the sample of 17,819 loans borrowed by 4,742 industrial firms between 1997 and 2013. Panel A reports statistics for all sample loans, and Panel B report statistics for lows borrowed by firms that have low market fluidity (below sample median) and high market fluidity (above sample median), respectively. Descriptions of each variable are in Appendix I. In Panel B, The statistical significance testing the difference of the mean between the two sub-samples is denoted by ***, **, and * to indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A: All Loans

Variable	Obs.	Mean	p25	p50	p75	S.D.
Increasing PP	17,819	0.32	0	0	1	0.47
Fluidity	17,819	6.49	4.06	5.81	8.28	3.34
Assets	17,819	5,667	231	849	3,231	20,529
Market-to-book	15,808	1.74	1.07	1.39	1.95	1.21
CashFlow	16,614	0.03	0.02	0.03	0.05	0.04
Leverage	17,090	0.31	0.15	0.29	0.43	0.21
InterestCvg	15,061	0.18	0.05	0.13	0.27	0.50
Tangibility	17,719	0.32	0.12	0.25	0.46	0.24
HHI	17,816	0.24	0.09	0.16	0.30	0.21
Loan Amount	17,446	487	50	175	500	1,126
Maturity	16,830	45.38	26	48	60	24.45
Secured	12,336	0.72	0	1	1	0.45
FinCov	17,819	0.62	0	1	1	0.49

Panel B: High v.s. Low-Fluidity Borrowers

	Low-Fluidity Borrowers			High-Fluidity Borrowers			Diff.
Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.	
Increasing PP	8,915	0.34	0.47	8,904	0.30	0.46	-0.03***
Assets	8,915	4,696	16,482	8,904	6,645	23,874	1,977***
Market-to-book	7,656	1.61	0.97	8,152	1.86	1.40	0.25***
CashFlow	8,245	0.03	0.03	8,369	0.03	0.05	0.01***
Leverage	8,575	0.30	0.19	8,515	0.31	0.22	0.01***
InterestCvg	7,633	0.18	0.46	7,428	0.19	0.54	0.01
Tangibility	8,873	0.28	0.20	8,846	0.35	0.28	0.07***
HHI	8,915	0.28	0.22	8,904	0.19	0.18	-0.09***
Loan Amount	8,732	445	976	8,714	528	1,257	85.8***
Maturity	8,434	45.05	23.07	8,396	45.71	25.77	0.68*
Secured	5,976	0.67	0.47	6,360	0.77	0.42	0.10***
FinCov	8,915	0.62	0.49	8,904	0.62	0.49	-0.00

Table 2: Pairwise Correlations between the Main Variables

This table reports the pairwise correlations of key variables from our sample of 17,819 loans borrowed by 4,742 industrial firms between 1997 and 2013. Descriptions of each variable are in Appendix I.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Increasing PP											
(2) Fluidity	-0.0369										
(3) Assets	-0.0131	0.0813									
(4) Market-to-book	-0.0175	0.1056	-0.0457								
(5) CashFlow	0.1203	-0.1424	0.0218	0.0966							
(6) Leverage	-0.0536	0.0835	-0.0028	-0.1508	-0.0287						
(7) Tangibility	0.0069	0.1669	-0.0015	-0.1310	0.0999	0.2380					
(8) HHI	-0.0193	-0.2749	-0.0346	-0.0310	0.0050	-0.0181	-0.1878				
(9) Maturity	0.1069	0.0338	-0.0323	-0.0727	0.0964	0.1892	0.0739	-0.0047			
(10) DealAmount	0.0750	0.0775	0.5145	-0.0235	0.0585	0.0739	0.0283	-0.0553	0.0631		
(11) Secured	-0.2778	0.1202	-0.1894	-0.0781	-0.1741	0.1515	0.0087	0.0382	0.0751	-0.2007	
(12) FinCov	0.4257	-0.0049	-0.1470	-0.0055	0.0570	-0.0412	-0.0219	0.0368	0.0829	-0.0652	-0.0643

Table 3: Baseline Analyses on the Effect of Product Market Threats on the Use of Interest-Increasing Performance Pricing

This table presents Probit regressions to examine the effect of product market threats on the use of interest-increasing performance pricing terms in bank loan contracts. Marginal effects of estimated coefficients are reported. The dependent variable is a dummy variable that equals 1 if a loan contract incorporates an interest-increasing performance, and zero otherwise. *Fluidity* measures product market threats faced by a firm, and is developed by Hoberg, Phillips, and Prabhala (2014) based on a textual analysis of firms' product descriptions in 10-K filings to capture changes in rivals' products relative to the firm's own products. Detailed descriptions for the fluidity measure, as well as for all other dependent variables are in Appendix I. *Loan Purpose FE* are indicator variables for the four loan purposes: acquisition, recapitalization, general purpose, and others, as classified in the DealScan database. Year and two-digit SIC industry fixed effects are denoted as *Year FE* and *Industry FE*, respectively. 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. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Fluidity	-0.015***	-0.008*	-0.020***	-0.019***	-0.021***	-0.016**
	(-3.65)	(-1.66)	(-3.63)	(-3.55)	(-3.62)	(-2.29)
logAssets		0.089***	0.242***	0.243***	0.247***	0.252***
		(8.81)	(18.29)	(18.21)	(17.01)	(16.80)
Market-to-Book		-0.039***	-0.009	-0.007	-0.007	0.003
		(-2.67)	(-0.54)	(-0.45)	(-0.40)	(0.19)
CashFlow		4.837***	2.988***	3.229***	3.315***	3.298***
		(8.92)	(4.91)	(5.31)	(5.37)	(5.42)
Leverage		-0.419***	-0.575***	-0.557***	-0.596***	-0.504***
		(-5.53)	(-6.26)	(-5.97)	(-6.28)	(-5.20)
InterestCvg		-0.036	-0.014	-0.010	-0.007	-0.009
		(-1.40)	(-0.44)	(-0.33)	(-0.21)	(-0.29)
Tangibility		-0.107*	-0.062	-0.077	-0.067	-0.129
		(-1.69)	(-0.85)	(-1.04)	(-0.89)	(-1.14)
HHI		-0.071	-0.111	-0.136	-0.172**	-0.149*
		(-0.93)	(-1.31)	(-1.59)	(-1.97)	(-1.66)
logMaturity			0.188***	0.185***	0.207***	0.238***
			(6.56)	(6.40)	(6.92)	(7.76)
logDealAmount			0.222***	0.250***	0.264***	0.251***
			(9.80)	(10.79)	(11.14)	(10.42)
Secured			-0.493***	-0.487***	-0.519***	-0.526***
			(-11.38)	(-11.13)	(-11.56)	(-11.57)
FinCov			1.062***	1.059***	1.025***	1.064***
			(19.08)	(19.13)	(18.23)	(19.10)
Loan Purpose FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes
Industry FE	No	No	No	No	No	Yes
N	17,819	11,853	7,938	7,938	7,938	7,937
pseudo R^2	0.001	0.028	0.181	0.185	0.198	0.210

Table 4: Cross-sectional Analyses Based on the Severity of Incentive Conflicts between Borrowers and Creditors

This table presents Probit regressions to examine the variations in the effect of product market threats on the use of interest-increasing performance pricing in bank loan contracts, based on the severity of incentive conflicts between borrowers and creditors. Marginal effects of estimated coefficients are reported. The dependent variable is a dummy variable that equals 1 if a loan contracts incorporate interest-increasing performance, and zero otherwise. Columns (1) to (3) consider whether a borrower has abundant pledgeable collateral at the time of borrowing. Columns (1) consists of borrowers whose pledgeable collateral at the time of borrowing is above the sample median, and column (2) consists of borrowers whose pledgeable collateral at the time of borrowing is below the sample median. A borrower's pledgeable collateral is defined in Appendix I. Column (3) consists of the full sample, and includes an interaction term between *Fluidity* and *Collateral* in the specification. Columns (4) to (6) consider whether a borrower of loan has an established relationship with the lending banks in the past ten years. Column (4) consists of loans whose borrowers have a relationship with the lead banks of the loan, and column (5) consists of loans whose borrowers do not have a relationship with the lead banks of the loan. Column (6) consists of the full sample, and includes an interaction term between *Fluidity* and *Borrowing Frequency* in the specification, where *Borrowing Frequency* is defined in Appendix I. Columns (7) to (9) consider whether a borrower is able to access to the public debt market. Column (7) consists of borrowers that have an S&P issuer credit rating at the time of borrowing, and column (8) consists of borrowers that do not have an S&P issuer credit rating at the time of borrowing. Column (9) consists of the full sample, and includes an interaction term between *Fluidity* and *Rating Dummy* in the specification, where *Rating Dummy* is defined in Appendix I. Detailed descriptions of dependent variables are in Appendix I. *Loan Purpose FE* are indicator variables for the four loan purposes: acquisition, recapitalization, general purpose, and others, as classified in the DealScan database. Year and two-digit SIC industry fixed effects are denoted as *Year FE* and *Industry FE*, respectively. 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. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pledgeable Collateral		Full	Lending Relationship		Full	Access to Public Debt		Full
	High	Low		With	Without		With	Without	
Fluidity	-0.031***	-0.001	0.045**	-0.017**	-0.009	-0.006	-0.017*	-0.010	-0.002
	(-3.28)	(-0.05)	(2.34)	(-1.98)	(-0.82)	(-0.72)	(-1.72)	(-0.96)	(-0.18)
Fluidity * Collateral			-0.088***						
			(-3.50)						
Collateral			0.359*						
			(1.70)						
Fluidity * Borrowing Frequency						-0.005**			
						(-2.23)			
Borrowing Frequency						0.039**			
						(2.11)			
Fluidity * Rating Dummy									-0.024**
									(-2.23)
Rating Dummy									0.199**
									(2.38)
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3,845	3,836	7,695	4,564	3,237	7,802	3,584	4,343	7,663
pseudo R^2	0.237	0.204	0.212	0.200	0.228	0.210	0.202	0.228	0.210

Table 5: Cross-sectional Analyses Based on the Extent of Adverse Effects of Product Market Threats on Firm Prospectus

This table presents Probit regressions to examine the variations in the effect of product market threats on the use of interest-increasing performance pricing in bank loan contracts, based on the extent of potential negative impact of product market threats on firms' prospectus. Marginal effects of estimated coefficients are reported. The dependent variable is a dummy variable that equals 1 if a loan contracts incorporate interest-increasing performance, and zero otherwise. Columns (1) to (3) consider whether a borrower has large investments in intellectual capital. Column (1) consists of borrowers with R&D capital above the sample median at the time of borrowing, and column (2) consists of borrowers with R&D capital below the sample median at the time of borrowing. R&D capital is defined in Appendix I. Column (3) consists of the full sample, and includes an interaction term between *Fluidity* and *R&D Capital* in the specification. Columns (4) to (6) consider whether a firm is in financial distress, as measured by Altman's Z-score. Column (4) consists of borrowers that have a *Z-Score* below the sample median at the time of borrowing, and column (5) consists of borrowers that have a *Z-Score* above the sample median at the time of borrowing. *Z-Score* is defined in Appendix I. Column (6) consists of the full sample, and includes an interaction term between *Fluidity* and *Z-Score* in the specification. Detailed descriptions of dependent variables are in Appendix I. Loan Purpose FE are indicator variables for the four loan purposes: acquisition, recapitalization, general purpose, and others, as classified in the DealScan database. Year and two-digit SIC industry fixed effects are denoted as Year FE and Industry FE, respectively. 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. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	R&D Capital		Full	Financial Distress		Full
	High	Low		High	Low	
Fluidity	-0.006	-0.025	-0.018	-0.022**	-0.012	-0.022***
	(-0.33)	(-1.32)	(-1.41)	(-2.23)	(-1.13)	(-2.87)
Fluidity ∗ R&D Capital			0.097***			
			(3.76)			
R&D Capital			-1.447***			
			(-3.65)			
Fluidity ∗ Z-Score						0.003*
						(1.81)
Z-Score						-0.010
						(-0.72)
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,272	1,266	2,548	3,747	3,750	7,503
pseudo R^2	0.311	0.233	0.265	0.191	0.228	0.209

Table 6: Instrumental Variable Analyses

This table presents Probit instrumental variable regressions. Marginal effects of estimated coefficients are reported. We instrument *Fluidity* using the total cash holdings of a borrower's ten closest rivals, divided by the total book value of assets of these 10 rivals (*Rival Cash Richness*), A borrower's 10 closest rivals are the firms that have highest product similarity with this borrower at the time of borrowing, where product similarity is obtained from Hoberg and Phillips (2010, 2015), which measures the cosine similarity between two firms' product descriptions in their 10-K filings. Columns (1) to (3) report the first-stage regressions. In the first stage, the dependent variable is *Fluidity*, and the independent variables include the instrument, as well as the same control variables as in the corresponding second-stage regressions. The first-stage F-statistics are reported at the bottom of each column. Columns (4) to (6) report the second-stage regressions. In the second stage, the dependent variable is a dummy variable that equals 1 if a loan contracts incorporate interest-increasing performance, and zero otherwise. The independent variables include the instrumented *Fluidity*, predicted using the first-stage regression estimates, as well as the same set of control variables as in Table 3. Definitions of all dependent variables are in Appendix I. The second-stage *Wald Chi-squared* and its p-values are reported at the bottom of each column. Standard errors are clustered at the firm level and corrected for heteroskedasticity. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage			Second Stage		
	Fluidity			Increasing PP		
Rival Cash Richness	4.755***	4.733***	4.697***			
	(11.52)	(11.59)	(12.20)			
Instrumented Fluidity				-0.102***	-0.112***	-0.088**
				(-3.35)	(-3.70)	(-2.55)
logAssets	0.310***	0.252***	0.221***	0.258***	0.257***	0.262***
	(7.64)	(5.56)	(6.31)	(19.18)	(17.58)	(17.30)
Market-to-Book	0.448***	0.459***	0.309***	0.038	0.045*	0.031
	(10.82)	(10.93)	(8.93)	(1.63)	(1.85)	(1.43)
CashFlow	-10.696***	-10.238***	-8.963***	2.158***	2.165***	2.535***
	(-8.02)	(-7.72)	(-7.94)	(2.89)	(2.89)	(3.51)
Leverage	0.768***	0.906***	0.343	-0.490***	-0.505***	-0.482***
	(2.59)	(3.07)	(1.49)	(-5.03)	(-5.00)	(-4.89)
InterestCvg	-0.082	-0.065	-0.033	-0.017	-0.012	-0.011
	(-0.99)	(-0.80)	(-0.50)	(-0.56)	(-0.41)	(-0.36)
Tangibility	2.684***	2.668***	0.790***	0.103	0.132	-0.085
	(1.03)	(1.32)	(-0.74)	(9.81)	(10.02)	(2.77)
HHI	-3.739***	-3.865***	-2.750***	-0.457***	-0.540***	-0.363***
	(-17.02)	(-17.46)	(-13.43)	(-3.12)	(-3.60)	(-2.69)
logMaturity	-0.018	-0.014	-0.054	0.179***	0.198***	0.230***
	(-0.25)	(-0.19)	(-0.90)	(6.10)	(6.55)	(7.41)
logDealAmount	0.018	-0.006	-0.046	0.239***	0.248***	0.241***
	(0.31)	(-0.11)	(-0.95)	(9.85)	(9.84)	(9.61)
Secured	1.289***	1.223***	0.874***	-0.356***	-0.379***	-0.448***
	(10.66)	(10.09)	(8.90)	(-5.19)	(-5.51)	(-7.40)
FinCov	0.163	0.211**	-0.011	1.036***	1.003***	1.044***
	(1.53)	(1.97)	(-0.12)	(17.92)	(17.21)	(18.07)
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Industry FE	No	No	Yes	No	No	Yes
N	7,936	7,936	7,936	7,936	7,936	7,936
First Stage F-Stat.	147.05	145.51	180.42			
Second Stage Wald χ^2				1,476.7	1,582.4	1,690.5
p-value of χ^2				0.00	0.00	0.00

Table 7: Analyses using the Range of Potential Interest Changes in Response to Borrowers' Performance Change

This table presents Tobit regressions to examine the effect of product market threats on the use of interest-increasing performance pricing in bank loan contracts. The dependent variable is the range of potential interest changes in response to borrowers' performance change in an interest-increasing performance pricing term, calculated as the difference between the maximum interest rates as specified in performance pricing and the interest rates charged at the inception of a loan contract. It is positive for loans with an interest-increasing performance pricing term, and equals zero for loans that do not have an interest-increasing performance pricing. Columns (1) and (2) report baseline analyses, and correspond to columns (5) and (6) in Table 3. Column (3) reports instrumental variable analyses, and corresponds to column (6) in Table 6. Columns (4) to (9) report cross-sectional analyses based on the severity of incentive conflicts between creditors and borrowers as measured in Table 4. Columns (10) to (13) report cross-sectional analyses based on the extent of adverse effects of product market threats on firms' prospectus as measured in Table 5. 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. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Fluidity	-0.047***	-0.036**		0.056	0.133***	-0.022	-0.016	0.001	-0.002	-0.027	-0.041	-0.058***	-0.046**
	(-3.14)	(-1.97)		(1.22)	(2.72)	(-1.10)	(-0.71)	(0.06)	(-0.07)	(-1.00)	(-1.31)	(-3.27)	(-2.19)
Instrumented Fluidity			-0.278***										
			(-2.73)										
Fluidity∗Collateral				-0.146**	-0.248***								
				(-2.34)	(-3.76)								
Collateral				1.298**	1.081*								
				(2.48)	(1.93)								
Fluidity∗Borrowing Frequency						-0.012**	-0.011*						
						(-2.07)	(-1.79)						
Borrowing Frequency						0.094**	0.062						
						(2.09)	(1.39)						
Fluidity∗Rating Dummy								-0.081***	-0.058**				
								(-2.72)	(-1.98)				
Rating Dummy								0.462**	0.413*				
								(2.04)	(1.85)				
Fluidity∗R&D Capital										0.228***	0.229***		
										(3.23)	(3.19)		
R&D Capital										-3.573***	-3.553***		
										(-3.50)	(-3.32)		
Fluidity∗Z-Score												0.004	0.005
												(1.17)	(1.17)
Z-Score												0.022	0.010
												(0.57)	(0.24)
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	7,939	7,939	7,937	7,697	7,697	7,804	7,804	7,530	7,530	2,570	2,570	7,505	7,505
pseudo R^2	0.076	0.089		0.076	0.090	0.076	0.089	0.075	0.088	0.099	0.113	0.077	0.089

Table 8: Analyses on the Real Effects of Product Market Threats on Firm Future Performance

This table report ordinary least squared regressions to examine the real effects of product market fluidity on firm future performance. The sample consists of all firm-years of firms that have borrowed a bank loan during our sample period between 1997 and 2013. In columns (1) to (3), the dependent variable is the change in borrower profitability in the next one, two, and three years, respectively. In columns (4) to (6), the dependent variable is the change in borrower leverage in the next one, two, and three years, respectively. In columns (7) to (9), the dependent variable is the change in borrower S&P issuer credit ratings in the next one, two, and three years, respectively. *Fluidity* measures product market threats faced by a firm, and is developed by Hoberg, Phillps, and Prabhala (2014) based on a textual analysis of firms' product descriptions in 10-K filings to capture changes in rival firms' products relative to the firm's own products. Detailed descriptions for the *Fluidity*, as well as for all other dependent variables are in Appendix I. Year and two-digit SIC industry fixed effects are denoted as *Year FE* and *Industry FE*, respectively. Rating FE are indicators for each of S&P issuer rating category. The pseudo Standard errors are clustered at the firm level and corrected for heteroskedasticity. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Change of Profitability			Change of Indebtedness			Change of Credit Ratings		
	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3
Fluidity	-0.001***	-0.001***	-0.001**	0.001***	0.001**	0.002*	0.005**	0.008**	0.006
	(-4.11)	(-2.76)	(-2.04)	(3.00)	(2.26)	(1.95)	(2.28)	(2.36)	(1.23)
logAssets	-0.001	-0.003***	-0.004***	-0.002**	-0.001	0.001	-0.046***	-0.080***	-0.102***
	(-1.45)	(-3.36)	(-3.05)	(-2.03)	(-0.48)	(0.56)	(-7.48)	(-7.35)	(-6.74)
Market-to-Book	0.006***	0.006***	0.005**	-0.002	-0.001	-0.003	-0.042***	-0.067***	-0.068***
	(2.91)	(2.62)	(2.40)	(-0.80)	(-0.40)	(-0.73)	(-5.81)	(-5.73)	(-4.83)
CashFlow	-0.300***	-0.537***	-0.614***	-0.053**	-0.018	0.030	-1.185***	-1.630***	-1.925***
	(-7.65)	(-18.85)	(-23.21)	(-2.09)	(-0.52)	(0.78)	(-9.85)	(-9.28)	(-8.75)
Leverage	0.035***	0.055***	0.051***	-0.102***	-0.202***	-0.284***	0.438***	0.508***	0.461***
	(5.90)	(7.21)	(5.22)	(-12.76)	(-14.91)	(-15.36)	(9.98)	(8.04)	(5.36)
InterestCvg	0.000	-0.005**	-0.004	-0.002	-0.007	-0.005	-0.005	0.006	0.065
	(0.13)	(-2.20)	(-1.43)	(-0.62)	(-1.48)	(-0.94)	(-0.24)	(0.19)	(1.55)
Tangibility	0.007	0.024***	0.028***	0.020***	0.027**	0.036**	0.086**	0.059	0.030
	(1.63)	(3.83)	(3.45)	(3.22)	(2.52)	(2.49)	(2.10)	(0.88)	(0.32)
HHI	0.006**	0.009**	0.011*	0.001	0.004	0.011	0.009	0.023	-0.048
	(2.04)	(1.97)	(1.86)	(0.26)	(0.52)	(0.99)	(0.28)	(0.44)	(-0.65)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10,921	10,148	8,998	10,922	10,146	8,995	10,549	9,305	8,155
adj. R^2	0.141	0.287	0.331	0.075	0.124	0.175	0.089	0.121	0.131

Table 9: Analyses on the Effect of Product Market Threats on the Use of Interest-Decreasing Performance Pricing

This table presents the analyses on the effect of product market threats on the use of interest-increasing performance pricing terms in bank loan contracts. In columns (1) to (5), the dependent variable is a dummy variable that equals 1 if a loan contract incorporates an interest-decreasing performance term, and zero otherwise. Marginal effects of estimated coefficients are reported. Column (1) reports baseline analyses, and corresponds to column (6) in Table 3. Columns (2) and (3) report cross-sectional analyses based on the severity of incentive conflicts between creditors and borrowers, and correspond to columns (1) and (2) in Table 4, respectively. Columns (4) and (5) report cross-sectional analyses based on the extent of adverse effects of product market threats on firms' prospectus, and correspond to columns (1) to (2) in Table 5, respectively. Column (6) presents the Tobit regression, and the dependent variable is the range of potential interest changes in response to borrowers' performance change in an interest-decreasing performance pricing term, calculated as the difference between the interest rates charged at the inception of a loan contract and the minimum interest rates as specified in a performance pricing. It is positive for loans with an interest-decreasing performance pricing term, and equals zero for loans that do not have an interest-decreasing performance pricing. This column corresponds to column (2) of Table 7. 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. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)
	Dummy	Pledgeable Collateral		R&D Capital		Range
		High	Low	High	Low	
Fluidity	-0.005	-0.014	-0.004	0.003	0.005	-0.004
	(-0.72)	(-1.36)	(-0.39)	(0.17)	(0.27)	(-0.27)
logAssets	0.249***	0.263***	0.226***	0.229***	0.205***	0.519***
	(16.66)	(12.03)	(10.29)	(6.46)	(5.46)	(15.94)
Market-to-Book	-0.020	-0.032	-0.013	-0.007	-0.006	-0.109***
	(-1.23)	(-1.37)	(-0.53)	(-0.21)	(-0.12)	(-2.87)
CashFlow	1.642***	0.978	2.649***	4.198***	-0.781	4.357***
	(3.14)	(1.55)	(2.67)	(3.40)	(-0.36)	(3.48)
Leverage	-0.013	0.054	-0.177	0.171	0.232	0.097
	(-0.13)	(0.35)	(-1.32)	(0.66)	(0.84)	(0.43)
InterestCvg	0.039	0.078*	-0.004	0.016	0.078	0.122
	(1.21)	(1.73)	(-0.09)	(0.18)	(0.72)	(1.53)
Tangibility	0.052	0.093	0.274	-0.430	0.039	0.004
	(0.46)	(0.52)	(1.39)	(-1.24)	(0.11)	(0.02)
HHI	0.018	0.133	-0.066	0.099	-0.096	0.000
	(0.20)	(1.00)	(-0.55)	(0.46)	(-0.48)	(.)
logMaturity	0.301***	0.286***	0.300***	0.412***	0.251***	0.682***
	(9.46)	(6.31)	(6.25)	(5.79)	(3.17)	(8.99)
logDealAmount	0.313***	0.331***	0.281***	0.240***	0.245***	0.728***
	(13.06)	(9.95)	(7.69)	(3.78)	(4.13)	(12.94)
Security	-0.494***	-0.553***	-0.393***	-0.479***	-0.619***	-0.624***
	(-10.23)	(-8.05)	(-5.67)	(-3.96)	(-5.37)	(-6.50)
FinCov	1.320***	1.196***	1.462***	1.453***	1.404***	3.548***
	(24.21)	(15.85)	(17.67)	(8.90)	(10.21)	(24.57)
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	7,937	3,849	3,839	1,279	1,278	7,941
pseudo R^2	0.240	0.250	0.241	0.296	0.262	0.094