Product Market Competition and Firm Trade Credit

Cathy Xuying Cao*
Albers School of Business and Economics
Seattle University
901 12th Avenue, Seattle, WA, 98122
caoc@seattleu.edu

Chongyang Chen
University of Washington Tacoma
1900 Commerce St.
Tacoma, WA 98402
chenc99@uw.edu

Abstract

This paper explores the impact of product market competition on firms' use of trade credit, leveraging large U.S. import tariff reductions as a quasi-natural experiment to capture exogenous shifts in competitive pressure. We find that, at the aggregate level, firms in industries affected by significant tariff reductions reduce their use of trade credit compared to firms in unaffected industries. Further analysis reveals that this negative association is primarily driven by financially constrained firms. Specifically, we show that for financially unconstrained firms, an increase in competition leads to a greater reliance on trade credit, likely driven by the need to preserve liquidity for competitive strategies. In contrast, financially constrained firms decrease their use of trade credit in response to heightened competition. These results are consistent with the dual motives for trade credit use—namely, the incentive motive and the liquidation motive—outlined by Fabbri and Menichini (2010), highlighting the complex interplay between competition and financial constraints in shaping trade credit behavior. Our findings contribute to the growing literature on the relationship between product market dynamics, financial constraints, and firms' financing decisions.

Keywords: trade credit, product market competition, financial constraint

* Corresponding author
Cathy Xuying Cao*
Albers School of Business and Economics
Seattle University
901 12th Avenue, Seattle, WA, 98122
Tel: (206)296-5712
caoc@seattleu.edu

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Abstract

This paper explores the impact of product market competition on firms' use of trade credit, leveraging large U.S. import tariff reductions as a quasi-natural experiment to capture exogenous shifts in competitive pressure. We find that, at the aggregate level, firms in industries affected by significant tariff reductions reduce their use of trade credit compared to firms in unaffected industries. Further analysis reveals that this negative association is primarily driven by financially constrained firms. Specifically, we show that for financially unconstrained firms, an increase in competition leads to a greater reliance on trade credit, likely driven by the need to preserve liquidity for competitive strategies. In contrast, financially constrained firms decrease their use of trade credit in response to heightened competition. These results are consistent with the dual motives for trade credit use—namely, the incentive motive and the liquidation motive—outlined by Fabbri and Menichini (2010), highlighting the complex interplay between competition and financial constraints in shaping trade credit behavior. Our findings contribute to the growing literature on the relationship between product market dynamics, financial constraints, and firms' financing decisions.

I. Introduction

Trade credit is a major source of short-term financing for U.S. firms, accounting for over 50% of short-term liabilities for non-financial, non-utility firms on average. Despite its significance, trade credit has received less attention in academic literature compared to other sources of financing, such as bank loans or public debt. This paper expands the existing research by exploring the influence of product market competition on firms' use of trade credit.

Several key theoretical reasons explain why product market competition impacts trade credit practices. First, product market competition influences a firm's financial decisions (Phillips, 1995; Campello, 2003; MacKay and Phillips, 2005). Since trade credit is an essential alternative financing source, firms strategically adjust their trade credit usage to remain competitive within their industries. Second, heightened competition increases the cost of bank debt (Valta, 2012), prompting firms to rely more on trade credit when access to bank financing becomes constrained or expensive (Garcia-Appendini and Montoriol-Garriga, 2013). Third, firms may need to conserve cash to pursue aggressive competitive strategies during periods of intensified competition (Bolton and Scharfstein, 1990; Fresard, 2010). Financially constrained firms, in particular, may rely more on trade credit to preserve liquidity. This paper empirically investigates the link between exogenous product market shocks, specifically tariff reductions, and changes in firms' trade credit behavior.

We exploit a quasi-natural experiment in the form of large U.S. import tariff reductions between 1974 and 2005. These reductions, which resulted in an average tariff rate decrease of 50%, provide sharp exogenous shifts in the competitive pressure faced by

firms in affected industries. This competition shock enables us to estimate the causal impact of increased competitive threat on trade credit usage.

Our methodology utilizes a difference-in-differences design, comparing the trade credit usage of firms in industries affected by tariff cuts to that of firms in unaffected industries. We find that, on average, firms in tariff-reduction-affected industries significantly reduce their use of trade credit, highlighting the relationship between increased competition and changes in trade credit behavior. Additionally, we find that firms with higher short-term leverage are more likely to utilize trade credit, reinforcing the importance of firm-specific characteristics in determining trade credit use.

To deepen our understanding of these findings, we explore whether the impact of product market competition on trade credit differs between financially constrained and unconstrained firms. Although both types of firms use trade credit, they do so for different reasons. Fabbri and Menichini (2010) propose two motivations for firms to use trade credit: the incentive motive and the liquidation motive. Financially constrained firms rely on trade credit for both of these motives, while unconstrained firms primarily use trade credit for the liquidation motive. When faced with an unexpected increase in competition, whether a firm increases or decreases its reliance on trade credit depends on the relative importance of these motives. For financially constrained firms, the incentive motive may drive an increase in trade credit usage to preserve cash, while for unconstrained firms, the liquidation motive becomes more relevant.

Our analysis shows that financially constrained firms in unaffected industries use more trade credit than unconstrained firms. In contrast, unconstrained firms in affected industries increase their use of trade credit in response to heightened competition, as they

seek to preserve liquidity to fund competitive strategies. For financially constrained firms, however, the relationship between increased competition and trade credit use is negative. This is because the increase in competition heightens business risks, reduces the liquidation value of assets, and limits access to trade credit, particularly for constrained firms. These findings support the idea that the liquidation motive plays a key role in determining trade credit behavior in the face of increased competition.

We perform several robustness checks to confirm the reliability of our results. These include using alternative definitions of financial constraints, excluding potentially problematic observations in 1988 and 1989 due to changes in the import data coding methodology, and using a matched sample to control for firm-level characteristics. In all cases, our findings remain consistent, further validating the relationship between product market competition, financial constraints, and trade credit usage.

This paper makes significant contributions to the literature on trade credit. First, it demonstrates a clear link between product market competition and trade credit, an area that has not been extensively explored in prior research. While previous studies have focused on firm-level characteristics, such as size and profitability, in determining trade credit use (Petersen and Rajan, 1995), this paper highlights the importance of industry-level factors, specifically competition intensity. Second, this study contributes to the growing literature on financial constraints and alternative sources of financing by exploring how the interaction between competition and financial constraints shapes trade credit behavior. Finally, the paper sheds light on the broader dynamics between competition, financial constraints, and firm financing decisions, showing that product market shocks can have significant effects on a firm's access to trade credit.

Our results have important implications for both firms and policymakers. Firms can use these insights to better navigate competitive pressures and make informed decisions about financing in response to changes in the competitive landscape. For policymakers, this research underscores the potential unintended consequences of product market shocks, such as tariff reductions, on firms' financing structures, particularly for those facing financial constraints.

The remainder of the paper is organized as follows. Section II describes the data and methodology. Section III presents the empirical analysis of the impact of product market competition on trade credit use. Section IV provides robustness checks to confirm the reliability of our results. Finally, Section V concludes and outlines avenues for future research. The Appendix provides definitions of the variables used in the analysis.

II. Data and Methodology

A. Data

To investigate how firms manage their trade credit in response to unexpected fluctuations in industry-level product market competition, we exploit significant reductions in import tariffs as potentially exogenous shocks to industry competition. According to existing literature on barriers to trade, substantial reductions in import tariffs typically ease trade restrictions and substantially heighten product market competition (see Tybout (2003) for a survey, and Bernard, Jensen, and Schott (2006)). These tariff reductions provide a useful context for studying how firms might adjust their trade credit practices in response to shifts in competitive pressures.

Specifically, we utilize industry-level import tariff data spanning from 1974 to 2005, as compiled by Feenstra (1996), Feenstra, Romalis, and Schott (2002), and Schott (2010).

For each four-digit Standard Industry Code (SIC) industry and year, we calculate the ad valorem tariff rate, which is the ratio of duties collected by U.S. Customs to the Free-on-Board (FOB) value of imports. Importantly, the variation in tariff rates differs from year to year, presenting an opportunity to capture the effects of substantial tariff reductions on industry competition.

To isolate economically significant fluctuations in tariff rates, we follow the methodology of Fresard (2010) and focus on "large" tariff reductions. Specifically, we define a large reduction as one where the tariff cut in a given year for an industry is at least 2.5 times greater than the median tariff change in that industry across all years. The choice of this threshold is robust: in our sensitivity analysis, we demonstrate that our results hold when we use alternative cutoffs, such as those corresponding to tariff reductions two or three times the median. Furthermore, to ensure that the observed reductions reflect non-transitory changes in competition, we exclude instances where large tariff cuts are followed by equivalent increases in tariff rates within the two subsequent years.

We then turn to the financial and accounting data, which we collect from the Compustat Annual Industrial file (COMPUSTAT) for the period 1974 to 2005. Following Peterson and Rajan (1997), we exclude financial firms (SIC codes 6000 to 6999), utility firms (SIC codes 4900 to 4999), and service firms (SIC codes 7000 to 8999). This exclusion ensures that our analysis is focused on firms operating in the manufacturing and other relevant sectors.

To measure trade credit, we draw upon three commonly used metrics from prior literature. The first measure, Trade Credit 1, is the ratio of accounts payable to sales. The second measure, Trade Credit 2, is the ratio of accounts payable to the cost of goods sold

(COGS). Finally, Trade Credit 3 is defined as the ratio of accounts payable to adjusted purchase cost, where adjusted purchase cost is calculated as COGS adjusted for inventory changes. These measures are commonly used to gauge a firm's reliance on trade credit and are central to our analysis.

In addition, we create a set of control variables that include total assets, Tobin's Q, leverage ratio, the ratio of interest expense to assets, and other relevant financial indicators. We ensure that all variables used in the analysis are non-missing, and apply winsorization to all continuous variables at the 5th and 95th percentiles to mitigate the influence of extreme values. Robustness checks confirm that our results are not sensitive to alternative winsorization thresholds, such as using the 1st and 99th percentiles.

Table 1 provides summary statistics for the sample of firms in industries that experienced large tariff reductions (referred to as "treated firms") compared to those in industries without such reductions (referred to as "control firms"). On average, treated firms exhibit significantly lower levels of trade credit than their control counterparts. For instance, the average ratio of accounts payable to COGS for treated firms is 0.189, whereas for control firms it is 0.586, suggesting that firms in industries facing more intense competition rely on trade credit to a lesser extent when financing their costs of goods sold.

In addition to trade credit differences, we observe several notable differences in firm characteristics between treated and control firms. Treated firms, on average, exhibit lower growth rates, as indicated by lower values for Tobin's Q, sales growth, and investment growth. These firms also have less reliance on external financing, as evidenced by lower leverage, lower interest expenses, and higher fixed charge coverage. Moreover, treated firms tend to be more profitable, with higher return on sales and higher gross profit

margins compared to control firms. These differences in firm fundamentals suggest that it is crucial to control for heterogeneity in firm characteristics when analyzing the relationship between industry-level competition and trade credit management.

To further address potential biases stemming from these differences, we use matching algorithms in the robustness analysis section. This approach ensures that treated and control firms are compared on an equivalent basis, mitigating any confounding effects related to firm-specific characteristics. By controlling for these variables, we aim to more precisely isolate the impact of industry competition on trade credit decisions.

B. Methodology

To investigate the impact of increased product market competition on firms' use of trade credit, we adopt a difference-in-differences (DiD) methodology, a widely used technique for estimating causal effects when random assignment is not feasible. This approach allows us to compare the changes in trade credit usage for firms in industries affected by large tariff reductions (the "treated" firms) against firms in unaffected industries (the "control" firms).

We define treated firms as those located in industries that experience a large reduction in import tariffs during a given year. Control firms are those that operate in industries not affected by tariff reductions in the same period. In addition to the basic DiD framework, we conduct a robustness check using a matched sample of firms. Specifically, we match treated firms with firms that have similar characteristics, such as firm size, Tobin's Q, and cash flows, in the year immediately preceding the tariff reduction. This matching approach allows us to ensure that treated and control firms are comparable on

relevant firm characteristics before the treatment occurs, thereby reducing the potential for selection bias. We estimate the following difference-in-differences regression model:

$$\text{Trade Credit}_{i,k,t} = \alpha + \gamma\, Tariff\ Cut_{k,t} + \beta\, X_{i,k,t} + \eta_t + \rho_k + \varepsilon_{i,k,t} \quad (1)$$

where $\text{Trade Credit}_{i,k,t}$ is the measure of trade credit for firm i in industry k at time t. As discussed previously, we use three distinct trade credit measures: the ratio of accounts payable to sales, the ratio of accounts payable to cost of goods sold, and the ratio of accounts payable to adjusted purchase cost. The variable $Tariff\ Cut_{k,t}$ is a dummy variable that equals 1 if the industry k in year t has experienced a large tariff reduction, which we define as a reduction at least 2.5 times the median change in tariffs for that industry, as outlined in the data section. This variable allows us to capture the effect of the tariff shock on the treated industries. We include $X_{i,k,t}$ as a vector of control variables for firm i in industry k at time t. These control variables include firm size, profitability (measured by return on assets), financial leverage, age of the firm, Tobin's Q (a measure of market valuation), cash flow, and other factors that could influence the use of trade credit. These variables help account for differences in firm characteristics and the potential confounding effects of firm-specific factors on trade credit decisions. η_t represents year fixed effects that capture common shocks or trends that might affect all firms during the period, such as macroeconomic conditions or changes in interest rates. These fixed effects control for factors that influence trade credit usage across all industries in a given year. ρ_k represents industry fixed effects, which control for unobserved, time-invariant characteristics that differ across industries. For example, some industries may inherently rely more on trade credit due to their nature or structure, and industry fixed effects help isolate the impact of

tariff reductions from these baseline differences. $\varepsilon_{i,k,t}$ is the error term that captures any unobserved factors affecting trade credit use at the firm or industry level.

The coefficient γ on the variable $Tariff\ Cut_{k,t}$ represents the difference in the change in trade credit usage between treated firms (those in industries experiencing large tariff reductions) and control firms (those in unaffected industries). If γ is statistically significant, it indicates that the tariff reductions led to a differential change in trade credit usage between the two groups of firms, which would provide evidence that increased product market competition influences firms' reliance on trade credit. A positive γ suggests that treated firms increased their use of trade credit following the tariff reductions, whereas a negative γ suggests a decrease in trade credit usage. The sign and significance of γ is central to the analysis.

To ensure the robustness of our results, we match treated firms to control firms based on key firm characteristics (size, profitability, cash flow, etc.) from the year prior to the tariff reduction. Matching helps control for observable differences between the two groups of firms, reducing the potential for omitted variable bias. We apply nearest-neighbor matching with a caliper to ensure that only firms with similar characteristics are matched. The matched sample allows us to reassess the effect of tariff reductions on trade credit usage while addressing concerns about the comparability of treated and control firms. Additionally, we address potential endogeneity concerns by using the tariff reductions as an exogenous shock to industry competition. We acknowledge, however, that there may be other confounding factors that influence both tariff reductions and firms' decisions about trade credit. For example, firms in industries experiencing high levels of competition may have pre-existing tendencies to adjust their use of trade credit in anticipation of tariff

changes. We mitigate this by using matching techniques and controlling for a wide range of firm-specific and industry-specific characteristics.

III. Empirical Findings

A. Product Market Competition and Firm Trade Credit

In this section, we analyze how changes in industry competition, induced by tariff cuts, affect firms' use of trade credit. To test this, we estimate a baseline difference-in-differences (DiD) regression model, using various measures of trade credit. We include control variables drawn from the literature on trade credit, including firm size, gross margin, sales growth rate, capital expenditure, short-term and long-term leverage, interest expenses, and fixed charge coverage, among others (Petersen and Rajan (1995, 1997), Klapper, Laeven, and Rajan (2012)).

Table 2 presents the coefficient estimates from the baseline regression. The signs of the coefficient estimates for the control variables align with expectations based on existing empirical evidence. Specifically, we find that firms tend to increase their use of trade credit when they are younger, smaller, and have high Tobin's Q (a proxy for firm value), greater capital expenditure, and lower cash flow or profitability (i.e., low returns on sales). These results are consistent with the view that firms with fewer internal resources, such as smaller and less profitable firms, are more likely to rely on trade credit as a source of external financing.

In addition, we observe a positive relationship between trade credit and short-term debt. For all three trade credit measures, the coefficient estimates for short-term debt are consistently positive and statistically significant. This suggests that firms with higher levels of short-term debt are more likely to use trade credit, which is consistent with the notion

that firms with higher short-term liabilities may face liquidity constraints that are alleviated through trade credit.

The key finding from our analysis is that firms operating in industries that experience tariff reductions significantly reduce their use of trade credit. The coefficient on the Tariff Cut variable is negative and statistically significant for all three trade credit measures. For example, in the second model, which measures trade credit as the ratio of accounts payable to cost of goods sold, the coefficient on Tariff Cut is -0.013 with a t-value of 2.04. This suggests that, on average, firms in industries experiencing tariff cuts reduce their use of trade credit by 1.3% relative to firms in unaffected industries. This result implies that trade credit, as an alternative financing source, is not only influenced by a firm's internal financial conditions, but also by the competitive environment in which the firm operates. The negative relationship between tariff cuts and trade credit use is consistent with the view that increased competition may reduce firms' reliance on trade credit as firms may adjust their external financing strategies to adapt to more competitive market conditions (Campello (2003), Mackay and Phillips (2005)).

Taken together, the baseline results provide evidence that product market competition—captured by the tariff reduction shock—has a significant effect on firms' use of trade credit. On an aggregate level, the use of trade credit decreases substantially for firms in tariff-reduction-affected industries compared to those in unaffected industries. To further explore the impact of tariff cuts on trade credit, we next examine whether the effect varies between financially constrained and unconstrained firms.

B. Differential Effect of Financial Constraint on the Relation Between Product Market Competition and Firm Trade Credit

The literature suggests that financially constrained firms may use trade credit differently from their unconstrained counterparts. Several theoretical and empirical studies highlight that the motivations for using trade credit differ between these two groups. According to Fabbri and Menichini (2010), firms with financial constraints use trade credit for both liquidation and incentive motives. The liquidation motive arises when suppliers offer credit to firms with low asset liquidity, while the incentive motive is driven by the desire to maintain a competitive position despite financial difficulties.

When industry competition increases due to tariff reductions, the response of financially constrained firms may differ from that of unconstrained firms, depending on which motive dominates. On the one hand, financially constrained firms may increase their reliance on trade credit to avoid using precious cash reserves for operating activities, as suggested by the incentive motive (Bolton and Scharfstein (1990), Fresard (2010)). On the other hand, the liquidation motive could diminish during periods of heightened competition, as financially constrained firms may face higher business risks, reduced bargaining power, and a lower liquidation value of assets. These factors could limit the supply of trade credit to financially constrained firms.

Furthermore, the relationship between trade credit use and other financing sources may differ across financially constrained and unconstrained firms. For instance, Burkart and Ellingsen (2004) show that trade credit and bank credit are substitutes for unconstrained firms, but complementary for constrained firms. Empirical evidence by Engemann, Eck, and Schnitzer (2014) supports this idea, showing that trade credit and bank credit are generally substitutes, except for financially constrained firms, where they function as complements. Thus, increased competition could lead to an increase or decrease

in trade credit use depending on whether trade credit acts as a substitute or complement for other financing sources.

To explore whether the impact of tariff cuts on trade credit use differs between financially constrained and unconstrained firms, we extend the baseline model (1) by including a dummy variable for financial constraint and an interaction term between financial constraint and tariff cuts. The extended regression model is:

$$\begin{aligned}\text{Trade Credit}_{i,k,t} = {} & \alpha + \gamma\, \textit{Tariff Cut}_{k,t} + \varphi\, \textit{Financial Constraint}_{i,k,t} \\ & + \lambda\, \textit{Tariff Cut}_{k,t} \times \textit{Financial Constraint}_{i,k,t} \\ & + \beta\, X_{i,k,t} + \eta_t + \rho_k + \varepsilon_{i,k,t} \qquad (2)\end{aligned}$$

where the variable $\textit{Financial Constraint}_{i,k,t}$ is a dummy variable that equals one if a firm is financially-constrained and zero otherwise. The rest of the variables are the same as in specification (1). Our main variable of interest is the interaction of two dummy variables: $\textit{Tariff Cut}_{k,t}$ and $\textit{Financial Constraint}_{i,k,t}$. We define equals to Financial Constraint to be one for firms with financial constraints index among the top one third and zero otherwise, where we construct financial constraints index following Hadlock and Pierce (2010). The coefficient of interest is λ, which measures the differential sensitivity of trade credit use to tariff cuts between financially constrained and unconstrained firms.

Table 3 reports the results from these regressions. The coefficient on Financial Constraint is positive and statistically significant in some specifications, suggesting that financially constrained firms tend to use more trade credit relative to unconstrained firms, particularly when industry competition is unchanged. For example, in the regression model where trade credit is measured as accounts payable to sales, the coefficient on Financial

Constraint is 0.013 with a t-value of 1.77, indicating that constrained firms rely more heavily on trade credit.

However, the key findings emerge when examining the interaction between financial constraints and tariff cuts. The results show that the negative effect of tariff reductions on trade credit use is primarily driven by the response of financially constrained firms. Specifically, the coefficient estimates for Tariff Cut in the interaction term are negative and statistically significant across all three trade credit measures. For instance, the coefficient on Tariff Cut in the model with accounts payable to sales is -0.056 with a t-value of -3.08, indicating that financially constrained firms in industries experiencing tariff cuts significantly reduce their use of trade credit compared to constrained firms in unaffected industries.

In contrast, the results show that financially unconstrained firms tend to increase their use of trade credit in response to tariff reductions. For example, the coefficient on Tariff Cut for unconstrained firms is positive and significant in all three specifications. In the model of accounts payable to sales, the coefficient is 0.011 with a t-value of 2.47, suggesting that unconstrained firms use more trade credit when industry competition intensifies, likely as a strategy to preserve cash for competitive purposes.

These findings are consistent with the theoretical predictions that financially constrained firms face greater difficulty in accessing trade credit during periods of heightened competition, due to increased business risk and reduced liquidation value. In contrast, financially unconstrained firms are able to use trade credit more effectively to support their competitive strategies. These results highlight the differential impact of

product market competition on firms' financing decisions, with financially constrained firms being particularly vulnerable to the negative effects of increased competition.

The empirical results provide strong evidence that increased product market competition, as captured by tariff reductions, significantly affects firms' use of trade credit. The baseline analysis reveals a broad reduction in trade credit usage among firms in industries exposed to tariff cuts. However, when examining the role of financial constraints, we find that the effect of product market competition on trade credit use differs between financially constrained and unconstrained firms. Financially constrained firms reduce their reliance on trade credit in response to heightened competition, while unconstrained firms tend to increase their use of trade credit.

These findings contribute to the literature on trade credit by providing insights into how external shocks—such as changes in industry-level competition—affect firm-level financing decisions. Specifically, the results suggest that the availability and use of trade credit are not only influenced by internal factors such as firm size, profitability, and leverage, but also by broader industry-level shocks. The differential responses between constrained and unconstrained firms further highlight the importance of financial constraints in shaping firms' financing strategies in competitive environments.

The study also has important policy implications. For instance, policymakers considering trade policy changes should be aware of the potential consequences for firms' access to trade credit, particularly for those firms that are already financially constrained. Moreover, the results underscore the importance of understanding the interaction between product market competition and financial constraints when evaluating firms' financing decisions.

IV. Alternative Explanations and Robustness Checks

In this section, we provide additional specifications and robustness checks to further validate the robustness of our baseline results. Specifically, we test the impact of product market competition on firms' use of trade credit under alternative measures of financial constraints, account for potential data issues by excluding periods affected by changes in import data methodology, and perform a matching analysis to ensure that our findings are not driven by differences in firm characteristics between treated and control groups.

A. Re-examine the effect of industry competition on trade credit using alternative measure of financial constraint

It is possible that our results are sensitive to the specific measure of financial constraints used in the baseline analysis. To address this concern, we test the robustness of our findings by employing an alternative measure of a firm's access to external financing: credit rating. Specifically, we define a firm as financially constrained if it has no credit rating for either its short-term or long-term debt. This definition captures the firms that are most likely to face difficulties in obtaining external financing.

We then re-estimate the difference-in-differences regression model (2) using this alternative financial constraint measure. Table 4 presents the results from this robustness check. The findings remain consistent with our previous results. In particular, the coefficient on the dummy variable No Credit Rating is positive and statistically significant when trade credit is measured as either the ratio of accounts payable to sales or the ratio of accounts payable to adjusted cost of goods sold.

Additionally, we observe that the interaction term between Tariff Cut and No Credit Rating is consistently negative and significant across all three trade credit measures. These results reinforce our previous conclusions: 1) firms with limited access to external financing tend to rely more heavily on trade credit than firms with greater access to credit, 2) firms without credit ratings increase their use of trade credit in response to a sudden increase in product market competition, and 3) when industry competition unexpectedly intensifies, firms with no credit rating in affected industries reduce their trade credit use more than firms with no credit rating in unaffected industries.

This robustness check strengthens our confidence in the baseline results by demonstrating that the observed patterns in trade credit use are not driven by the specific definition of financial constraint but are consistent across different measures of external financing availability.

B. Re-examine the effect of industry competition on trade credit when deleting periods with change in compiling methodology for import data

Our baseline results rely on tariff cuts as an exogenous shock to industry competition. The calculation of tariff cuts is based on product-level import data from Feenstra (1996), Feenstra, Romalis, and Schott (2002), and Schott (2010). However, the coding of imports changed in 1989 due to a revision in the Harmonized System (HS) codes. It is possible that some of the observed tariff changes are driven by this coding revision rather than by genuine changes in tariff policy. To mitigate this potential data issue, we exclude observations from 1988 and 1989, which correspond to the period when the coding methodology changed.

Table 5 reports the results of re-estimating the difference-in-differences model (2) after excluding the years 1988 and 1989. Our results remain robust, suggesting that the main findings are not driven by changes in the import data compilation methodology. This robustness check alleviates concerns that our results could be influenced by data issues related to the import coding revision, strengthening the reliability of our conclusions.

C. Re-examine the effect of industry competition on trade credit using matched sample

While large tariff reductions provide a plausible exogenous shock to industry competition, a potential concern is that firms in affected industries (treated firms) may differ systematically from firms in unaffected industries. If these differences in firm characteristics are not properly controlled for, they could drive the observed results. To address this concern, we employ a matching strategy to ensure that firms in the treated and control groups are similar in terms of their characteristics prior to the tariff reduction.

Following the approach outlined by Almeida, Campello, Laranjeira, and Weisbenner (2012), we construct a matched control group by matching firms in tariff-reduction-affected industries with firms in unaffected industries based on three key characteristics one year before the tariff cut: book assets, Tobin's Q, and cash holdings. This matching procedure ensures that the control group is composed of firms that are as similar as possible to the treated firms, apart from the exposure to the tariff shock.

Table 6 presents the results from re-estimating the difference-in-differences model (2) using the matched sample. Our main findings remain unchanged. Specifically, the results show that compared to their matched counterparts in unaffected industries, financially constrained firms in affected industries significantly reduce their use of trade credit, while financially unconstrained firms increase their use of trade credit in response

to the increased competition. These findings are consistent with the baseline analysis and reinforce our conclusion that the differential response to product market competition is primarily driven by firms' financial constraints.

This matching analysis further supports the robustness of our results by demonstrating that the observed patterns in trade credit use are not driven by underlying differences in firm characteristics between treated and control groups but are a direct result of the product market competition shock.

V. Conclusions

This paper investigates the relationship between product market competition and firms' use of trade credit, using large U.S. import tariff reductions as a natural experiment to capture sharp exogenous shifts in competitive dynamics. Our findings contribute to the growing literature on the interplay between product and financial markets, highlighting how increased product market competition can influence a firm's financing decisions, specifically in the context of trade credit.

At the aggregate level, we find that firms operating in industries affected by significant tariff reductions significantly reduce their use of trade credit compared to firms in unaffected industries. This suggests that the competitive pressures resulting from tariff cuts lead firms to adjust their reliance on trade credit, potentially due to changes in their financing strategies or cash flow needs.

Furthermore, we uncover differential effects based on firms' financial constraints. For financially unconstrained firms, increased product market competition appears to lead to a higher reliance on trade credit. This can be interpreted as firms seeking to preserve liquidity to finance their more aggressive competitive strategies. In contrast, financially

constrained firms, which have limited access to external capital, tend to reduce their use of trade credit when faced with heightened competition. This reduction may reflect increased business risks, deteriorating bargaining positions, and diminished liquidation values, which limit their access to trade credit.

Our results emphasize the importance of considering both product market conditions and a firm's financial health when analyzing trade credit practices. This paper highlights the dynamic interaction between financial constraints and competitive pressures, offering insights into how changes in industry competition can have different implications for firms depending on their financial flexibility.

While the focus of this study is on the overall effect of product market competition on trade credit use, it also opens several avenues for future research. For instance, the exact mechanisms through which competition influences trade credit—whether through changes in firm default risk, liquidity needs, or bargaining power—remain unexplored and warrant further investigation. Additionally, exploring how these effects vary across different industries or international settings could provide a more nuanced understanding of the broader implications of competition on firms' financial decisions.

In sum, our findings contribute to the literature on corporate finance by demonstrating that competition in product markets can have significant, yet heterogeneous, effects on firms' trade credit use, especially when financial constraints come into play. These insights are valuable for both researchers and policymakers interested in understanding the broader consequences of competition policy and its potential impact on corporate financing practices.

Appendix: Variable Definitions

All variables except for dummy variables are winsorized at the 1 and 99 percentiles of their distributions, and all dollar value financial variables, such as sales and assets, are adjusted to 2000 dollars using the CPI deflator.

Key Variables

***Trade Credit* 1**: Ratio of account payable to sales.

***Trade Credit* 2:** Ratio of account payable to cost of goods sold.

***Trade Credit* 3:** Ratio of account payable to adjusted cost of goods sold, where the adjusted cost of goods sold is calculated as cost of goods sold minus the change in inventory.

Dummy for tariff cut: It is defined based on industry-level import tariff data at the four-digit SIC (Standard Industry Classification) level for the U.S. manufacturing sector (SIC 2000–3999) from 1972 to 2005. It equals to one for a "substantial" tariff cut in a given industry year, and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years.

***Financial Constraint*:** A dummy variable that equals to one for firms with financial constraints index among the top 67% and zero otherwise. Financial constraints index is constructed following Hadlock and Pierce (2010).

All other variables

Book Asset: Book value of asset at the end of fiscal year.

***Tobin's Q*:** Ratio of the market value of assets divided by the book value of assets, both computed at the end of each fiscal year.

***Cash/Net Book Asset*:** Ratio of cash flow to net asset (i.e., book asset value minus cash holdings).

***Capital expenditures/Book Asset*:** Ratio of capital expenditures to the book value of total assets.

***Short-term Debt*:** Ratio of debt in current liabilities to assets and

***Long-term Debt*:** Ratio of long-term debt to assets.

***Age*:** number of years preceding the observation year that the firm has a non-missing book assets in the Compustat data.

***Cash Flow*:** Sum of income before extraordinary item and depreciation scaled by the lag value of book assets.

***Interests Expense*:** Ratio that equals to total interest and related expense divided by the lag value of book assets.

***Sales growth rate*:** Ratio of previous year's sales to current year's sales minus one.

***Investment growth rate*:** Ratio of previous year's capital expenditure to current year's capital expenditure minus one.

***Return on Sales*:** Ratio of operating income before depreciation to sales.

***Quick Ratio*:** Ratio calculated as the difference between current assets and inventory divided by current liability.

***Fixed Charge Coverage*:** Ratio that equals to operating income before depreciation divided by the sum of current liability and interests expense.

***Gross Profit Margin*:** Ratio that equals to gross profit divided by sales.

Book leverage ratio: Long term debt plus debt in current liabilities divided by the book value of total assets.

Bond rating: Standard and Poor's bond rating coded from 0 to 6 with no rating = 0, B and below = 1, BB = 2, BBB = 3, A = 4, AA = 5, and AAA = 6.

Bond rating dummy: Equals one if the firm has a Standard and Poor's bond rating, and zero otherwise.

R&D: Ratio of research and development expense to sales, with R&D set equal to zero when research and development expense is missing.

Tangibility: Ratio of book value of property, plant, and equipment to the book value of total assets.

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Table 1: Summary Statistics

This table presents summary statistics for our sample with and without large tariff cuts between 1976 and 2005. We exclude firms within financial industry (SIC from 6000 to 6999), utility industry (SIC from 4900 to 4999), and service firms (SIC from 7000 to 8999). *Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year t and year $t-1$), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. *Trade Credit* 1 is the ratio of account payable to sales. *Trade Credit* 2 is the ratio of account payable to cost of goods sold. *Trade Credit* 3 is measured as the ratio of account payable to adjusted cost of goods sold, where the adjusted cost of goods sold is calculated as cost of goods sold minus the change in inventory. *Book Asset* is the book value of asset at the end of fiscal year. *Tobin's Q* is measured as the ratio of the market value of assets divided by the book value of assets, both computed at the end of each fiscal year. *Cash/Net Book Asset* is the ratio of cash flow to net asset (i.e., book asset value minus cash holdings). *Capital expenditures/Book Asset* is the ratio of capital expenditures to the book value of total assets. *Short-term Debt* is the ratio of debt in current liabilities to assets and *Long-term Debt* is the ratio of long-term debt to assets. Age is the number of years preceding the observation year that the firm has a non-missing book assets in the Compustat data. *Cash Flow* is the sum of income before extraordinary item and depreciation scaled by the lag value of book assets. *Interests Expense* equals to total interest and related expense divided by the lag value of book assets. *Sales growth rate* is the ratio of previous year's sales to current year's sales minus one. *Investment growth rate* is the ratio of previous year's capital expenditure to current year's capital expenditure minus one. *Return on Sales* is measured as the ratio of operating income before depreciation to sales. *Quick Ratio* is calculated as the difference between current assets and inventory divided by current liability. *Fixed Charge Coverage* equals to operating income before depreciation divided by the sum of current liability and interests expense. *Gross Profit Margin* equals to gross profit divided by sales. The variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The difference between two categories of firms in means is tested by a two-tailed test.

	Tariff Cut=1					Tariff Cut=0					P value of
Variables	**Mean**	**P25**	**P50**	**P75**	**N**	**Mean**	**P25**	**P50**	**P75**	**N**	**difference in means**
Trade Credit 1	0.146	0.049	0.07	0.105	11100	0.349	0.051	0.081	0.139	163372	0.000
Trade Credit 2	0.189	0.074	0.109	0.162	11094	0.586	0.075	0.122	0.214	164521	0.000
Trade Credit 3	0.177	0.073	0.108	0.162	10421	0.477	0.073	0.12	0.208	151070	0.000
Book Assets	1221.28	15.443	79.547	480.509	11246	1232.39	11.485	63.414	376.892	171317	0.830
Tobin's Q	1.863	0.958	1.271	1.864	11246	2.18	0.856	1.159	1.834	171317	0.000
Cash Holdings	0.175	0.021	0.066	0.207	11239	0.196	0.017	0.063	0.221	170653	0.000
Capital Expenditure	0.064	0.027	0.049	0.08	11062	0.077	0.021	0.049	0.097	166102	0.000
Short-term Leverage	0.086	0.007	0.031	0.091	11240	0.104	0.004	0.029	0.1	170877	0.000
Long-term Leverage	0.181	0.029	0.138	0.26	11223	0.198	0.011	0.14	0.3	171033	0.000
Age	16.804	6	14	25	11246	12.34	4	9	18	171317	0.000
Cash Flow	0.032	0.037	0.094	0.146	10449	-0.062	-0.009	0.076	0.136	155228	0.000
Interests Expenses	0.032	0.01	0.022	0.039	10179	0.039	0.009	0.024	0.044	149195	0.000
Sales Growth	0.174	-0.025	0.082	0.21	10406	0.247	-0.03	0.093	0.254	150736	0.000
Investment Growth	0.544	-0.27	0.076	0.571	10167	0.732	-0.324	0.078	0.672	145891	0.000
Return on Sales	-0.194	0.048	0.103	0.155	11079	-0.509	0.02	0.092	0.173	162984	0.000
Quick Ratio	1.855	0.86	1.268	1.952	11097	2.141	0.68	1.121	1.951	161798	0.000
Fixed Charge Coverage	7.916	0.465	1.72	4.695	10353	4.627	0.145	1.266	3.657	150444	0.000
Gross Profit Margin	0.259	0.229	0.322	0.441	11109	0.073	0.187	0.308	0.465	163784	0.000

Table 2: Product Competition and Trade Credit

This table presents the estimates from difference-in-differences regressions for corporate investment around import tariff reductions (tariff cuts) from 1976 to 2005. The dependent variable is Trade Credit. *Tariff Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year t and year $t-1$), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. The detailed variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The t-values in parenthesis are computed using robust standard errors. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Independent Variables	Trade Credit 1	Trade Credit 2	Trade Credit 3
Tariff Cut	-0.004	-0.013**	-0.009*
	(-0.76)	(-2.04)	(-1.67)
log(Book Assets)	-0.008***	-0.014***	-0.014***
	(-5.92)	(-4.79)	(-5.13)
Tobin's Q	0.035***	0.062***	0.062***
	(5.26)	(5.43)	(5.80)
Cash Holdings	-0.061***	0.005	0.076**
	(-2.81)	(0.14)	(2.31)
Capital Expenditure	0.248***	0.704***	0.611***
	(5.27)	(8.10)	(7.84)
Short-term Leverage	0.316***	0.639***	0.586***
	(5.33)	(4.34)	(3.92)
Long-term Leverage	-0.007	-0.013	-0.017
	(-0.23)	(-0.23)	(-0.27)
Age	-0.007**	-0.016***	-0.016***
	(-2.43)	(-3.45)	(-3.66)
Cash Flow	-0.059**	-0.176***	-0.127**
	(-2.01)	(-3.14)	(-2.42)
Interests Expenses	0.248	-0.056	0.209
	(1.05)	(-0.12)	(0.43)
Sales Growth	-0.006	-0.001	-0.007
	(-0.85)	(-0.08)	(-0.92)
Investment Growth	-0.001	-0.008***	-0.005*
	(-0.70)	(-2.67)	(-1.90)
Return on Sales	-0.179***	-0.220***	-0.163***
	(-12.44)	(-8.66)	(-7.47)
(Return on Sales)^2	-0.002***	-0.002***	-0.001***
	(-6.69)	(-4.54)	(-3.63)
Quick Ratio	-0.004	-0.003	-0.006
	(-1.16)	(-0.57)	(-1.58)
Fixed Charge Coverage	0.000***	0.000	0.000
	(4.59)	(0.09)	(0.46)
Gross Profit Margin	-0.005	0.220***	0.182***
	(-0.32)	(7.41)	(6.69)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R Square	0.26	0.12	0.12
Number of Observation	101709	101722	101339

Table 3: Product Competition and Trade Credit for Firms With vs. Without Financial Constraints

This table presents the estimates from difference-in-differences regressions for corporate investment around import tariff reductions (tariff cuts) from 1976 to 2005. The dependent variable is Trade Credit. *Tariff Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year *t* and year *t*−1), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. F*inancial Constraint* is a dummy variable that equals to one for firms with financial constraints index among the top 67% and zero otherwise. Financial constraints index is constructed following Hadlock and Pierce (2010). The detailed variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The t-values in parenthesis are computed using robust standard errors. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Independent Variables	**Trade Credit 1**	**Trade Credit 2**	**Trade Credit 3**
Tariff Cut	0.011**	0.006	0.010**
	(2.47)	(1.33)	(2.27)
Financial Constraint	0.013*	0.005	0.006
	(1.77)	(0.42)	(0.50)
Tariff Cut ×	-0.056***	-0.078***	-0.074***
Financial Constraint	(-3.67)	(-3.08)	(-3.60)
log(Book Assets)	-0.007***	-0.015***	-0.015***
	(-4.92)	(-5.17)	(-5.63)
Tobin's Q	0.036***	0.069***	0.068***
	(4.92)	(5.69)	(5.93)
Cash Holdings	-0.062***	0.002	0.076**
	(-2.80)	(0.05)	(2.23)
Capital Expenditure	0.252***	0.722***	0.626***
	(4.95)	(7.74)	(7.48)
Short-term Leverage	0.324***	0.652***	0.598***
	(5.32)	(4.31)	(3.89)
Long-term Leverage	-0.008	-0.013	-0.018
	(-0.25)	(-0.22)	(-0.28)
Age	-0.007**	-0.018***	-0.017***
	(-2.38)	(-3.52)	(-3.81)
Cash Flow	-0.057*	-0.172***	-0.123**
	(-1.93)	(-3.05)	(-2.33)
Interests Expenses	0.248	-0.060	0.206
	(1.04)	(-0.13)	(0.42)
Sales Growth	-0.006	-0.002	-0.008
	(-0.85)	(-0.16)	(-0.98)
Investment Growth	-0.001	-0.008***	-0.005*
	(-0.70)	(-2.66)	(-1.85)
Return on Sales	-0.178***	-0.220***	-0.162***
	(-12.39)	(-8.63)	(-7.43)
(Return on Sales)^2	-0.002***	-0.002***	-0.001***
	(-6.67)	(-4.54)	(-3.62)
Quick Ratio	-0.004	-0.004	-0.007*
	(-1.22)	(-0.72)	(-1.69)
Fixed Charge Coverage	0.000***	-0.000	0.000
	(4.60)	(-0.01)	(0.35)
Gross Profit Margin	-0.006	0.219***	0.182***
	(-0.35)	(7.36)	(6.65)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R Square	0.26	0.12	0.12
Number of Observation	101709	101722	101339

Table 4: Robustness: Product Competition and Trade Credit for Firms With vs. Without Credit Ratings

This table presents the estimates from difference-in-differences regressions for corporate investment around import tariff reductions (tariff cuts) from 1976 to 2005. The dependent variable is Trade Credit. *Tariff Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year *t* and year *t*−1), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. *No Credit Rating* is a dummy variable that equals to one for firms without credit rating and zero otherwise. The detailed variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The t-values in parenthesis are computed using robust standard errors. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Independent Variables	**Trade Credit 1**	**Trade Credit 2**	**Trade Credit 3**
Tariff Cut	0.013*	0.009	0.018***
	(1.92)	(1.36)	(3.03)
No Credit Rating	0.018***	0.013	0.028***
	(2.82)	(1.15)	(2.87)
Tariff Cut ×	-0.033***	-0.044***	-0.054***
No Credit Rating	(-3.50)	(-3.40)	(-4.96)
Control Variables	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R Square	0.26	0.12	0.12
Number of Observation	101709	101722	101339

Table 5: Robustness: Product Competition and Trade Credit When Excluding the Tariff changes in 1988 and 1989

This table presents the estimates from difference-in-differences regressions for corporate investment around import tariff reductions (tariff cuts) from 1976 to 2005. The dependent variable is Trade Credit. *Tariff Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year *t* and year *t*−1), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. F*inancial Constraint* is a dummy variable that equals to one for firms with financial constraints index among the top 67% and zero otherwise. Financial constraints index is constructed following Hadlock and Pierce (2010). The detailed variable definitions are provided in Appendix. The detailed variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The t-values in parenthesis are computed using robust standard errors. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Independent Variables	**Trade Credit 1**	**Trade Credit 2**	**Trade Credit 3**
Tariff Cut	0.011**	0.007	0.011**
	(2.49)	(1.52)	(2.41)
Financial Constraint	0.014*	0.008	0.009
	(1.79)	(0.61)	(0.77)
Tariff Cut ×	-0.058***	-0.083***	-0.079***
Financial Constraint	(-3.71)	(-3.19)	(-3.74)
Control Variables	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R Square	0.26	0.12	0.12
Number of Observation	94233	94244	93909

Table 6: Robustness: Product Competition and Trade Credit For Matched Sample

This table presents the estimates from difference-in-differences regressions for corporate investment around import tariff reductions (tariff cuts) from 1976 to 2005. In the year before a tariff cut, firms within industries with large tariff reductions are matched firms from other unaffected industries by the total assets, Tobin's Q, and cash holdings scaled by assets. The dependent variable is Trade Credit. *Tariff Cut* is a dummy variable that equals one if an industry experiences a "substantial" tariff cut in past two years (year *t* and year *t*−1), and 0 otherwise. Following Fresard (2010), we define a tariff cut in a given industry year as "substantial" if it is at least three times larger than the median annual (absolute) change in tariff rate in the same industry across all years. F*inancial Constraint* is a dummy variable that equals to one for firms with financial constraints index among the top 67% and zero otherwise. Financial constraints index is constructed following Hadlock and Pierce (2010). The detailed variable definitions are provided in Appendix. The detailed variable definitions are provided in Appendix. All variables are winsorized at the 0.5% level. The t-values in parenthesis are computed using robust standard errors. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Independent Variables	**Trade Credit 1**	**Trade Credit 2**	**Trade Credit 3**
Tariff Cut	0.011**	0.013**	0.015***
	(2.56)	(2.35)	(2.79)
Financial Constraint	0.008	0.007	0.010
	(0.93)	(0.42)	(0.67)
Tariff Cut ×	-0.065***	-0.106***	-0.091***
Financial Constraint	(-3.42)	(-3.23)	(-3.41)
log(Book Assets)	-0.009***	-0.018***	-0.016***
	(-4.99)	(-4.88)	(-4.77)
Tobin's Q	0.041***	0.095***	0.091***
	(3.99)	(5.69)	(5.82)
Cash Holdings	-0.081***	-0.011	0.087**
	(-2.99)	(-0.21)	(1.99)
Capital Expenditure	0.247***	0.693***	0.567***
	(4.10)	(5.99)	(5.51)
Short-term Leverage	0.344***	0.711***	0.617***
	(5.00)	(4.12)	(3.62)
Long-term Leverage	-0.009	-0.017	-0.017
	(-0.25)	(-0.24)	(-0.23)
Age	-0.007*	-0.019***	-0.017***
	(-1.74)	(-2.64)	(-2.89)
Cash Flow	-0.057*	-0.188***	-0.130**
	(-1.74)	(-2.91)	(-2.13)
Interests Expenses	0.178	-0.152	0.174
	(0.69)	(-0.30)	(0.33)
Sales Growth	-0.004	-0.005	-0.008
	(-0.51)	(-0.40)	(-0.80)
Investment Growth	-0.004	-0.012***	-0.007**
	(-1.59)	(-3.64)	(-1.99)
Return on Sales	-0.180***	-0.212***	-0.162***
	(-11.37)	(-7.43)	(-6.52)
(Return on Sales)^2	-0.002***	-0.001***	-0.001***
	(-6.20)	(-3.74)	(-3.02)
Quick Ratio	-0.006	-0.004	-0.010**
	(-1.50)	(-0.63)	(-2.24)
Fixed Charge Coverage	0.000***	-0.000	-0.000
	(4.87)	(-0.73)	(-0.13)
Gross Profit Margin	-0.004	0.218***	0.187***
	(-0.24)	(6.43)	(5.93)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R Square	0.271	0.121	0.122
Number of Observation	74138	74153	73879