



**WORKING PAPER SERIES**

**WP 2023-002**

**June 2023**



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# Opportunity or Challenge? Impact of Product Market Threats on a Firm's Bankruptcy Risk

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*Extant literature reveals that a firm's decision-making is deeply impacted by product market threats from competitors. Every decision made by a firm impacts its bankruptcy risk. However, the literature overlooks product market threats' impact on a firm's bankruptcy risk. This study fills this research gap by showing product market threats' heterogeneous effect on a firm's bankruptcy risk; that is, product market threats (a) increase bankruptcy risk in weak firms but (b) reduce it in competitive firms. The main results indicate that product market threats can be both a challenge and an opportunity for a firm. Moreover, the results document that managerial ability could eliminate the negative effects of competitive pressure. The empirical results further reveal that a weak firm's investment and employment growth is more negatively impacted by product market threats compared to one that is strong, and that overall, strong firms benefit from competition, but weak firms lose out. Utilizing the above findings, management in firms facing product market threats from rivals can actually turn these threats around and convert them into opportunities that will not only stop such firms from going bankrupt but also turn them into financially stronger firms.*

*Keywords: Product market threats; bankruptcy risk; investment; managerial ability*

## I. Introduction

A firm's corporate strategy and decision-making is deeply influenced by product market competition (Alimov 2014). For example, product market threats from competitors affect a firm's cash holding policy (Hoberg, Phillips, and Prabhala 2014), reduce its market share (Billett, Garfinkel, and Yu 2017), and may also cause the firm to decrease its investment in research and development (R&D) to maintain financial flexibility (He and Wintoki 2016). Moreover, product market threats may impact a firm in terms of debt as well as equity financing (Boubaker, Saffar, and Sassi 2018; Li and Zhan 2019; Morellec and Zhdanov 2019; Platt 2020; Seo 2021; Valta 2012). According to a previously conducted study, an increase in competition increases a firm's business risk (Wang and Chui 2015); therefore, if the firm faces increased competition from the product market, it indicates that its rival is actively increasing the competition level—in an attempt to prey on the firm's business. This implies that product market threats may impact a firm's bankruptcy risk since product market threats increase business risk with regard to its operations and limit the firm's financial policy choices.

No prior study has explored the relationship between product market threats and a firm's default risks. Therefore, this study investigated how increased competition from rivals impacts the focal firm's bankruptcy risk and found that product market threats' impact is determined by the firm's own competitive conditions. In the case of a weak firm, market threats from rivals increase

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a firm's bankruptcy risk. On the contrary, if a firm is competitively strong, it will benefit from its rival's predatory intentions.

The sample comprised U.S. public firms from 2000–2019. The empirical results support the hypothesis that product market threats' impact varies among different firms. These results illustrate that product market threats' impact presents both challenges and opportunities, depending on a firm's conditions. Market threats increase bankruptcy risk if a firm is in a weak financial position and decrease the risk if it is financially healthy. Additional tests not only indicate that managerial ability (MA) is critical for a financially weak firm—since it could help eliminate product market threats' negative impact on the firm's bankruptcy risk—but also that firms respond differently to product market threats in different areas, such as employment, R&D, and investments. In sum, product market threats' negative impact is stronger in weak firms, compared to the impact in strong firms. Moreover, the empirical results reveal the existence of a non-linear relationship between product market threats and a firm's performance.

This study contributes to the existing literature in three ways. First, it is the first study to investigate the impact of market threats raised by rivals on a firm's bankruptcy risk. Second, this study reveals product market threats' heterogeneous effect; that is, product market competition is an opportunity if a firm is strong but a challenge if it is weak. Third, this study shows how product market threats impact a firm's employment, investment, and performance, thereby affecting its bankruptcy risk. Notably, product market threats reduce employment growth if the firm is weak but exhibit no impact on a strong firm. When the product market threat is high, a weak firm reduces its R&D expenditures to maintain financial flexibility, but product market threats exhibit no such impact on a strong firm's innovation activities. Moreover, both strong and weak firms reduce the quantum of new investments when the product market threat is high; however, compared to a strong firm, a weak firm reduces it to a greater extent.

## **II. Literature review and hypothesis development**

Bankruptcy risk is mainly derived from a firm's operating and financing activities. Previous studies have found that product market threats impact a firm's operating (market share, innovation, and employment) and financing activities (debt and equity financing).

In this study, product fluidity—a text-based measurement developed by Hoberg, Phillips, and Prabhala (2014)—was used to measure product market threats. Fluidity is calculated by a change in the rival firm's product description in the 10-K in response to the firm's 10-K report. A higher product market fluidity suggests that the rival's product is highly similar to that offered by the firm. In other words, the firm faces a higher threat level from the rival firm since the rival's product is homogeneous to that of the firm.

Therefore, product market fluidity decreases the firm's financial stability and increases its default risk. Thus, the literature has demonstrated that product market threats impact the firm's operating as well as financing activities.

### ***Product market threats' impact on a firm's operating activities***

Prior literature has revealed that product market threats impact a firm's market share, labor investment, and R&D activities (Billett, Garfinkel, and Yu 2017; Boubaker, Dang, and Sassi 2022; Hoberg, Phillips, and Prabhala 2014). Market share is the outcome of operations; labor employed

impacts a firm's production and management; and innovation is also an important component of the firm's operating activities. All these findings indicate that product market threats impact a firm's operating abilities.

Indubitably, if the similarity between the rival and firm's product increases, the customer will have more options and, therefore, rely less on the product offered by the focal firm. Consequently, the firm's market share will reduce as the firm's product market fluidity increases. Billett, Garfinkel, and Yu (2017) found that a firm with more "fluid" products will lose more market share due to the product market shock.

Competition pressure increases managers' focus on short-term performance to maintain their reputation. Particularly in a highly competitive industry, reputation is extremely important for a firm to obtain access to external financing. According to signal theory, the manager may hire an excessive number of employees unnecessarily to show or signal an external investor that the business is booming, especially in highly competitive industries. However, hiring an excessive number of employees adversely impacts labor investment efficiency. Boubaker, Dang, and Sassi (2022) found that a firm with higher competition pressure (higher product market threats) exhibits lower labor investment efficiency. This decrease in labor efficiency not only increases the human capital cost but also reduces its quality. Human capital is a key factor in a firm's operating activities. Hence, competition pressure from rival firms negatively impacts a firm's operating ability through low labor investment efficiency.

Hoberg, Phillips, and Prabhala (2014) found that firms with higher product market threats exhibit higher financial flexibility to protect themselves from threats raised by rival firms. Consequently, firms may reduce their R&D expenditure to maintain financial flexibility. Boubaker, Dang, and Sassi (2022) demonstrated that an increase in product market threats is associated with a short-term decrease in R&D activities. Thus, the firm loses R&D opportunities, which detrimentally affects its long-term performance.

In sum, product market threats reduce a firm's market share, labor investment efficiency, and R&D investments. All these negative effects precipitate challenges in a firm's operations, thereby reducing the income from operating activities, which further increases the bankruptcy risk.

### ***Product market threats' impact on a firm's financing activities***

As discussed earlier, product market threats impact a firm's operating activities. The firm's income is predominantly derived from either its operational or financial activities. Therefore, the following question arises: How does the product market threat impact the focal firm's financial activities? Existing literature (Boone, Floros, and Johnson 2016; Boubaker, Saffar, and Sassi 2018; Li and Zhan 2019; Morellec and Zhdanov 2019) has shown that product market threats impact debt and equity financing, as well as a firm's cash holding policy.

Hoberg, Phillips, and Prabhala (2014), Chi and Su (2016), and He and Wintoki (2016) found that product market threats force firms to hold more cash to maintain financial flexibility. Holding more cash aids the focal firm against the uncertainty caused by the increasing competition in the product market. Due to high competition pressure, the focal firm holds more cash in hand to maintain liquidity, which can be helpful in seizing future investment opportunities. However, despite increasing a firm's financial flexibility, holding more cash restricts the firm's flexibility in choosing its cash policy (because the firm has to maintain a high cash level).

Further, product market threats impact a firm's equity financing. It is well-known that information asymmetry is critical to a firm's external financing activities. The product market

threat increases the firm's cash flow uncertainties, erodes its growth opportunities, and raises the volatility in the information environment. All these challenges increase information asymmetry and reduce the accuracy of analysts' forecasts (Mattei and Platikanova 2017). Additionally, competitive pressure may lead to strategic financial reporting and, consequently, reduce the financial statement comparability (Imhof, Seavey, and Watanabe 2022). All these factors increase information asymmetry, which further impacts the firm's debt and equity financing.

For debt financing, a firm either borrows from financial institutions or issues the debt in the bond market. As a financial institution, a bank has greater information and specialization than other loan providers. Hence, bank monitoring is stricter than other debt sources. When the uncertainty in the product market is high because of product market threats, the manager will try avoiding the pressure of monitoring. Since bank debt is associated with stricter monitoring, the firm is less likely to rely on bank debt (Boubaker, Saffar, and Sassi 2018). Moreover, the rising uncertainty in cash flow due to increasing product market threats increases the cost of the firm's corporate bonds (Platt 2020). Hence, product market threats limit a firm's debt choice and increase the cost of its corporate bonds.

Debt and equity financing are the main external financing sources. The literature has revealed that product market threats reduce a firm's reliance on debt financing due to its high monitoring pressure and cost. Thereafter, the next question is as follows: How does the product market threat impact a firm's equity financing? As the equity cost for a high predation risk firm is low (Sassi et al. 2019), the firm exhibits greater reliance on equity financing. However, due to the problem of information asymmetry, to access the equity market, a firm with higher product fluidity will need to disclose greater information. This indicates that a firm facing high risk in the product market finds it more difficult to obtain access to the equity market. Boone, Floros, and Johnson (2016) found that an IPO firm with higher product fluidity is more likely to redact information from SEC registration filings. Moreover, a firm with a higher predation risk faces a higher peer effect, which induces the firm's disclosure (Seo 2021).

A firm with a higher product market threat not only faces high information disclosure pressure to access the equity market but may also be associated with a higher stock crash risk. The product market threat forces the manager to withhold bad news. However, the negative information accumulates up to a tipping point where all of it is revealed at the same time, thus leading to an abrupt and huge decline in stock prices. Hence, a firm with higher product market threats is associated with a higher stock crash risk (Li and Zhan 2019). Product market threats not only impact the firm's stock but also its option. Morellec and Zhdanov (2019) found that product market fluidity causes an inverse relationship between the return on equity and volatility.

In sum, the lower equity cost of a higher predation risk firm (Sassi et al. 2019) increases its reliance on equity financing. However, owing to information asymmetry, the disclosure pressure on the high product fluidity firm increases. Moreover, a higher stock crash risk and inversed risk-return relationship escalate the equity financing difficulty.

In conclusion, product market threats impact a firm's financing activities. The threat from rivals limits the firm's flexibility in choosing its cash holding policy. The predation risk reduces its reliance on bank debt and increases the corporate bonds' cost. A firm with higher product market threats benefits from lower equity cost but finds it more difficult to access the equity market. Higher disclosure pressure, a higher stock crash risk, and the inverse risk-return relationship increase firms' difficulty in accessing equity financing. Xu (2020) found that the economic policy uncertainty (EPU) index increases a firm's capital cost; particularly, product market fluidity enhances the capital relationship's EPU cost.

The literature has revealed that product market threats not only impact a firm's operating activities but also its financing activities. The increasing product fluidity erodes the firm's market share, its labor investment efficiency, and its R&D opportunities. On the one hand, these raise the firm's going concern risk on the side of operating activities; on the other hand, the predation risk also increases the firm's cost of corporate bonds, disclosure pressure, stock crash risk, and equity financing difficulty. Moreover, product fluidity limits the firm's cash holding policy and debt choices. The operating and financing activities are the foundation of a firm's going concern. Since product market threats negatively impact both operating and financing activities, it raises the firm's default risk.

Most studies have reported that product market threats' impact is uniform across firms and is more likely negative. Based on the homogenous effect assumption, the hypothesis states the following:

H1: Product market threats increase bankruptcy risk homogeneously in all firms.

### ***Product market threats' heterogeneous impacts***

Product market threats measure the actions taken by the competitor. If a competitor mimics a firm's product, the focal firm's predation risk increases as the product market threats are high. However, the threats' impact is determined by the focal firm's condition. For example, if the focal firm is strong and exhibits a competitive advantage (since the firm survived the competition previously and learned from experience), product market threats will be less likely to hurt the firm's performance or financial condition; in fact, if it has a competitive advantage, it may even gain from the competition. However, if the focal firm is competitively weak, challenges from the rival would threaten the firm's financial position and performance. Hence, the impact of product market threats from rivals may vary depending on the firm's competitive condition.

The literature has further revealed that product market threats' impact on the firm is not invariably negative. This impact depends on the firm's own competitive condition. Dasgupta, Li, and Wang (2018) found that under competitive pressure, a CEO in a weak governance firm is more likely to be forced out, while a CEO in a strong governance firm enjoys a higher incentive pay. Singla and Singh (2019) found that external market competition implements board monitoring in weak firms but weakens it in strong firms. Moreover, Januszewski, Köke, and Winter (2002) found that market competition's impact varies in different ownership types. Productivity growth is high if the firm has a strong owner but not when the parent owner is a financial institution (Januszewski, Köke, and Winter 2002).

These arguments suggest that whether the product market threat is an opportunity or challenge depends on the focal firm's competitive condition; notably, the competitive shock effect (Platt 2020; Valta 2012) exists. When rivals begin imitating a firm's product, especially that of a financially distressed firm, product market threats increase the default risk. However, previous studies have shown that predation is a risk not only to the firm being preyed upon but also to the predator firm (Shroff 2016). This finding indicates that product market threats are both opportunities and challenges for the focal firm. When rivals raise the competition, high product market threats increase the focal firm's predation risk, and the competition is raised to prey on the focal firm's business. For the predator firm, predation is costly and risky, as it has to adjust its product to compete with that of the focal firm. This requires the rival firm's customers to switch from the original to the new product offering. Moreover, the switching cost may cause the rival

firm to lose market share. Hence, threats raised by rivals are a risk to themselves. If the firm being preyed upon is financially constrained, the predation is more likely to succeed. However, if the prey firm has survived in the high competition industry previously, they would have learnt from it, would have already adopted an efficient strategy, and would have fostered a competitive advantage. Consequently, the prey firm is more likely to benefit from product market competition. This competitive shock effect suggests a non-linear relationship between default risk and product market threats—with a financially weak firm more likely being squeezed out of the business. However, if the firm has a strong financial position and has previously survived the competition, the firm is more likely to benefit from the rival’s threats since they already exhibit a competitive advantage. Thus, the following hypothesis is proposed:

H2: Product market threats (a) increase bankruptcy risk in financially weak firms but (b) reduce it in financially strong firms.

### III. Data and methodology

The sample period spans from 2000–2019 and covers all U.S. listed firms. Data on firm characteristics were obtained from Compustat North America Fundamentals Annual files, and product market threat information from the Hoberg-Phillips data library. All financial (SIC code from 6000-6999) and utility firms (SIC code from 4900-4999) were excluded. The final sample includes 8,168 unique firms with 65,420 firm-year observations. Tables 1–3 present the sample selection, year, and industry distribution, respectively.

**Table 1.** Sample selection.

	<b>Resource</b>	<b>#obs</b>
	Compustat	204,135
Less	Product market fluidity missing	111,093
Less	Firm characteristics missing	22,739
Less	Finance and utility firms	4,883
	<b>Final sample</b>	<b>65,420</b>

**Table 2.** Year distribution.

<b>Data Year - Fiscal</b>	<b>Freq.</b>	<b>Percent %</b>	<b>Cum. %</b>	<b>Data Year - Fiscal</b>	<b>Freq.</b>	<b>Percent %</b>	<b>Cum. %</b>
2000	4837	7.39	7.39	2010	2945	4.50	61.62
2001	4407	6.74	14.13	2011	2833	4.33	65.95
2002	4038	6.17	20.30	2012	2731	4.17	70.12
2003	3728	5.70	26.00	2013	2760	4.22	74.34
2004	3649	5.58	31.58	2014	2871	4.39	78.73
2005	3552	5.43	37.01	2015	2846	4.35	83.08
2006	3461	5.29	42.30	2016	2756	4.21	87.29
2007	3402	5.20	47.50	2017	2749	4.20	91.50
2008	3223	4.93	52.43	2018	2776	4.24	95.74
2009	3069	4.69	57.12	2019	2787	4.26	100.00
				<b>Total</b>	<b>65420</b>	<b>100.00</b>	



**Table 3.** Fama-French 5 industry distribution.

<b>Fama-French industry code (5 industries)</b>	<b>Freq.</b>	<b>Percent %</b>	<b>Cum. %</b>
Consumer Durables, NonDurables, Wholesale, Retail, and Some Services (Laundries, Repair Shops)	13071	19.98	19.98
Manufacturing, Energy, and Utilities	12952	19.80	39.78
Business Equipment, Telephone and Television Transmission	18873	28.85	68.63
Healthcare, Medical Equipment, and Drugs	11979	18.31	86.94
Others -- Mines, Construction, Building Material, Trans, Hotels, Bus Serv, Entertainment, Finance	8545	13.06	100.00
<b>Total</b>	<b>65420</b>	<b>100.00</b>	

The primary focus was investigating product market threats' impact on the firm's bankruptcy risk, as represented by Model 1:

$$\text{Model 1: } Zscore = \alpha + \beta_1 \text{PMT changes} + \beta_{2-5} \text{Controls} + FE + \varepsilon$$

The dependent variable, the firm's bankruptcy risk, was measured using Altman's Z-score. This measurement is widely used as a proxy for bankruptcy (default) risk (Cho et al. 2021; Gopalakrishnan and Mohapatra 2020; Kabir et al. 2021). Altman's Z-score comprises five elements: working capital/total assets, retained earnings/total assets, earnings before interest and tax (EBIT)/total assets, market value equity/total liabilities, and sales/total assets.

The main testing variable—product market threats—was measured by product market fluidity, which is a text-based measurement developed by Hoberg, Phillips, and Prabhala (2014). Hoberg, Phillips, and Prabhala (2014) identified the words used in the focal firm's business description in the 10-K and the change in the words used by the competitor companies. The threat rises if the rival firm's business description tends to be increasingly similar to the focal firm (higher product fluidity). That is, if the words used in the rival firm's description overlaps with the focal firm's, it indicates that the latter is threatened by the former. Product fluidity should be distinguished from the market concentration-based competition measurement—the Herfindahl–Hirschman index (HHI). Product market fluidity captures the similarity in business descriptions and is raised by the competitor, since it captures the changes in the rival's business description. However, the HHI captures the market concentration, which is not related to the competitors' behavior. Hence, this research should be distinguished from the study that uses the market concentration based HHI.

Since existing literature has documented the competitive shock effect (Platt 2020; Valta 2012), a larger shock indicates that the change in product market threats is high. Hence, the main model utilizes the change rate—rather than the level—of product market threats. A higher change in product market threats indicates that the threat from the rival is higher, since the rival's business becomes more similar to the focal firm's business. Further, the product market threats' level was employed in the robustness tests as well as in the additional tests.

Table 4 presents the summary statistics of the key variables of the full sample. The statistics based on the full sample is comparable with the existing literature. Table 5 presents the correlations among the key proxies.

**Table 4.** Summary statistics.

	N	Mean	Std. Dev.	p25	Median	p75
Z-score	65420	3.737	8.876	1.307	3.013	5.36
PMT	65420	6.872	3.595	4.181	6.126	8.86
Total assets (at)	65420	2585.748	7354.732	72.175	316.428	1470.903
Total liabilities/ Total assets (leverage)	65420	.503	.309	.279	.472	.657
Earnings/Total assets (ROA)	65420	-.111	.387	-.116	.019	.067
Book to market	65420	.676	.363	.404	.637	.885
Operating cash flow	65420	-.01	.277	-.023	.067	.124

Notes: The Z-score is calculated following Altman's model,  $Z\text{-score} = 1.2*(wcap/at)+1.4*(re/at)+3.3*(ebit/at)+0.6*(csho*prcc\_f/lt)+(sale/at)$  (where *wcap* is the working capital, *at* is the total assets, *re* is the retained earnings, *ebit* is the earnings before interest and tax, *csho* is the number of the common share outstanding, *prcc\_f* is the stock price at the end of the fiscal year, and *lt* is the total liabilities). PMT is the product market fluidity from the Hoberg-Phillips data library. Leverage is the total liabilities divided by the total assets. ROA is the return on assets, which is calculated by dividing the income before the extraordinary items scaled by the total assets. Book to market is the book to market ratio, calculated by dividing the total assets by the sum of the total liabilities and market value ( $lt+prcc\_f*csho$ ). Operating cash flow is the operating cash flow scaled by the total assets.

**Table 5.** Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Z-score	1.000						
(2) PMT	-0.017	1.000					
(3) Leverage	-0.501	-0.052	1.000				
(4) ROA	0.435	-0.312	-0.206	1.000			
(5) Book to market	-0.230	-0.171	-0.066	0.086	1.000		
(6) lnta	0.111	-0.113	0.167	0.458	0.007	1.000	
(7) Operating cash flow	0.387	-0.329	-0.101	0.844	0.104	0.475	1.000

Notes: The Z-score is calculated following Altman's model,  $Z\text{-score} = 1.2*(wcap/at)+1.4*(re/at)+3.3*(ebit/at)+0.6*(csho*prcc\_f/lt)+(sale/at)$  (where *wcap* is the working capital, *at* is the total assets, *re* is the retained earnings, *ebit* is the earnings before interest and tax, *csho* is the number of the common share outstanding, *prcc\_f* is the stock price at the end of the fiscal year, and *lt* is the total liabilities). PMT is the product market fluidity from the Hoberg-Phillips data library. Leverage is the total liabilities divided by the total assets. ROA is the return on assets, which is calculated by dividing the income before the extraordinary items, scaled by the total assets. Book to market is the book to market ratio, which is calculated by dividing the total assets by the sum of the total liabilities and market value ( $lt+prcc\_f*csho$ ). Operating cash flow is the operating cash flow scaled by the total assets.

## IV. Empirical results

### *Main analysis: Product market threats' heterogenous effect on the firm's bankruptcy risk*

This section presents the empirical results of product market threats' heterogenous effect on the firm's default risk. Model 1 was tested in the full sample as well as in the strong, non-strong, and weak firm sub-samples. According to the heterogenous effect hypothesis, it was expected that the product market threat's coefficients would differ in different sample settings. A firm was defined

as strong if its previous three years' product market threats and current net income were higher than the industry median; otherwise, it was categorized as a non-strong firm; that is, if the firm survived drastic competition in the past three years and still can earn a higher income than the industry level, it indicates that the firm has learned from past competition and can now benefit from current competition.

A firm having low managerial abilities and weak financial conditions (Z-score below 1.8)—and facing sharp threats precipitating predation risk from the rival—was classified as weak. Hence, a firm exhibiting product market threat changes above 20%, low managerial ability, and a Z-score lower than 1.8 was defined as weak. Product market threats greater than 20% indicated that the firm was significantly challenged by the rival. A firm with a managerial ability score lower than the industry median was considered to exhibit low managerial ability. The managerial ability score was developed by Demerjian, Lev, and McVay (2012); the relevant data is available in the Peter Demerjian data library. Theoretically, 1.8 is the critical value for a Z-score. If the Z-score is lower than 1.8, the firm is considered as advancing toward bankruptcy. Table 6 presents the summary statistics of different groups.

**Table 6.** Summary statistics of the subsample.

	Strong firm			Non strong firm			Weak firm		
	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.
Z-score	9431	5.7785	8.8797	55989	3.3929	8.8292	3819	-1.5909	5.8121
PMT	9431	8.3951	3.3851	55989	6.6157	3.5652	3819	8.2229	3.8037
Total asset (at)	9431	4929.483	10508.156	55989	2190.9608	6597.3038	3819	2213.1499	6280.722
Total liabilities/ Total asset (leverage)	9431	.4711	.275	55989	.5086	.3137	3819	.7036	.339
Earnings/ Total asset (ROA)	9431	.0274	.2539	55989	-.1339	.4004	3819	-.3174	.5273
Book to market	9431	.5704	.2905	55989	.6935	.3707	3819	.8694	.3946
Operating cash flow	9431	.0711	.2215	55989	-.0231	.2832	3819	-.1115	.3261

Table 7 presents the cross-section regression results of Model 1. In the full sample, the change in product market threats is significant and positively associated with the Z-score. The coefficient is 0.314 and significant at the 1% level. In the strong firm group, the product market threats change is significantly positively associated with the Z-score. The coefficient is 0.412 and significant at the 5% level. In the non-strong firm group, the change in the product market threats is significantly positively associated with the Z-score. The coefficient is 0.259 and significant at the 1% level. When comparing the coefficients of the strong and non-strong groups, the magnitude drops from strong to non-strong firms (i.e., from 0.412 to 0.259). The positive coefficient of product market threat changes and the Z-score indicates that threats from rivals improve the firm's financial conditions, since a higher Z-score implies healthier financial conditions and lower bankruptcy risk. The difference in coefficients in the different sub-samples indicates that a strong firm benefits more from market competition compared to a non-strong firm. In particular, in the weak firm sample, the change in the product market threat is significantly negatively associated with the Z-score. The coefficient is -0.811 and significant at the 5% level. The empirical results reveal that product market threats increase bankruptcy risk (reduce the Z-score) if the firm is weak.

The product market threats' inconsistent coefficients among different sub-samples indicate that product market threats exhibit different impacts on the firm's bankruptcy risk. The product market

threat is an opportunity for the firm if it is strong, since the results show that product market threats improve the Z-score. However, the threat is a challenge if the firm is weak, since the results show that the competition raised by the rival reduces the focal firm's Z-score. This inconsistency in the coefficients supports the hypothesis that the product market threat is an opportunity or challenge depending on the firm's competitive conditions.

**Table 7.** Product market threats and Z-score sub-sample regression comparison.

VARIABLES	DV: Zscore			
	(1)	(2)	(3)	(4)
	Full	Strong firm	Non-strong firm	Weak firm
PMT changes	0.3138*** (0.0648)	0.4117** (0.2012)	0.2590*** (0.0695)	-0.8113** (0.4020)
ROA	2.2221*** (0.2490)	9.4968*** (1.5524)	2.1800*** (0.2574)	2.1251*** (0.6793)
Operating cash flow	7.7622*** (0.4000)	3.8155** (1.7020)	7.6422*** (0.4053)	7.5541*** (1.2785)
Leverage	-12.4885*** (0.3286)	-13.0590*** (0.8828)	-12.4178*** (0.3408)	-3.9660*** (0.8067)
Inta	1.6562*** (0.1351)	0.0856 (0.2478)	1.8122*** (0.1478)	3.0068*** (0.4187)
Book to market	-7.3008*** (0.2108)	-8.6580*** (0.5291)	-7.1065*** (0.2225)	-1.9987*** (0.7140)
Constant	7.6056*** (0.7334)	16.0865*** (1.6478)	6.8258*** (0.7869)	-11.1854*** (2.5826)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	56,877	8,236	48,641	2,165
R-squared	0.440	0.415	0.446	0.565
Number of firms	7,155	2,217	6,933	1,496

*Notes:* Strong-firm: If the firm's product fluidity (product market threats) has been higher than the industry median in the past three years and the current net income is higher than the industry median net income, it is defined as a strong firm; otherwise, it is a non-strong firm. Weak-firm: If the firm's product fluidity (product-market threats) has increased over 20%, the firm's management suffers from low managerial ability, and the Z-score is lower than 1.8, it is defined as a weak firm. High/Low managerial ability: If the firm's MA score is higher than the industry-year median, it identifies as part of a high-ability group. If the firm's MA score is less than the industry-year median, it identifies as part of a low-ability group. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

Table 8 shows the impact of managerial ability. As mentioned earlier, a weak firm's definition entails that the firm must satisfy three conditions: an increase of over 20% in product market threats, low managerial ability, and unhealthy financial conditions (Z-score lower than 1.8). By contrast, the generated sample included firms facing over a 20% increase in product market threats and unhealthy financial conditions (Z-score lower than 1.8), but managerial ability was higher than the industry median. This allowed the investigation of managerial ability's importance in determining a firm's strength.

Table 8 presents the empirical evidence of managerial ability's importance. In the high managerial ability sub-sample, the coefficient is insignificant; however, in the low group, it is negative and significant. These results indicate that managerial ability becomes critical in a firm with weak financial conditions, especially when it is under high competition pressure. High

managerial ability could help eliminate product market threats' negative impact on a firm's default risk. This indicates that the management team's ability is an important component of a firm's competitive advantage.

**Table 8.** Product market threats and Z-score sub-sample regression comparison (managerial ability's impact).

	DV: Zscore	
	(1)	(2)
VARIABLES	High MA	Low MA
PMT changes	1.1043 (1.0620)	-0.8113** (0.4020)
Constant	-19.1814*** (3.5085)	-11.1854*** (2.5826)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	1,211	2,165
R-squared	0.603	0.565
Number of firms	970	1,496

Notes: The firm's product fluidity (product-market threats) increases over 20% and with a Z-score lower than 1.8. High/Low managerial ability: If the firm's MA score is higher than the industry-year median, it identifies as part of a high-ability group. However, if the firm's MA score is less than the industry-year median, it identifies as part of a low-ability group. Robust standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

**Table 9.** Quantile regression results.

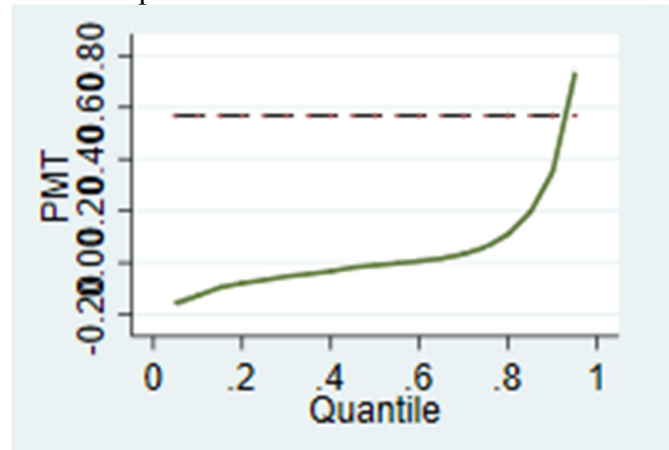
Dependent: Z-score

	DV: Zscore			
	(1)	(2)	(3)	(4)
VARIABLES	25%	50%	75%	85%
PMT	-0.0691*** (0.0040)	-0.0160** (0.0073)	0.0566*** (0.0136)	0.1935*** (0.0190)
ROA	6.8884*** (0.4376)	6.9272*** (0.3667)	3.7443*** (0.3634)	2.9415*** (0.5301)
Operating cash flow	7.0454*** (1.0036)	4.2380*** (0.7018)	4.5803*** (0.9298)	3.6493*** (1.0055)
Leverage	-8.0516*** (0.1537)	-8.7225*** (0.2322)	-9.0338*** (0.2152)	-9.6081*** (0.9783)
Inta	0.0557*** (0.0068)	-0.0801*** (0.0174)	-0.2539*** (0.0286)	-0.4737*** (0.0344)
Book to market	-2.9976*** (0.0446)	-3.6820*** (0.0497)	-4.9524*** (0.0838)	-6.1654*** (0.1897)
Constant	8.9990*** (0.0738)	11.9358*** (0.1157)	15.6543*** (0.2643)	19.0808*** (0.7318)
Year FE	Yes	Yes	Yes	Yes
Observations	65,420	65,420	65,420	65,420
R-squared	0.538	0.537	0.538	0.538

Notes: Robust standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

For the robustness check, the same model was applied; however, quantile regression was used, and the PMT change was replaced with the PMT level. Table 9 shows that the coefficient of product market threats switches from negatively significant in the lower quantile to positively significant in the higher one. Figure 1 shows the product market threats' coefficients in different quantiles. The continuous line describes the coefficients in the quantile regression, and the dotted line describes the OLS regression's coefficient. The figure reveals that the relationship between product market threats and bankruptcy risk is non-linear. The results indicate that product market threats increase bankruptcy risk (reduce the Z-score) at a lower quantile Z-score (the firm with weak financial conditions) and reduce it (increase the Z-score) at a higher quantile Z-score (the firm with relatively stronger financial conditions). The quantile regression results are consistent with the sub-sample tests and further support the hypothesis that product market threats increase bankruptcy risk in a weak firm but reduce it in a strong firm.

**Figure 1.** Coefficients of product market threats in different quantities.



### ***Endogeneity test***

#### *Two-Stage least squares (2-SLS)*

To address the endogeneity concern, the tariff and industry average product market threats were used as instruments to run the 2-SLS regression. Following previous studies (Boubaker, Dang, and Sassi 2022; Li and Zhan 2019; Mattei and Platikanova 2017), tariff reduction was used as an exogenous instrument. A decline in import tariffs—an important fraction of trade costs (Anderson and van Wincoop 2004)—lowers trade barriers and intensifies foreign competition (Tybout 2001). Tariff reduction increases competition in the product market from foreign competitors. Hence, tariff reduction is an exogenous shock to a domestic firm's competition strategy. The industry level tariff data is obtained from Schott's International Economics Resource Page. Mattei and Platikanova (2017) defined large tariff reduction events as industry-year observations, wherein the decrease in tariff rates exceeds three times the industry mean tariff reduction and excludes the reductions followed by large increases, which exhibit a reduction less than 1%. Moreover, industry average product market threats were used as an additional instrument because the firm's competitive pressure tends to be high if a firm is in a more competitive industry.

Table 10 presents the results of 2-SLS. The results in Column 2 reveal that product market threats improve the firm's financial condition if it is strong; those in Column 6 reveal that the product market threats increase the firm's bankruptcy risk if it is weak. These results are consistent with those presented in Table 7.

**Table 10.** 2-SLS.

	DV: Z-score					
	Strong firm		Non strong firm		Weak firm	
	(1)	(2)	(3)	(4)	(5)	(6)
	First stage	Second stage	First stage	Second stage	First stage	Second stage
PMT changes		1.043*		0.564**		-3.525**
		(0.543)		(0.240)		(1.424)
Tariff reduction	-0.003		-0.007*		-0.036	
	(0.007)		(0.004)		(0.023)	
Industry PMT changes	0.957***		0.975***		0.394***	
	(0.015)		(0.009)		(0.035)	
ROA	0.030	7.858***	-0.003	4.561***	-0.016	3.908***
	(0.022)	(0.759)	(0.008)	(0.208)	(0.028)	(0.458)
Operating cash flow	-0.047*	7.413***	0.008	7.161***	0.159***	8.627***
	(0.026)	(0.890)	(0.011)	(0.274)	(0.044)	(0.781)
Leverage	-0.006	-16.725***	-0.008	-13.616***	0.070**	-2.609***
	(0.013)	(0.449)	(0.006)	(0.142)	(0.030)	(0.484)
Inta	0.001	-0.163***	0.004***	0.052**	0.000	0.436***
	(0.002)	(0.062)	(0.001)	(0.023)	(0.005)	(0.086)
Book to market	-0.015	-10.399***	-0.012***	-7.776***	0.043	0.794*
	(0.011)	(0.372)	(0.005)	(0.118)	(0.029)	(0.469)
Constant	-0.036***	19.167***	0.001	15.817***	0.356***	0.504
	(0.012)	(0.412)	(0.007)	(0.167)	(0.049)	(0.944)
Observations	3,858	3,858	23,876	23,876	973	973
R-squared	0.506	0.544	0.328	0.514	0.170	0.569

Notes: Strong-firm: If the firm's product fluidity (product market threats) has been higher than the industry median in the past three years and the current net income is higher than the industry median net income, it identifies as a strong firm; otherwise, it identifies as a non-strong firm. Weak-firm: If the firm's product fluidity (product market threats) increases over 20%, with low managerial ability and a Z-score lower than 1.8, it identifies as a weak firm. Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

### *Two-stage quantile regressions*

To confirm the robustness tests' results, the same instruments were used; following Kaplan and Sun (2017), a two-stage quantile regression was applied. The results presented in Table 11 are consistent with those presented in Table 9. The product market threat's coefficient changes from negatively significant to positively significant, and from low quantile to high quantile, which confirms that product market threats are both an opportunity and a challenge—depending on the firm's financial conditions.

**Table 11.** Two-stage quantile regression.

	<b>DV: Zscore</b>			
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<b>VARIABLES</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>85%</b>
PMT	-0.1218*** (0.0118)	-0.0703*** (0.0237)	0.0398 (0.0395)	0.1903*** (0.0587)
ROA	6.4935*** (0.6298)	5.9449*** (0.7533)	4.6874*** (1.6260)	2.6554 (2.5891)
Operating cash flow	6.6721*** (0.5790)	4.0906*** (1.0352)	3.4928*** (0.8817)	3.8497** (1.7796)
Leverage	-8.5122*** (0.4995)	-9.6709*** (0.4701)	-10.9119*** (1.2024)	-11.4742*** (1.0501)
Inta	0.0095 (0.0122)	-0.0893*** (0.0160)	-0.3436*** (0.0223)	-0.5682*** (0.0328)
Book to market	-3.4465*** (0.1111)	-4.2221*** (0.1191)	-5.7248*** (0.3093)	-7.2641*** (0.2412)
Constant	9.4018*** (0.2432)	12.1258*** (0.1883)	16.8379*** (1.0800)	20.5477*** (0.9048)
Year FE	Yes	Yes	Yes	Yes
Observations	31,805	31,805	31,805	31,805

Notes: Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

### ***Product market threats' heterogenous effect on the firm's employment, R&D, and new investment***

Table 12 tested product market threats' impact on a firm's employment growth, R&D activities, and new investment in both a strong and weak firm. The results in Columns 1 and 2 suggest that market threats reduce employment growth in weak firms but exhibit no impact on strong firms. Moreover, the results in Columns 3 and 4 show that market threats reduce R&D expenditure if the firm is weak but exhibit no impact on strong firms. Furthermore, the results in Columns 5 and 6 reveal that both strong and weak firms reduce new investment when product market threats are high; however, the weaker firm is more impacted by product market threats.

In sum, a strong firm is not impacted by product market threats concerning employment growth and innovation activities; by contrast, a weak firm reduces its employment growth and innovation activities when the product market threat is high. Both strong and weak firms reduce new investments when the competitive pressure is high; however, the weak firm is more negatively impacted by the product market threat. New investments as well as investment in labor and innovation are important to a firm's future cash flow. Under- investment causes a firm to lose growth opportunities, which may impact the firm's bankruptcy risk.



**Table 12.** Product market threats' heterogeneous effect on the firm's employment, R&D, and new investment.

VARIABLES	Employment growth		R&D		New investment	
	(1)	(2)	(3)	(4)	(5)	(6)
	Strong firm	Weak firm	Strong firm	Weak firm	Strong firm	Weak firm
PMT	-0.0019 (0.0020)	-0.0104* (0.0057)	0.0002 (0.0004)	-0.0019* (0.0010)	-0.0019* (0.0010)	-0.0071*** (0.0025)
ROA	0.0476 (0.0632)	0.0859 (0.0571)	-0.1196*** (0.0256)	-0.0155 (0.0130)	-0.1095*** (0.0344)	0.0496** (0.0246)
Operating cash flow	-0.1196* (0.0683)	0.0883 (0.1705)	-0.0822*** (0.0233)	-0.1711*** (0.0357)	-0.1381*** (0.0324)	-0.1426*** (0.0489)
Leverage	-0.0009 (0.0299)	-0.1546** (0.0677)	0.0260*** (0.0099)	-0.0181 (0.0165)	0.0655*** (0.0188)	-0.0839*** (0.0307)
Inta	0.0898*** (0.0103)	0.0660** (0.0305)	-0.0196*** (0.0025)	-0.0136*** (0.0039)	0.0080* (0.0047)	-0.0040 (0.0107)
Book to market	-0.1485*** (0.0257)	-0.1674*** (0.0597)	-0.0162*** (0.0056)	-0.0125 (0.0094)	-0.0255** (0.0118)	-0.0996*** (0.0229)
Sales growth	0.1227*** (0.0181)	0.1614*** (0.0319)	-0.0041 (0.0031)	-0.0029 (0.0043)	0.0106** (0.0050)	0.0037 (0.0080)
Constant	-0.4001*** (0.0722)	-0.0260 (0.2019)	0.1924*** (0.0167)	0.1546*** (0.0315)	0.0655** (0.0304)	0.3316*** (0.0632)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,953	2,113	8,963	3,771	6,634	2,696
R-squared	0.1222	0.2547	0.2801	0.2693	0.0863	0.1433
Number of firms	2,088	1,459	2,581	2,528	2,188	1,988

Notes: Strong-firm: If the firm's product fluidity (product market threats) is higher than the industry median in the past three years and the current net income is higher than the industry median net income, it identifies it as a strong firm. Weak-firm: If the firm's product fluidity (product market threats) has increased over 20%, with low managerial ability and a Z-score lower than 1.8, it identifies as a weak firm. Employment growth: Percentage change in the number of employees. R&D: R&D expenditures scaled by total assets. New investment: Following Richardson (2006), new investment=(R&D expenditures + capital expenditures + acquisitions – Sale of PPE-depreciation and amortization)/at. Robust standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

### *Non-linear relationship between product market threats changes and Tobin's Q*

Table 13 presents the results of product market threats' impact on the firm's performance. The results clearly demonstrate that since strong firms are less negatively impacted by product market threats, it is expected that a relatively stronger firm benefits from competition in the firm's performance, whereas a weaker firm loses out.

The results in Table 13 reveal that product market threats significantly positively impact the firm's performance; however, the strong firm benefits more from competition compared to non-strong firms. Moreover, product market threats significantly negatively impact the weak firm's performance. Considering the sub-sample results together, we can see that product market threats impact firms' performances differently. The strong firm benefits more from competition, but product market threats decrease the weak firm's performance. The last Column in Table 13 shows the non-linear term's results. Notably, the product market threat's non-linear term is negatively

significant. These results confirm the non-linear relationship between product market threats and the firm's performance.

**Table 13.** Product market threats and Tobin's Q.

Dependent variable: Tobin's Q

VARIABLES	(1) Full	(2) Strong firm	(3) Non-strong firm	(4) Weak firm	(5) Full
PMT	0.0170*** (0.0052)	0.0264** (0.0107)	0.0134** (0.0057)	-0.0175* (0.0096)	0.0590*** (0.0120)
PMT square					-0.0024*** (0.0007)
ROA	-0.1280** (0.0537)	-0.4736 (0.3978)	-0.1229** (0.0546)	-0.2530* (0.1499)	-0.1299** (0.0537)
Operating cash flow	0.3743*** (0.0920)	1.4713*** (0.3449)	0.2495*** (0.0954)	-0.4318 (0.2686)	0.3741*** (0.0920)
Leverage	0.4181*** (0.0602)	0.7167*** (0.2006)	0.4186*** (0.0618)	0.9147*** (0.1676)	0.4181*** (0.0601)
Lnta	-0.4292*** (0.0238)	-0.7191*** (0.0567)	-0.4109*** (0.0257)	-0.2378*** (0.0475)	-0.4295*** (0.0238)
Constant	4.4981*** (0.1439)	6.8315*** (0.3696)	4.3156*** (0.1515)	2.2178*** (0.2918)	4.3486*** (0.1505)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	65,420	9,431	55,989	3,819	65,420
R-squared	0.0828	0.1710	0.0800	0.2262	0.0832
Number of firms	8,168	2,857	7,864	2,564	8,168

*Notes:* Strong-firm: If the firm's product fluidity (product market threats) is higher than the industry median in the past three years and the current net income is higher than the industry median net income, it identifies as a strong firm; otherwise, it identifies as a non-strong firm. Weak-firm: If the firm's product fluidity (product market threats) has increased over 20%, with low managerial ability and a Z-score lower than 1.8, it identifies as a weak firm. High/Low managerial ability: If the firm's MA score is higher than the industry-year median, it identifies as part of a high-ability group. If the firm's MA score is less than the industry-year median, it identifies as part of a low-ability group. Robust standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.

## V. Conclusion

This study investigated product market threats' heterogeneous effect on a firm's bankruptcy risk. This study's main contribution is identifying these effects and illustrating the importance of the firm's own financial conditions and managerial ability in facing competition.

The empirical results confirm the hypothesis that product market threats (a) increase bankruptcy risk in competitively weak firms but (b) reduce it in firms that are competitively strong. The main results indicate that product market threats can be a challenge as well as an opportunity for the focal firm. If the firm is financially weak and the managerial ability is low, market threats become a challenge. However, a financially strong firm with a competitive advantage would benefit more from the market competition. Moreover, additional tests' results reveal that managerial ability could help eliminate product market threats' negative effects on the firm's bankruptcy risk. The results further reveal how product market threats impact the firm's

bankruptcy risk—in terms of reducing employment growth and R&D expenditures in weak firms—but exhibit no impact on strong firms. Both strong and weak firms reduce their investments, but weak firms are more negatively impacted. Moreover, the empirical results show a non-linear relationship between product market threats and the firm’s performance. Product market threats hurt or improve the firm’s performance depending on whether the firm is weak or strong, respectively. These findings aid operations management in firms facing threats from rivals by turning these threats around and converting them into opportunities, which will not only prevent bankruptcy in such firms but also make them financially stronger.

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## Appendix: Product market threats' impact on the leverage ratio

The previously conducted tests focused on product market threats' impact on a firm's bankruptcy risk and performance. Further, its impact on the firm's capital structure was investigated. Next, market threats' impact on the firm's leverage is tested: Here, *PMT* refers to the level of product market threats. Using the Arellano-Bover bound GMM method, the following dynamic model was estimated:

$$\text{Model 2: } leverage_t = \alpha + \beta_1 leverage_{t-1} + \beta_2 PMT_t + \beta_{3-7} Controls_t + FE + \varepsilon$$

Model 2 was separately tested in the full sample, financially distressed sub-sample, and non-financially distressed sub-sample. If a firm has negative net income, it is defined as a financially distressed firm; otherwise, it is defined as a non-distressed firm. Table 14 presents the empirical results. Overall, product market threats increase debt usage, but in financially distressed samples, product market threats' coefficient is not significant, which indicates that for a financially distressed firm, product market threats exhibit no impact on the firm's capital structure. However, in the non-financially distressed sub-sample, the product market threats level is positively significant and increases the firm's leverage. Product market threats' coefficient is 0.0019 and significant at the 1% level. Considering the findings in the previous tests, product market threats may hurt the firm's performance if the firm is weak. For financially distressed firms, increasing the leverage becomes risky because doing so may magnify the potential loss. However, non-distressed firms can benefit more from the competition, as their competitive advantage encourages them to increase their leverage to magnify the potential benefits.

**Table 14.** Product market threats' impact on the leverage.

	(1)	(2)	(3)
VARIABLES	Full	NI<0	NI>0
PMT	0.0008*	-0.0005	0.0019***
	(0.0004)	(0.0008)	(0.0004)
L.Leverage	0.5758***	0.5713***	0.6124***
	(0.0058)	(0.0086)	(0.0070)
Inta	0.0449***	0.0062	0.0470***
	(0.0019)	(0.0040)	(0.0018)
ROA	-0.2935***	-0.2519***	-0.4823***
	(0.0040)	(0.0059)	(0.0060)
Book to market	-0.1340***	-0.1436***	-0.1179***
	(0.0034)	(0.0057)	(0.0038)
Operating cash flow	0.0930***	0.1190***	0.0691***
	(0.0062)	(0.0093)	(0.0082)
z-score	-0.0122***	-0.0121***	-0.0116***
	(0.0002)	(0.0002)	(0.0002)
Constant	0.0584***	0.2915***	0.0183
	(0.0130)	(0.0222)	(0.0133)
Observations	56,643	23,172	33,471
Number of firms	7,109	5,711	4,765

Notes: Robust standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1.