Capital Structure Decisions along the Supply Chain: Evidence from Import Competition[1]

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Abstract

This paper studies the propagation of import competition shock along the supply chain. We find that a large reduction in import tariffs in a customer industry induces suppliers to choose more conservative financial policies via transmission of contraction and distress risk. We show that firms lower their leverage more when they are involved in more relationship-specific investments with their customers and when they are more concerned about distress. Moreover, firms adjust their leverage mainly by issuing more equity. We also show that firms increase their cash holdings and limit their trade credit provision.

JEL Classification: D43, F12, G32, G33, L22

Key words: Globalization; Import competition; Customer-supplier links; Capital structure

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INTRODUCTION

The globalization of economic activities has brought major changes to the competitive configuration of industries in the past few decades, bringing with it a debate among policymakers about trade openness.[2] A large literature has been devoted to examining how firms adjust their operations—such as through modifications to entry and exit strategies, product quality control, and resource allocation—when facing increased import competition.[3] Several recent studies (Baggs & Brander (2006), Xu (2012), and Zhou, Booth, & Chang (2013)) show that foreign competition can also influence corporate decisions on financial policies. How foreign competition in an industry has a spillover effect into other industries, however, is relatively unstudied. Given the great interest among researchers in studying the customer-supplier link in a firm's financial policy decisions (Titman, 1984), this paper attempts to bridge the gap in the literature by examining how a significant increase in the degree of import competition in downstream industries affects upstream firms' financial policies.

Despite some well-documented economic benefits of trade liberalization, many studies in the trade literature show that greater import competition can have negative impacts on the profitability of domestic firms (Tybout, 2003) and on employment (Autor, Dorn, & Hanson, 2013; Acemoglu, Autor, Dorn, Hanson, & Price, 2016; Pierce & Schott, 2016). Moreover, the input-output linkages can amplify these negative impacts. For example, both Acemoglu et al. (2016) and Pierce & Schott (2016) show that foreign competition shock propagates along a supply chain and that increased Chinese import competition in an industry significantly depresses employment in upstream industries. These findings are not surprising: as

[2] For example, during his presidential campaign, US President Donald Trump railed against China and several other Asian countries for stealing American jobs. He also withdrew the United States from the Trans-Pacific Partnership in January 2017.

[3] See Bernard et al. (2006), Coucke & Sleuwaegen (2008), Colantone & Sleuwaegen (2010), and Amiti and Khandelwal (2013), among others.

Di Giovanni, Levchenko, & Mejean (2014) demonstrate, the input-output linkages are approximately three times as important as the direct effect of firms' shocks in driving economy-wide fluctuations.

We hypothesize that intensified import competition in a firm's major customer industry would induce the firm to choose more conservative financial policies out of distress concern. The first channel by which this happens is the contagion of contraction along the supply chain and the increased variation of performance (profitability). When an industry contracts due to greater import competition, its demand for intermediate inputs will be reduced, leading to contraction in upstream industries and, consequently, poorer performance of the upstream firms (Acemoglu et al., 2016). Additionally, downstream contraction may trigger price competition among firms in upstream industries, and this competition can increase variation in input prices and firm profitability.[4] Lower or more volatile future cash flow increases the probability that a firm's cash flow will be insufficient to service its debt obligations (Bradley, Jarrell, & Kim, 1984). As a result, supplier firms will have incentive to maintain lower leverage as a precaution.

The second channel is the contagion of financial distress: the increased chance of customer default can lead to increased distress risk for suppliers. If a firm's major customers become distressed, they may delay their payment or default on their trade credit. Since trade credit is unsecured, in case of bankruptcy of a customer, these suppliers may not be able to fully recover their claims (Jorion and Zhang, 2009). As a result, trade credit is often blamed for propagating shocks along the supply chain (Bradley & Rubach, 2002; Bradley & Cowdery, 2004; Raddatz, 2010). Consistent with this argument, Hertzel, Li, Officer, & Rodgers (2008) and Kolay, Lemmon, & Tashjian (2012) find that firms' financial distress has a negative effect on their suppliers' stock returns. Taken together, when intensified import competition in a customer industry presents supplier firms with increased risk of distress, these firms would have incentive to adopt more conservative financial policies to avoid distress.

[4] Similarly, deregulation promotes price competition and increases variation in prices and firm profitability (Winston, 1993; Ovtchinnikov, 2010).

Using tariff data for the US manufacturing sector during the period 1989 to 2005, we identify the largest tariff reductions for each industry, focusing on those cuts whose sizes are larger than four times the industry average during our sample period.[5] A tariff reduction is largely considered an exogenous shock to the industry concerned, which should be exogenous to suppliers as well (Fresard, 2010; Valta, 2012). We use input-output tables to identify supplier-customer industry pairs and test the effect of large tariff cuts in customer industries on supplier firms. We choose industry-level data for our main analysis, but results from customer-supplier pairs at the firm level are no different.

We document that a large tariff reduction in the main downstream industry has a statistically and economically significant negative impact on the leverage of upstream firms. Using a sample of customer-supplier pairs that operate in different four-digit NAICS industries, we find that suppliers whose main customers experience a large tariff reduction lower their leverage by about 5% of their capital.[6] The results are robust to various alternative samples. Trend analysis shows that the significant effect on leverage starts to appear right after the tariff reduction, supporting the idea that the leverage reduction is indeed driven by increased import competition in the downstream industry.

Although we adopt a quasi-natural experimental approach in our analysis, our estimates are not free from endogeneity concerns. The problem emerges if suppliers with the customers facing intensified import competition differ from other suppliers, and the difference is systematically related to the firms' leverage choice. To address this issue, we conduct a difference-in-differences analysis using a matched sample in the short window around the event. Control firms are selected based on size, book leverage, and market-to-book ratio measured one year before the tariff reduction. We find that firms with a tariff-

[5] Definitions of cuts based on three times or five times the industry average affect the results negligibly, but for larger cuts the results are stronger.

[6] To ensure that our captured effect is derived from customers' competition, our sample excludes supplier firms whose own industries have experienced large tariff reductions. However, we still control for import penetration of suppliers' own industry in all analyses.

affected downstream industry tend to decrease their leverage more than those matched control firms in the two years following the event. Moreover, we do not observe similar patterns in the falsification test using periods that do not involve significant tariff cuts in downstream industries.

Next, we explore whether the relationship-specific investments involved in a customer-supplier relationship affect the impact of customer tariff reductions on supplier leverage (Titman & Wessels, 1988; Banerjee, Dasgupta, & Kim, 2008). We conjecture that suppliers should decrease their leverage by a larger amount if they face higher bankruptcy costs resulting from more relationship-specific investments. Consistent with our conjecture, we find that the negative impact on supplier leverage of tariff cuts in the customer industries is significantly greater when customers purchase a larger fraction of the supplier's total revenue, when the products supplied to customers are more unique, and when suppliers have a less diversified business.

We additionally explore whether vulnerability to the competitive shock influences the magnitude of the impact on supplier leverage. If greater foreign competition in customer industries increases the supplier firms' default probability, we would expect that firms with higher ex ante distress risk should respond more to the tariff cuts in customer industries. Consistent with this conjecture, we find that firms closer to financial distress are more likely to decrease their leverage when foreign competition intensifies in customer industries.

To attribute the change in debt to actual changes in tariff rates of customer industries, we examine issuance and retirement decisions using a change regression specification. Our analysis reveals that firms lower leverage mainly by issuing more equity when the tariff rates of downstream industries drop. This finding suggests that when import competition in customer industries intensifies, firms issue equity as a buffer against financial distress. Additionally, we examine the changes in firms' cash policy to further support our argument that distress concern drives a more conservative capital structure. We show that firms tend to increase their holdings of liquid assets by increasing cash and net working capital, which results in even deeper reduction in net debt. This is consistent with Acharya, Davydenko, & Strebulaev (2012), who argue that firms increase their holdings of liquid assets when the default risk increases. This

finding is also consistent with evidence from McLean (2011) that firms issue shares to save cash as a precaution.[7]

Trade credit is a key financing source between a customer and a supplier as well as an essential part of liquidity management. To better understand the mechanism driving the conservative capital structure, we therefore examine whether there is any change in trade credit. We find no evidence that firms extend more trade credit to their troubled customers, which could indicate that firms attempt to reduce their exposure to the threatened customer industry to avoid distress. The finding is consistent with evidence that restriction on the trade credit supply lowers supplier firms' default probability (Barrot, 2016).

Our study contributes to the literature in several ways. First, we complement the literature on the impact of foreign competition on corporate outcomes and policies. In particular, we provide the first empirical evidence that a change in the downstream competitive environment can affect the capital structure of upstream firms. Second, this paper is closely related to the literature on how customer-supplier relations affect firms' financial policies. Kale & Shahrur (2007) and Chu (2012) show that a firm's leverage is negatively related to the domestic competition that its customers or suppliers face. We complement these studies by showing that firms adjust various financial policies in response to increased import competition in customer industries. Finally, this paper is related to literature that attempts to explain the economy-wide conservative financial policies in the US over the past decades (Bates, Kahle, & Stulz, 2009; Chakraborty, Holter, Maxwell, & Stepanchuk, 2013). Our results suggest that the propagation of foreign competition shock may be another factor driving the conservatism.

The rest of the paper is organized as follows. The next section presents a brief overview of the relevant literature and develops our hypotheses. In the section after that, we describe our data and empirical strategy. Third, we discuss our empirical findings. The final section concludes.

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[7] Itzkowitz (2013) shows that suppliers more worried about losing their major customers tend to hold more cash and issue equity to increase cash holdings.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Empirical prediction based on propagation channel

The idea that a sector-specific shock propagates through input-output linkages can go back to the multisector model by Long & Plosser (1983). Several subsequent theoretical studies, including Horvath (1998), Dupor (1999), Shea (2002), Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012), and Di Giovanni, Levchenko, & Mejean (2014), further demonstrate that the propagation of industry-specific shocks can generate macroeconomic fluctuations. Consistent with these models, Ahern & Harford (2014) show that a merger shock propagates from downstream to upstream and leads to economy-wide merger waves. Acemoglu et al. (2016) and Pierce & Schott (2016) show that significant increases in downstream competition caused by Chinese WTO accession have negative effects on upstream employment, suggesting that such competitive shock is significant enough to propagate up the supply chain.

We argue that the intensified downstream import competition increases distress risk of upstream firms and therefore adversely affects these firms' optimal capital structure. There are two reasons why upstream firms' distress risk increases. First, the contagion of contraction along the supply chain can hurt suppliers' performance and increase their variation of profitability. As pointed out by Acemoglu et al. (2016), if an industry contracts because of import competition, its demand for intermediate inputs produced in the United States will be reduced, leading to contractions in its upstream industries.[8] To maintain their production levels, suppliers would have to search for new customers, probably by investing in new business lines, which would increase the uncertainty in their future cash flow. Additionally, the downstream contraction may trigger price competition among the upstream firms, which can increase variation in input prices and firm profitability. Both the deteriorating performance and the increased cash

[8] It is well documented that accounting performance and stock returns are closely linked between customers and suppliers (See Olsen & Dietrich, 1985; Cohen & Frazzini, 2008; Menzly & Ozbas, 2010; and Pandit et al., 2011).

flow volatility may result in an increase in the probability that a firm's cash flow will be insufficient to service its debt obligations (Bradley, Jarrell, & Kim, 1984). Hence, supplier firms will have the incentives to maintain a lower leverage as a precaution.

Second, a higher probability of customers' default due to intensified competition can generate the propagation of financial distress. It has been shown that increased import competition deteriorates firm profitability after significant increases in import competition (DeRosa & Goldstein, 1981; Katics & Petersen, 1994; Pugel, 1980) and increases firms' default probability (Valta, 2010). If a firm's major customers become distressed, they may delay their payment or default on their trade credit, a key channel through which a shock propagates along the supply chain (Jorion & Zhang, 2009; Raddatz, 2010). For instance, survey evidence shows that nonpayment by customers is a major cause of bankruptcy for small firms in the United States (Bradley & Rubach, 2002). Simulated data by Boissay (2006) predicts that a sound firm gets into financial difficulties with a probability that ranges from 4.1% to 12.8% when its customers are financially distressed. Even if a supplier is able to recover its receivables, the bankruptcy of a customer can lead a supplier to distress due to its significant loss of sales. Fee & Thomas (2004) show that suppliers who are terminated after a customer's merger experience significant cash-flow deterioration. Finally, Hertzel et al. (2008) and Kolay, Lemmon, & Tashjian (2012) document empirical evidence on the contagion of downstream financial distress by examining how customers' bankruptcy affects suppliers.

Taken together, because corporate managers are most concerned about financial flexibility when it comes to capital structure decisions (Graham & Harvey, 2001), when customers experience a negative competitive shock, supplier firms will try to maintain higher financial flexibility to lessen the adverse impact. This leads to our main hypothesis.

Hypothesis 1: Increased import competition in downstream industries will lead upstream firms to choose lower leverage.

Bradley, Jarrell, & Kim (1984) argue that the negative effect of cash flow volatility on a firm's leverage is greater when a firm's bankruptcy costs are higher. As emphasized by Titman (1984) and Titman & Wessel (1988), relationship-specific investment between customers and suppliers would lose value if the trading relation was terminated. This suggests that suppliers with more relationship-specific investments are likely to incur higher bankruptcy costs and should adjust their leverage more deeply. Furthermore, the supplier firm's financial condition should also affect the impact of increased distress risk on its capital structure. If the supplier firm is already financially distressed, it will more likely be concerned about increased default risk and will therefore have a greater incentive to lower its leverage. This leads to the following sub-hypotheses.

Hypothesis 2a: Increased import competition in downstream industries will have a greater impact on upstream capital structure when the customer-supplier link involves high relationship-specific investments.

Hypothesis 2b: Increased import competition in downstream industries will have greater impact on upstream capital structure when the suppliers' ex-ante risk of financial distress is higher.

Discussion about an alternative channel

An alternative channel that generates prediction on the impact of downstream import competition on supplier leverage is the bargaining channel. Bronars & Deere (1991), Dasgupta & Sengupta (1993), Hennessy & Livdan (2009), and Chu (2012) argue that firms may use their debt as a bargaining tool against their customers or suppliers and that a firm's optimal leverage decreases with its bargaining power. In our setting, one may argue that suppliers are in a better bargaining position against their customers when the customers become weaker due to increased import competition. This suggests that after a large tariff reduction in a customer industry, supplier firms would have less incentive to maintain higher leverage in the presence of the agency costs of debt.

Alternatively, one can argue that downstream competition would lower supplier firms' bargaining power and thereby induce them to increase leverage. For instance, when facing intense competition, customers may demand discounts from their suppliers to help themselves compete more aggressively in the product market. If import competition depresses customers' profitability, the customers would not have as much rent to be shared with suppliers. All of these arguments suggest that suppliers would have incentives to increase leverage to enhance their bargaining position.

Which prediction from the bargaining theory prevails would depend on whether increased import competition in downstream industries boosts or harms the bargaining position of upstream firms. Kale & Shahrur (2007) argue that high domestic competition in a customer industry weakens the bargaining power of customer firms in the industry because a supplier can easily switch to alternative customers. However, when customers face intense import competition, domestic suppliers may not be able to switch easily to foreign customers. Thus, unlike domestic competition, an increase in downstream import competition would likely strengthen customers' bargaining position and induce suppliers to increase their leverage. On the other hand, as we argued earlier, when supplier firms face lower demand from domestic customers, high leverage will increase supper firms' financial and operational risk. Moreover, a supplier firm does face the risk that its customer might terminate the trade relationship entirely, voluntarily, or because the customer is going out of business (Banerjee, Dasgupta, & Kim, 2008). Taken altogether, we believe that, compared to the increased distress risk, the bargaining advantage will appear to be a less important factor when we examine the impact of downstream import competition on upstream capital structure.

EMPIRICAL METHODOLOGY AND DATA

A quasi-natural experiment: Import tariff reductions in downstream industries

The international trade literature generally agrees that lower trade barriers, such as lower import tariff rates, significantly increase domestic firms' competitive pressures from foreign rivals. Valta (2012) documents that an average tariff rate reduction from 3% to below 1.5% in the U.S. between 1992 and

2005 is associated with the increase of import penetration from 19.5% to 24.1%. Several papers in economics and finance have used tariff rate reductions as an exogenous shock to import competition. For instance, Baggs & Brander (2006) and Guadalupe and Wulf (2010) examine the effect of tariff reduction caused by the North American Free Trade Agreement (NAFTA) on Canadian and US firms, respectively. Fresard (2010) uses import tariff reductions to explore the interaction between product market competition and corporate cash holdings. Valta (2012) and Fresard & Valta (2016) employ the largest tariff reduction in a given industry to examine the effect of import competition on firms' cost of debt and investment, respectively.

In this paper, we adopt a quasi-natural experiment similar to that employed by Valta (2012) and examine how upstream firms adjust their financial policies when a large tariff reduction has occurred in their main downstream industry. We argue that if a large tariff reduction is exogenous to firms, as assumed in the studies discussed above, it should be exogenous to their suppliers as well. Moreover, the import tariff rates of downstream industries are unlikely to be determined by upstream firms.

We use the trade data compiled by Peter Schott to compute the ad-valorem tariff rate for each industry year (Schott, 2008; Pierce & Schott, 2012). These data provide import information for manufacturing industries as defined by the NAICS over the 1989 to 2005 period. The tariff rates are calculated as the fraction of duties collected by US customs over the Free-On-Board customer value of imports. An industry is considered to have experienced a significant tariff reduction in a year if a negative change in the tariff exceeds four times the industry's average cut over the entire sample period. If the average change of the industry's tariff is positive, we consider all negative changes as large cuts. However, if the tariff rate of an industry is smaller than 1% before a reduction, we do not classify the reduction as

large.[9] If an industry experiences more than one significant tariff cut, we use the largest as the event (Valta, 2012). One advantage of this identification approach is that it mitigates omitted-variable concerns by allowing multiple shocks to affect different industries at different times.

Sample Construction

To identify customer-supplier industry pairs, we use the input-output (IO) tables published by the US Bureau of Economic Analysis (BEA), which provide IO accounts of dollar flows among all producers and purchasers in the US economy.[10] The BEA updates the industry classifications used in the IO tables every five years. Prior to 1997, the IO industries were defined based on the 1977 and 1987 SIC codes. From 1997, the industries are based on the 1997 and 2002 NAICS codes. To maintain consistency over the years in our sample, we use the 1997 IO table in our main analysis, which roughly splits our sample period in half. The BEA reports the industry linkages at both the detail (six-digit industry code) and summary (two-digit industry code) levels. We use the detailed industry classification because it is more narrowly defined, and firms appearing in the Compustat are more likely to be representative of the industry.

Using the IO make and use tables, we construct an industry-by-industry matrix showing how much of each supplier industry's output is consumed by other industries (Ahern & Harford, 2014). The greater the share going to a particular industry, the more dependent the supplier is assumed to be on that customer industry. For the competition in customer industries to affect a supplier's financial policies, the customer's purchases must constitute a large fraction of the supplier's total sales. Therefore, in our

[9] Our results remain the same if these tariffs are included. Further, if the significant cuts are defined as three times or five times the industry average, our results only change slightly; however, results generally become stronger for larger cuts.

[10] Ahern and Harford (2014), Pierce and Schott (2016), and Acemoglu et al. (2016) also use the IO table to define upstream and downstream industries. Industry-level relationships allow us to better investigate how shocks at the industry level propagate through industry links. Using industry pairs can also help us to increase the sample size and to address the concern that some unobserved firm-specific shocks affect the existing trading relationship.

analysis, we select as the customer industry the IO industry making the most purchases. For each customer-supplier industry pair, we use the concordance table provided by the BEA to determine each industry's NAICS code. Most of the detailed IO industries can be identified with an NAICS classification at the six-digit level in our sample.[11]

Next, we merge the tariff data with the customer-supplier industry pairs using NAICS codes. To measure the change in import competition more accurately, we use the most detailed level of tariff data available for each industry. In particular, if an IO industry could be identified at the six-digit NAICS level, the tariff cut information at the same level is used. If the industry is matched at a broader NAICS level, the tariff information is aggregated at the appropriate NAICS code. Due to the availability of tariff data for both the customer and supplier industries, our initial sample covers 123 manufacturing IO industries.

To consistently estimate the effect of downstream tariff cuts on supplier firms, we need to ensure that our variable of interest is not related to any shocks that affect suppliers' own industries directly. To address this problem, we exclude from the sample any supplier-customer pairs that operate in the same 4-digit NAICS code industries because these industries are more likely to be directly affected by the same tariff event.[12] Additionally, we exclude supplier industries that themselves experience any significant tariff cuts (larger than four times the industry average) during our sample period to further ensure that the observed effect is not caused by the industry's own shocks. However, suppliers can still experience simultaneous and meaningful tariff cuts. To further isolate the effect of downstream tariff cuts, we control

[11] To ensure that each industry pair has a substantial trading relationship, we follow Ahern (2012) and require that the major customer industry buy at least 1% of a supplier industry's total output. We also conduct analyses by considering all customer industries that have more than 10% of a supplier industry's total output. Specifically, a supplier industry is defined as having experienced an increase in customer import competition if any of its major customer industries has a significant tariff cut, measured at the four-digit NAICS level. Industries that share the same four-digit NAICS code with any of their major customer industries and that themselves experience any significant tariff cut during our sample period are all removed. The results are similar.

[12] In the robustness test, we also examine the impact on leverage after excluding both suppliers that experience a tariff cut at the three-digit NAICS level and all customer-supplier pairs that share the same three-digit NAICS codes. The results are not affected by this exclusion.

for import penetration of supplier industries in all regressions, which captures the overall international competition pressure faced by a supplier industry.[13] Industries whose main customers never experience a large tariff rate reduction are included as control industries.

In the final step of sample construction, we merge the data with our Compustat sample using firms' primary NAICS codes. We additionally exclude firms headquartered in other countries and firms with missing values for our main variables. Our final sample includes 6,758 firm-year observations, of which 2,522 are affected by significant tariff cuts in their downstream industries between 1989 and 2005. Table 1 shows summary statistics of our main sample. Detailed definitions of the variables are given in the appendix. All of the firm-level financial variables are winsorized at their 1st and 99th percentiles to reduce the influence of outliers. We measure a firm's financial leverage using both book- and market-leverage ratios. Book leverage is the ratio of interest bearing debt (long-term debt plus debt in current liabilities) divided by total assets. Market leverage is the ratio of interest bearing debt divided by the sum of total assets plus market equity minus book equity. The median book (market) leverage ratio is 24.9% (19.2%) for our sample.

Empirical model

To examine how increases in downstream import competition affect upstream leverage, we use the following linear regression model:

$$\text{Leverage ratio}_{i,j,t} = \alpha + \beta\ \text{Post-reduction}_{j,t} + \gamma\ \text{Controls}_{i,t-1} + \delta_j + \eta_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable is the book or market leverage ratio of firm i in industry j in given year t. *Post-reduction* is a dummy variable that equals one if industry j's customer industry has experienced a significant tariff rate reduction by year t, and zero otherwise. We include industry fixed effects (δ_j) to

[13] In the robustness test, we also control for export shares of the industry.

control for time-invariant heterogeneity across industries, where industry is defined using detailed IO industry classification, and year fixed effects, denoted by η_t, to control for time trend.

In the regressions we also control for a number of known determinants of a firm's leverage, including firm size (logarithm of total assets), growth opportunities (as proxied by the market-to-book ratio), profitability, asset tangibility, cash flow volatility, and tax credit (e.g., Frank & Goyal, 2009).[14] However, in our main specification, we do not include profitability, cash flow volatility, or tax credit because these variables are likely to be endogenously affected by the downstream tariff cuts and including them would bias our estimates (Roberts & Whited, 2013). To control for the impact of foreign competition faced by supplier firms, we include import penetration of the supplier's industry, calculated as the ratio of imports to the sum of domestic production (Bertrand, 2004; Xu, 2012). Finally, we separately control for the effect of domestic competition of supplier industry by including the Herfindahl-Hirschman Index (HHI), calculated based on all Compustat firms.

RESULTS

Baseline results

Table 2 reports the estimation results for both book and market leverage, with robust standard errors adjusted for firm clustering.[15] Columns (1) and (3) present estimates from our baseline regressions. We find that the coefficient estimates on the *Post-reduction* dummy are negative and statistically different from zero in both book and market leverage regressions. Columns (2) and (4) present estimates obtained after we add more firm-level controls. Adding firm profitability, cash-flow volatility, and tax credit as additional control variables does not change the estimates on *Post-reduction*. Because none of our later

[14] In an unreported test, we also include R&D, customer industry leverage, customer industry R&D, and customer industry HHI (Dasgupta & Sengupta, 1993; Chu, 2012; Kale & Shahrur, 2007; Hennessy & Livdan, 2009), but the results do not change.

[15] Our results remain the same if we cluster the standard errors at the industry level.

results are qualitatively affected by the inclusion of these additional variables, we do not include them in the rest of our analysis out of endogeneity concerns.

The effect of tariff cuts in customer industries on supplier leverage is also economically meaningful. All else being equal, a significant tariff reduction in the customer industry is associated with a 5.4 percentage-point reduction in supplier firms' book leverage and an approximately 4 percentage-point reduction in their market leverage. To put the magnitude of this decrease in perspective, the marginal effect is about as large as the marginal impact of a one-standard-deviation decrease in a firm's asset tangibility.

The estimated coefficients of the other control variables in Table 2 are generally in line with those reported in previous studies and have the expected signs. For instance, leverage correlates negatively with profitability and tax credit and positively with asset tangibility. We also find a negative, albeit not statistically significant, coefficient for the supplier industry's import penetration. This may be due to the fact that we exclude from our analysis all supplier industries that have significant tariff reductions.

To better establish the causality, we next study the dynamic effects of the tariff reductions on supplier leverage. Following Bertrand & Mullainathan (2003), we replace the *Post-reduction* dummy with four dummies: Pre^{-1}, $Post^{0}$, $Post^{1}$, and $Post^{2+}$. Pre^{-1} is a dummy that equals one if the firm's customer industry will experience a significant tariff reduction one year from now, $Post^{0}$ is a dummy that equals one if the firm's customer industry has experienced a significant tariff reduction this year, $Post^{1}$ is a dummy that equals one if the firm's customer industry had a significant tariff cut one year ago, and $Post^{2+}$ is a dummy that equals one if the customer industry experienced a significant tariff cut at least two years ago. The dummy variable Pre^{-1} allows us to assess whether any significant leverage adjustment can be found prior to the large tariff cut in customer industries. If the tariff reduction was indeed a surprise to supplier firms and the firms subsequently adjust their leverage, we should not see a significant effect on leverage before the reduction, as captured by Pre^{-1}.

The results are reported in Table 3. The estimated coefficient of Pre^{-1} is not significantly different from zero; meanwhile, the coefficients on the post-year dummies are all significantly negative. Moreover,

the coefficient on $Post^0$ is economically smaller than those on $Post^1$ and $Post^{2+}$, which is consistent with a causal interpretation of our results. This suggests that the leverage adjustment is greater when import competition intensifies after the tariff policy is implemented. Overall, there appears to be no significant effect on leverage prior to the downstream tariff cut, but only significant and increasing effects after the cut.

Robustness tests

Table 4 reports outcomes of tests to ensure the robustness of our results. Panel A presents the results from book leverage regressions. First, we control for export intensity to remove the confounding effect of potential export shocks. Trade agreements are often bilateral or multilateral, meaning that an import tariff reduction is likely to be associated with simultaneous reductions in the export tariff, which can lead to market expansion opportunities for domestic firms. To ensure that our results are not driven by export shocks in the upstream industry, we include the supplier industry's export intensity in the baseline regression. We follow Colantone & Sleuwaegen (2010) and calculate the export intensity as industry exports divided by the sum of domestic production and industry imports. Column (1) shows that our results are not affected.

Second, in column (2) we exclude zero-leverage firms from our analysis to avoid any bias in our estimates that might be driven by these firms, which are regarded special in many respects (Strebulaev & Yang, 2013). The subsample results show very similar effects. Third, we reexamine the effect of downstream tariff cuts on the sample by excluding firms that have never experienced such cuts. Industries whose downstream industries never experienced large tariff cuts may be fundamentally different from those that have, and the difference may drive the observed effect rather than the downstream tariff reductions themselves. As shown in column (3), the estimated coefficient on *Post-reduction* remains negative and statistically significant.

Fourth, we reexamine the effect of downstream import competition by replacing the industry fixed effects with firm fixed effects. As column (4) shows, the magnitude of the leverage effect is reduced, but

it is still statistically and economically significant. Fifth, to further ensure that our results are not driven by tariff shocks common to supplier firms, we redo our analysis by excluding firms that share the same three-digit NAICS codes with their main customers and that have experienced a large tariff cut at the three-digit NAICS level. Results in column (5) show that our findings are again robust to this alternative sample.

Sixth, we re-estimate the impact on supplier book leverage using an industry-level regression. Because customer-supplier relationships are defined at the industry level, industries with more firms received more weight in our original tests. To address the concerns that these over-weighted industries or outliers may drive the results, we convert all firm-level variables into industry averages so that there is only one observation per industry-year pair. This robustness test ensures that each industry is equally represented in the analysis. The results in column (6) show that the effects are not driven by over-represented industries. The estimated effect of import competition in customer industries on supplier book leverage is still economically large.

Finally, because the main analyses use customer-supplier pairs identified at the industry level that do not necessarily capture actual trading relationships, we reexamine the effect of downstream competition using customer-supplier pairs identified at the firm level. According to the statement of financial accounting standards (SFAS) Nos. 14 and 131, public companies are required to disclose the identity of any customer that accounts for more than 10% of their annual sales.[16] We follow the literature to link these customers to companies covered by Compustat (Fee & Thomas, 2004; Kale & Shahrur, 2007; Cohen & Frazzini, 2008). A supplier firm is treated as having experienced an increase in the import competition of its customer industry if any of its principal customers has a significant tariff cut in its industry measured at the four-digit NAICS level. We follow our earlier approach and exclude firms that

[16] Some firms also report customers that account for less than 10% of their sales but which they consider important to their business. Our results are not sensitive to excluding those customers.

share a four-digit NAICS code with their customers and firms that themselves experience any significant tariff cut during our sample period. Results from supplier-customer pairs at the firm level are reported in column (7). As expected, we find that supplier firms lower their leverage after their customers experience a significant competitive shock.

In Panel B of Table 4, we ensure the robustness of our findings for market leverage. We find that the estimated coefficients on the *Post-reduction* dummy are significantly negative in all regressions. As another robustness test, we also construct an alternative variable to replace the *Post-reduction* dummy by considering all customer industries. In particular, for each supplier industry in each year, we compute the sales-weighted fraction of customer industries that have experienced large tariff reductions. Unreported tests show similar results. Overall, these findings show that changes in the degree of import competition in customer industries have both quantitative and qualitative effects on supplier leverage.

Matched sample results

Another potential concern about our analysis is that suppliers whose customers face intensified import competition may be different from other suppliers in ways that are systematically related to supplier firms' leverage choices. To address such endogeneity, we do a difference-in-differences analysis around large tariff reductions using the matched sample. Furthermore, because we can identify the event year for the control firms, the matched sample allows us to examine whether a leverage adjustment appears shortly after the event. The *Post-reduction* dummy in the main specification captures the effect observed in all years after the event.

We use Abadie & Imbens's (2002) matching estimator (full covariate) and construct a matched sample around the major tariff cuts in customer industries. Specifically, for each treated firm the matching estimator selects the nearest neighbor with a replacement. We define a treated supplier as a firm operating in an industry whose downstream industry experiences a large tariff reduction in year *t*; a nontreated supplier is a firm whose downstream industry never experiences such a reduction. A control supplier is then selected from the nontreated suppliers; it is the closest match to a treated supplier in terms of firm

size, book leverage, and market-to-book, measured one year before the tariff reduction, or year $t-1$. This matching procedure ensures that the treated and control suppliers closely resemble each other in terms of key firm characteristics ex ante but differ in whether they receive the large tariff reduction treatment. The difference between the change in leverage for treated and control firms thus reveals the causal effect of changes in the degree of downstream import competition.

We run the baseline regression model using the matched sample for the period of $t-1$ to $t+2$. Columns (1) and (2) in Panel A of Table 5 report that the coefficients of *Post-reduction* are negative and statistically significant in the book leverage regressions. All else being equal, a downstream tariff reduction decreases supplier leverage by about 4 percentage points by the end of the year following the reduction. Columns (3) and (4) show that the estimated coefficient of the *Post-reduction* dummy is again negative in regressions of market leverage. Overall, results in Panel A of Table 5 confirm, again, that suppliers decrease their leverage significantly after their downstream industry experiences a large tariff reduction.

Next, we repeat the analyses using placebo periods to examine whether the same pattern of leverage changes is observed in periods that do not involve significant tariff cuts in downstream industries. A similar pattern would suggest that the documented leverage effect could merely be a reflection of a general trend over our sample period. We perform this falsification test using years (−3) relative to the actual event years using the same treated firms. The same matching procedure used in Panel A is used to select control firms. We then examine the change in firm leverage from year (−3) to year (−1). The results are presented in Panel B of Table 5. We find that the coefficient on *Post-reduction* is not significantly different from zero in any of the regressions, lending further credence to our argument that the observed changes in supplier leverage really stem from the downstream tariff reductions.

Cross-sectional differences in the effect on supplier leverage

In this section we explore cross-sectional variations in the effects of the import competition in customer industries on supplier leverage. Specifically, we explore whether the impact of downstream

tariff cuts on supplier leverage depends on the strength of the customer-supplier relationship and on the financial health of suppliers before the cuts. Such analysis can help alleviate the concern that our documented effects may be due to some omitted variables. It also helps us understand the underlying channel through which downstream import competition affects upstream leverage.

Relationship-specific investment along the supply chain

To investigate whether suppliers are more likely to reduce leverage when their relationships with customers involve more relationship-specific investments, we use three proxies to measure the investments. The first measure is sales dependence. The more a supplier relies on a customer for generating sales, the more likely the supplier will be to make a relationship-specific investment with the customer and to be sensitive to customer's performance. Banerjee, Dasgupta, & Kim (2008) argue that such a supplier is indeed concerned more about the financial health of its customer. Similarly, Fee & Thomas (2004) show that a supplier is greatly affected by customers' mergers when the supplier is relatively more reliant on the merging customers. This evidence leads us to expect that the greater the supplier's dependence on sales to the customer, the stronger the effect customer-industry tariff cuts on the supplier's leverage should have.

The second measure is a supplier's output specificity. Giannetti, Burkart, & Ellingsen (2009) argue that differentiated goods are more likely to be tailored to the need of a particular customer. Suppliers of differentiated goods should have greater relationship-specific exposure to their customers and may have difficulty finding alternative customers for their differentiated products (see also Grinblatt & Titman, 2002). Titman (1984) and Titman & Wessels (1988) argue that product uniqueness should affect a firm's capital structure because the firm's customer/supplier would incur larger costs derived from the relationship-specific investments upon a firm's liquidation decision. We thus expect suppliers producing differentiated goods to be more affected by changes in the foreign competition that their customers face.

The third measure is a supplier firm's industry diversification. Plausibly, firms focusing on a certain customer industry are likely to make investments that are specific to the customer industry. Moreover,

studies have shown that there is an important co-insurance effect when diversified firms encounter adverse economic conditions (Gopalan & Xie, 2011; Kuppuswamy & Villalonga, 2016; Matvos & Seru, 2014). Since diversified firms often trade with customers in different industries, they should be better able to diversify away some of the customer-related risk in an industry. In other words, they are less exposed to their customer-industry shocks.

To test these conjectures, we separate sample firms into two groups based on each of the proxies for relationship-specific investments. We then estimate the baseline models across subgroups via a seemingly unrelated regression system (SUR) and compare the coefficients on the *Post-reduction* dummy. Table 6 reports the results. For brevity, we only present the estimates of *Post-reduction*. The first row shows the impact on supplier leverage estimated from two subsamples, divided according to sales dependence, which is calculated as the share of the supplier industry's total revenue coming from the customer industry (Ahern, 2012; Ahern & Harford, 2014). We split the full sample into two subgroups based on whether the supplier industry's sales to the major customer industry is above or below the sample median. Consistent with our expectation, increases in import competition of downstream industries have a greater impact on the leverage of more dependent suppliers than on that of less dependent suppliers. Wald tests show that the estimates of *Post-reduction* across subgroups are statistically different.

The second row of Table 6 reports the results using subsamples based on suppliers' output specificity. Following the same classifications used by Giannetti, Burkart, & Ellingsen (2009), we split the sample into suppliers outputting differentiated and standardized goods. The impact on supplier leverage is statistically significant only for suppliers producing differentiated goods. The coefficients across the two groups are also statistically different in the book leverage regressions.

The last row of Table 6 reports the subsample results based on the supplier firm's industry diversification. A supplier firm is defined as diversified if it has segments operating in different three-

digit SIC industries.[17] Consistent with our conjecture, suppliers with a less-diversified business (operating in one three-digit SIC industry) make greater leverage adjustments following major downstream tariff cuts.

Overall, these results are highly consistent with the prediction that the spillover effects of import competition in customer industries on supplier leverage are stronger when suppliers are involved in higher relationship-specific investments with their customers.

Ex-ante financial health

We next examine whether the documented leverage effects depend upon supplier firms' ex-ante financial health. To test the hypothesis, we split firms into two groups based on their financial conditions. Unlike the tests reported in Table 6, supplier firms' financial conditions are very likely to be affected by tariff reduction. Therefore, we conduct our analysis using the matching sample and separate firms based on their financial conditions measured at year (−1) for both the treated and the control groups. In particular, for each firm at year (−1), we construct three industry-year median-adjusted measures: leverage, Z-score, and Campbell et al. score (Campbell, Hilscher, & Szilagywe, 2008). For easier interpretation, we adjust a firm's Z-score by multiplying the score by −1 so that higher leverage, a higher Z-score, or a higher Campbell et al. score all relate to higher default probability. We then separate the firms into two groups based on whether a firm's distress risk is below or above the sample median. Finally, we estimate the baseline regressions on the effects of tariff cuts in customer industries on supplier leverage for each group.

The results are reported in Table 7. As anticipated, we find that the significant effects of tariff cuts in customer industries on supplier leverage are only observed among firms with higher ex ante distress risk.

[17] The NAICS information on segment is not complete. The results are similar if we manually match SIC codes to NAICS.

The absolute values of the coefficients are much larger for that group, and in all cases Wald tests reject the equality of coefficients across subgroup estimates. As a robustness check we also use some alternative distress risk measures, including O-score and the Merton model's Expected Default Frequency (EDF), estimated using the procedure described by Bharath & Shumway (2008). Unreported results show that firms with higher O-score or EDF have larger leverage adjustments. Overall, these results suggest that firms with higher ex ante probability of default are more likely to de-lever when competition intensifies in customer industries.

Issuance based on change regressions

The results reported in the previous sections establish that firms lower their leverage when their customers experience large reductions in import tariffs. In this section, we investigate how firms adjust their capital structure. Following Xu (2012), we examine the adjustment of capital structure using a change regression specification. In particular, we estimate our baseline equation (1) in first differences, where *Post-reduction* is replaced by change in tariff rate (ΔTariff rate). Lagged annual changes of the explanatory variables in the main regression are included as control variables. Additionally, we include lagged leverage to capture the cumulative impact of past corporate decisions on capital structure.

The regression results are reported in Table 8. In columns (1) and (2), the dependent variables are net debt issuance and net stock issuance, respectively, constructed using firms' balance sheet data. In columns (3) – (6), the dependent variables—*Debt issue*, *Debt retirement*, *Equity sale*, and *Equity purchase*—are constructed using data from firms' cash flow statements. In columns (1) and (2), we find that firms experiencing greater downstream tariff reductions have a significantly higher net stock issuance. The results from cash flow statement analysis are similar. As shown in column (5), firms issue significantly more equity when their major customers suffer larger tariff reductions. In the regressions of debt issuance (column 3) and debt retirement (column 4), however, the coefficients of the tariff change are not significant.

Taken together, we show that firms lower their leverage mainly by issuing more new equity when downstream import competition intensifies. These results are in line with the argument of Lemmon & Zender (2010), who show that firms rely on equity financing to keep away from distress and to save debt capacity for the future.

Other capital structure policies

Liquidity and net debt

In this section, we extend our analysis to cash policies because cash is often considered as negative debt (Acharya, Almeida, & Campello, 2007). In particular, we investigate whether supplier firms manage liquidity more conservatively when more intense import competition in their customer industries increases their default risk (Acharya, Davydenko, & Strevulaev, 2012).[18] We conjecture that if supplier firms expect lower future cash flow (or higher uncertainty of future cash flow), they would choose to hold more cash as a buffer against potential cash shortfalls.

In Table 9 we examine firms' holding of liquid assets using three measures: cash, net working capital, and net debt. All regressions include the same set of controls as those in Table 2. Results from the main specification are reported first, followed by results from firm-fixed-effects regressions. Columns (1) and (2) show that firms significantly increase their cash holdings after tariff reductions in downstream industries. This finding supports our conjecture that firms want to have more precautionary cash when they face increased default risk. Results in columns (3) and (4) indicate that suppliers increase their overall liquid assets, summarized in net working capital, in response to intensified downstream

[18] We also examine whether there is any change in short-term debt and short-term liabilities in an unreported test. Examining short-term liabilities is important not only to check liquidity policy, but also to confirm that firms choose to lower leverage. What we document in previous sections mainly suggests that firms reduce their long-term liabilities. Firms may merely change the composition of their debt from long to short term. We find that firms reduce leverage in both the short and long term to maintain more conservative financial policies.

competition. We finally show that net debt is even deeply lowered in columns (5) and (6). Overall, when firms' distress risk increases due to intensified import competition in downstream industries, they increase their holdings of liquid assets.

Our findings on both equity issuance and cash holding indicate that proceeds from equity issuance might be used to increase cash holdings, which is consistent with the evidence documented in other studies. For instance, McLean (2011) shows that over time firms tend to hold more cash using proceeds from equity issuance, and that this decision is mainly driven by precautionary motives arising from increased future cash flow volatility. Itzkowitz (2013) shows that when firms have a concentrated customer base, they hoard more cash through equity issuance as a precaution against high operating risk. Finally, our findings suggest that while firms do increase cash holdings, they do not necessarily retire debt to stay away from financial distress. This is in line with the argument that saving cash allows firms to hedge future investment against cash shortfalls (Archarya, Almeida, & Campello, 2007).

Trade credit

Finally, we examine a firm's trade credit policy. Although trade credit is a very expensive source of external financing—the equivalent one-year interest rate for a typical trade credit contract is about 44% (Yang, 2011)—it is nevertheless the single most important source of short-term financing and comprises a significant part of corporate liquidity management. Examining it gives a more comprehensive understanding of the impact of downstream competition on capital structure.

Following the literature, we measure trade credit as accounts payable/receivable. The results are presented in Table 10, in which the independent variables are the same as in Table 2. In columns (1) and (2), we normalize trade credit by total assets, to draw a correspondence to leverage (Petersen & Rajan, 1997). The negative coefficients of the *Post-reduction* dummy indicate both that firms' short-term financing through accounts payable significantly decreases after their downstream import competition decreases and that firms significantly reduce their lending to customers through accounts receivable. In columns (3) and (4), we report regression results when we measure trade credit respectively as accounts

payable divided by cost of goods sold and receivables divided by sales. The coefficients of the *Post-reduction* dummy are negative but not statistically significant. Overall, the results indicate that firms experience contraction due to tougher import competition in their downstream industries and that they do not necessarily extend more trade credit to help out their troubled customers.

Barrot (2016) shows that restriction on the provision of trade credit results in a significant drop in default probability. Consistent with the evidence, firms may attempt to stay away from distress by reducing their provision of trade credit to customers facing tougher competition. Similarly, Love, Preve, & Sarria-Allende (2007) show that provision of trade credit shrank in emerging markets during the period following the Asian Financial Crisis. Our finding on the reduction of accounts payable suggests that as expensive as trade credit is, supplier firms may try to use less of it if they expect lower future cash flows. Suppliers of the upstream firms may even contribute to reduction in accounts payable by their reluctance to extend more credit because they want to minimize their risk exposure along the supply chain. Overall, the results from the trade credit analyses suggest that firms adopt more conservative trade credit policy to decrease their exposure to the negative shock originating in downstream industries.

CONCLUSION

Prior research suggests that nonfinancial stakeholders such as customers and suppliers are important to firms' capital structure decisions. We extend the literature by providing the first empirical evidence on the spillover effect of import competition in downstream industries on upstream capital structure. Our main finding is that upstream firms choose significantly lower leverage after downstream industries experience large tariff reductions. This effect is magnified when the relationship-specific investment in the customer-supplier relationship is higher and when firms have greater concern over distress. Firms lower their leverage mainly by extending equity issuance. Further, upstream firms opt for more conservative financial policies by increasing their cash reserves and decreasing their trade credit.

By showing that downstream product markets can affect upstream firms' capital structure, this paper enhances our understanding of the total impact of import competition on various firm decisions. Our

results indicate that the effect of import competition on domestic firms goes beyond the industry where a trade policy is actually adopted. Although this paper focuses on the impact of downstream import competition on upstream capital structure, we also looked at the impact of upstream competitive shocks on downstream firms. Acemoglu et al. (2016) point out that the impact of upstream competition on downstream firms is unclear. We find that the coefficient on the *Post-reduction-upstream* dummy is positive, though not statistically significant.[19] The positive sign is consistent with the argument that increased upstream competition may benefit downstream firms by lowering input prices (Acemoglu et al., 2016; Pierce & Schott, 2016).

This paper is also related to the literature on the interaction between product market competition and capital structure. Most existing studies in this literature have focused on the shocks directly affecting the firm's own industry.[20] Our study suggests that it may be important to investigate firms' strategic responses in their product market competition when they face a significant change in their product market environment that is caused by a competition shock in downstream or upstream industries. This could be a fruitful research question for future studies.

[19] The results are available upon request.

[20] Most of the studies on this literature focus on the impact of financial structure on product market competition. These studies, such as Zingales (1998), Campello (2003, 2006), and Kim (2016), generally conclude that financial weakness hurts product market performance. On the impact of competition on financial structure, MacKay & Philips (2005) and Lyandres (2006) show that leverage is negatively related to the industry competition.

Appendix. Variable definitions

Variables	Definitions
ΔTariff rate	The annual change in import tariff rate of customer industries. Source: Peter Schott's website.
Accounts payable to assets	Accounts payable/Total assets. Source: Compustat.
Accounts receivable to assets	Accounts receivable/Total assets. Source: Compustat.
Accounts payable to COGS	Accounts payable/Cost of goods sold. Source: Compustat
Accounts receivable to sales	Accounts receivable/Sales. Source: Compustat
Book leverage	(Long-term debt + Debt in current liabilities)/Total assets. Source: Compustat.
Cash	Cash and cash equivalents/Total assets. Source: Compustat.
Cash flow volatility	The standard deviation of EBIT in the last five years scaled by total assets. Source: Compustat.
Change of EPS	The change in earnings per share from last year scaled by stock price. Source: CRSP.
Debt issue	The issuance of long-term debt divided by the prior year's total assets. Source: Compustat.
Debt retirement	The debt reduction divided by the prior year's total assets. Source: Compustat.
Equity purchase	The purchase of equity divided by the prior year's total assets. Source: Compustat.
Equity sale	The sale of equity divided by the prior year's total assets. Source: Compustat.
Export intensity	Industry exports divided by the sum of domestic products and imports. Source: Peter Schott's website.
Import penetration	Industry imports divided by the sum of domestic product and imports for the industry. Source: Peter Schott's website.
Industry concentration	The sales-based Herfindahl index of the firm's four-digit NAICS industry. Source: Compustat.
Market leverage	(Long-term debt + Debt in current liabilities)/Market value of assets. Source: Compustat.
Market-to-book	(Total assets − Book equity + Market value of equity)/Total assets. Source: Compustat.
Net debt	(Long-term debt + Debt in current liabilities − Cash and cash equivalents)/Total assets. Source: Compustat.
Net debt issuance	The change in debt/The prior year's total assets. Source: Compustat.
Net stock issuance	The change in outside common equity/The prior year's total assets. Source: Compustat.
NWC	(Current assets − Current liabilities)/Total assets. Source: Compustat.
Post-reduction	An indicator variable that takes the value of one if a significant tariff rate reduction has occurred in the customer industry. Source: Peter Schott's website.
Profitability	EBIT/Total assets. Source: Compustat.

Variables	Definitions
Tangibility	Net property, plant and equipment/Total assets. Source: Compustat.
Tax credit	Investment tax credit/Total assets. Source: Compustat.
Total assets	Total assets. Source: Compustat.

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Table 1: Summary Statistics

This table presents summary statistics for our main sample. The sample includes manufacturing companies over the period 1989 to 2005 that do not share the same four-digit NAICS code with their main customer industry and that have not experienced significant tariff reductions during the sample period. Detailed variable definitions are provided in the appendix. All firm-level financial variables are winsorized at the 1st and 99th percentiles.

	N	Mean	Std Dev	Min	Median	Max
Book leverage	6,758	0.249	0.245	0.000	0.216	1.405
Market leverage	6,715	0.192	0.187	0.000	0.148	0.713
Post-reduction	6,758	0.492	0.500	0.000	0.000	1.000
Log (Total assets)	6,758	5.630	2.152	−0.061	5.638	9.968
Market-to-book	6,758	2.095	2.602	0.538	1.328	20.700
Tangibility	6,758	0.320	0.201	0.010	0.302	0.802
Import penetration	6,758	0.286	0.144	0.005	0.258	0.941
Industry concentration	6,758	0.110	0.103	0.035	0.075	0.697
ΔTariff rate	6,758	−0.144	0.274	−1.927	−0.055	1.684
Net debt issuance	5,746	0.021	0.149	−0.349	0.000	0.846
Net equity issuance	5,717	0.118	0.417	−0.128	0.005	3.133
Asset growth	5,809	0.125	0.400	−0.586	0.047	2.351
Debt issue	5,311	0.097	0.216	0.000	0.002	1.342
Debt retirement	5,567	0.076	0.153	0.000	0.021	0.993
Equity sale	5,567	0.073	0.248	0.000	0.004	1.747
Equity repurchase	5,124	0.010	0.028	0.000	0.000	0.172
Cash	6,757	0.168	0.198	0.000	0.082	0.818
NWC	5,760	0.287	0.268	−0.951	0.282	0.846
Net debt	6,757	0.080	0.366	−0.795	0.120	1.162
Receivables to assets	5,757	0.152	0.087	0.000	0.142	0.424
Payables to assets	5,809	0.093	0.077	0.006	0.074	0.529
Receivables to sales	5,753	0.159	0.078	0.000	0.148	0.542
Payables to cogs	5,757	137.068	311.398	0.078	27.406	1968.047

Table 2: Effect of Downstream Tariff Reduction on Supplier Leverage

The table presents results from baseline regressions of supplier leverage on customer tariff reduction. The sample comprises manufacturing companies over the period 1989 to 2005 that do not share the same four-digit NAICS code with their main customer industry and that have not experienced significant tariff reductions during the sample period. The dependent variable in columns (1) and (2) is *Book leverage*, and in columns (3) and (4), *Market leverage*. Detailed variable definitions are provided in the appendix. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Book leverage		Market leverage	
	(1)	(2)	(3)	(4)
Post-reduction	−0.054***	−0.054***	−0.039***	−0.039***
	(0.012)	(0.014)	(0.009)	(0.011)
Log (Total assets)	−0.015**	0.001	−0.003	0.003
	(0.006)	(0.006)	(0.003)	(0.004)
Market-to-book	0.010**	−0.004*	−0.011***	−0.016***
	(0.004)	(0.002)	(0.002)	(0.004)
Tangibility	0.285***	0.267***	0.170***	0.177***
	(0.087)	(0.085)	(0.047)	(0.042)
Import penetration	−0.171	−0.190	−0.131	−0.147
	(0.162)	(0.180)	(0.124)	(0.138)
Industry concentration	−0.264***	−0.218***	−0.167**	−0.150**
	(0.088)	(0.077)	(0.073)	(0.063)
Profitability		−0.227***		−0.093***
		(0.048)		(0.032)
Cash flow volatility		0.096***		−0.001
		(0.029)		(0.022)
Tax credit		−0.598***		−0.691***
		(0.201)		(0.162)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	6,758	6,133	6,715	6,092
R-squared	0.214	0.270	0.358	0.374

Table 3: Effect of Downstream Tariff Reduction on Supplier Leverage over Time

The table presents results from regressions of supplier leverage on customer tariff reduction. The sample comprises manufacturing companies over the period 1989 to 2005 that do not share the same four-digit NAICS code with their main customer industry and that have not experienced significant tariff reductions during the sample period. The dependent variable in column (1) is *Book leverage*, and in column (2), *Market leverage*. Detailed variable definitions are provided in the appendix. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Book leverage	Market leverage
	(1)	(2)
$Post^{2+}$	−0.062***	−0.049***
	(0.023)	(0.016)
$Post^{1}$	−0.051**	−0.052***
	(0.020)	(0.014)
$Post^{0}$	−0.040**	−0.031**
	(0.018)	(0.012)
Pre^{-1}	−0.025	−0.017
	(0.017)	(0.012)
Log (Total assets)	−0.015***	−0.003
	(0.004)	(0.003)
Market-to-book	0.010***	−0.011***
	(0.004)	(0.001)
Tangibility	0.285***	0.170***
	(0.040)	(0.028)
Import penetration	−0.147	−0.117
	(0.166)	(0.121)
Industry concentration	−0.272***	−0.178***
	(0.084)	(0.063)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	6,758	6,715
R-squared	0.213	0.358

Table 4: Effect of Downstream Tariff Reduction on Supplier Leverage: Robustness Tests

This table reports results from regressions of leverage for different samples. The dependent variable in Panel A is *Book leverage*, and in Panel B, *Market leverage*. Column (1) includes export intensity as an additional control variable. Column (2) excludes zero-leverage firms from the main sample. Column (3) includes only firms that experienced large tariff cuts in downstream industries within our sample period. Column (4) controls for firm fixed effects. Column (5) includes only firms that do not share the same three-digit NAICS code with their main customer industry. Column (6) uses industry-level observations created by collapsing the main firm-level observations to industry averages. Column (7) includes customer-supplier pairs that are identified at the firm level by Compustat customer segment data. Detailed variable definitions are provided in the appendix. Robust standard errors, adjusted for firm-level clustering (industry-level clustering in column 6), are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Book leverage

	Control for export intensity	Exclude zero-leverage firms	Treated industries only	Firm fixed effects	Different NAICS3	Industry level	Firm-level customers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post-reduction	−0.054***	−0.050***	−0.030**	−0.020**	−0.052***	−0.049*	−0.043*
	(0.014)	(0.015)	(0.015)	(0.009)	(0.018)	(0.028)	(0.025)
Log (Total assets)	−0.015***	−0.022***	−0.018***	0.020***	−0.019***	−0.005	−0.008
	(0.004)	(0.004)	(0.005)	(0.007)	(0.006)	(0.021)	(0.005)
Market-to-book	0.010***	0.015***	0.008*	−0.004	0.019***	−0.010	−0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.010)	(0.003)
Tangibility	0.285***	0.234***	0.344***	0.277***	0.192***	0.029	0.369***
	(0.040)	(0.042)	(0.047)	(0.069)	(0.059)	(0.157)	(0.068)
Import penetration	−0.198	−0.123	−0.379*	−0.204	0.059	−0.278	−0.500**
	(0.174)	(0.168)	(0.195)	(0.143)	(0.212)	(0.252)	(0.245)
Industry concentration	−0.254***	−0.364***	−0.221***	−0.058	−0.286**	−0.165	−0.005
	(0.086)	(0.086)	(0.084)	(0.060)	(0.111)	(0.139)	(0.122)
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,758	5,831	4,236	6,639	3,629	676	1,670
R-squared	0.214	0.195	0.181	0.699	0.217	0.444	0.280

Panel B: Market leverage

	Control for export intensity	Exclude zero-leverage firms	Treated industries only	Firm fixed effects	Different NAICS3	Industry level	Firm-level customers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post-reduction	−0.040***	−0.037***	−0.018**	−0.025**	−0.034**	−0.049*	−0.046**
	(0.010)	(0.011)	(0.007)	(0.010)	(0.014)	(0.025)	(0.022)
Log (Total assets)	−0.003	−0.008***	−0.005*	0.036***	−0.006	0.022	−0.002
	(0.003)	(0.003)	(0.003)	(0.006)	(0.004)	(0.015)	(0.004)
Market-to-book	−0.011***	−0.015***	−0.010***	−0.007***	−0.012***	−0.014**	−0.017***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.006)	(0.002)
Tangibility	0.171***	0.143***	0.207***	0.196***	0.128***	−0.080	0.204***
	(0.028)	(0.029)	(0.035)	(0.044)	(0.046)	(0.101)	(0.045)
Import penetration	−0.216*	−0.083	−0.146	−0.180	0.135	−0.234	−0.555***
	(0.121)	(0.123)	(0.154)	(0.112)	(0.147)	(0.149)	(0.183)
Industry concentration	−0.137**	−0.232***	−0.144**	0.043	−0.057	−0.037	0.057
	(0.065)	(0.063)	(0.062)	(0.049)	(0.086)	(0.106)	(0.116)
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,715	5,794	4,207	6,715	3,602	670	1,654
R-squared	0.358	0.327	0.319	0.758	0.310	0.585	0.366

Table 5: Matching Sample Analysis

This table reports results from the matching analysis. Panel A contains analysis based on a matched sample around large tariff reductions in downstream industries. For each treated firm (whose customer industry has a large tariff reduction at year *t*), a control firm is matched based on its size, market-to-book, and book leverage measured at $t-1$. The dependent variable in columns (1) and (2) is *Book leverage*, and in columns (3) and (4), *Market leverage*. Columns (1) and (3) report results for the period of ±1 year around the tariff reduction year *t*, and columns (2) and (4) are for the period from one year before to two years after the reduction. Panel B contains placebo tests, for which the estimation is done three years before the actual tariff cuts. Detailed variable definitions are provided in the appendix. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A

	Book leverage		Market leverage	
	$t-1$ to $t+1$	$t-1$ to $t+2$	$t-1$ to $t+1$	$t-1$ to $t+2$
	(1)	(2)	(1)	(2)
Post-reduction	−0.034*	−0.041**	−0.036**	−0.041***
	(0.020)	(0.020)	(0.015)	(0.015)
Log (Total assets)	−0.015*	−0.015**	−0.005	−0.005
	(0.008)	(0.007)	(0.005)	(0.005)
Market-to-book	−0.017***	−0.017***	−0.027***	−0.026***
	(0.004)	(0.004)	(0.005)	(0.004)
Tangibility	0.269***	0.281***	0.147***	0.139***
	(0.072)	(0.073)	(0.053)	(0.051)
Import penetration	−0.648*	−0.521	−0.592*	−0.355
	(0.376)	(0.335)	(0.349)	(0.296)
Industry concentration	−0.254*	−0.234*	−0.230	−0.181
	(0.132)	(0.125)	(0.143)	(0.137)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1,057	1,353	1,048	1,343
R-squared	0.293	0.279	0.397	0.393

Panel B

	Book leverage		Market leverage	
	$t-1$ to $t+1$	$t-1$ to $t+2$	$t-1$ to $t+1$	$t-1$ to $t+2$
	(1)	(2)	(1)	(2)
Post-reduction	−0.020	−0.027	0.000	−0.011
	(0.032)	(0.031)	(0.013)	(0.014)
Log (Total assets)	−0.012	−0.007	−0.005	−0.003
	(0.008)	(0.007)	(0.005)	(0.004)
Market-to-book	−0.026***	−0.025***	−0.027***	−0.027***
	(0.005)	(0.005)	(0.008)	(0.008)
Tangibility	0.132	0.106	0.062	0.046
	(0.140)	(0.111)	(0.065)	(0.055)
Import penetration	−0.269	−0.194	−0.819**	−0.453*
	(0.609)	(0.323)	(0.313)	(0.225)
Industry concentration	−0.035	−0.003	−0.107	−0.069
	(0.227)	(0.140)	(0.142)	(0.096)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	551	708	541	696
R-squared	0.275	0.281	0.391	0.399

Table 6: Supplier Leverage and Relationship-Specific Investments

This table reports the results from a series of subsample estimations. The dependent variable in columns (1) and (2) is *Book leverage*, and in columns (4) and (5), *Market leverage*. Columns (3) and (6) report the statistical significance from a Wald test of the equality of coefficients. Two firm subgroups are formed based on (a) whether the supplier industry's sale to the major customer industry is above or below the sample median, (b) whether the supplier produces differentiated goods, and (c) whether the firm has more than one business segment measured at the three-digit SIC level. All regressions include the same set of control variables as in Table 4. For brevity, only the coefficients of the *Post-reduction* dummy are reported. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Book leverage			Market leverage		
	Low	High	Difference	Low	High	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Sales dependence	−0.028*	−0.060***	*	−0.021*	−0.067***	**
	(0.015)	(0.012)		(0.012)	(0.015)	
	4,029	2,729		4,004	2,711	
Differentiated goods	−0.013	−0.063***	*	−0.020	−0.042**	
	(0.028)	(0.023)		(0.021)	(0.014)	
	2,440	4,293		2,428	4,262	
Non-diversified business	−0.027	−0.064***	**	−0.016	−0.048***	*
	(0.024)	(0.019)		(0.024)	(0.015)	
	1,914	4,844		1,901	4,814	

Table 7: Supplier Leverage and Ex ante default probability

This table reports the results from a series of subsample estimations. The dependent variable in columns (1) and (2) is *Book leverage*, and in columns (4) and (5), *Market leverage*. Columns (3) and (6) report the statistical significance from a Wald test of the equality of coefficients. The two subgroups are formed based on whether the industry-year median-adjusted (a) leverage, (b) Z-score, and (c) Campbell et al. score is above or below the sample median. The control variables are the same as those in Table 4. For brevity, only the coefficients of the *Post-reduction* dummy are reported. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

	Book leverage			Market leverage		
	Low	High	Difference	Low	High	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Adjusted leverage	0.005	−0.054**	**	−0.005	−0.054**	**
	(0.017)	(0.024)		(0.021)	(0.018)	
	2,604	2,425		2,594	2,413	
Z-score	0.002	−0.067***	**	−0.014	−0.058***	*
	(0.017)	(0.025)		(0.014)	(0.020)	
	2,539	2,397		2,529	2,385	
Campbell et al. score	0.018	−0.094***	***	−0.009	−0.087***	***
	(0.020)	(0.025)		(0.017)	(0.023)	
	1,992	1,750		1,987	1,744	

Table 8: Mechanics of Capital Structure Adjustments following Downstream Tariff Reductions

This table reports results from regressions of issuance of debt and stock on the change in downstream tariff rates and control variables. *Net debt issuance* is defined as the change in debt scaled by lagged total assets, and *Net stock issuance* is the change in outside common equity scaled by lagged total assets. *Debt issue* is the issuance of long-term debt divided by the prior year's total assets. *Debt retirement* is debt reduction divided by the prior year's total assets. *Equity sale* is the sale of equity divided by the prior year's total assets. *Equity purchase* is the purchase of equity divided by the prior year's total assets. The control variables are the first differences of the control variables in the baseline specification, and Δ*Tariff rate* is the annual change of import tariff rate imposed on the customer industry. All control variables except lagged book leverage are lagged annual changes of their corresponding firm characteristics, and all regressions control for year fixed effects. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Balance sheet		Cash flow statement			
	Net debt issuance	Net stock issuance	Debt issue	Debt retirement	Equity sale	Equity purchase
	(1)	(2)	(3)	(4)	(5)	(6)
ΔTariff rate	0.002	−0.073***	0.002	0.012	−0.043***	−0.001
	(0.008)	(0.024)	(0.014)	(0.011)	(0.015)	(0.002)
ΔLog(Total assets)	0.043***	0.191***	−0.001	−0.013*	0.057***	−0.001
	(0.009)	(0.048)	(0.010)	(0.008)	(0.020)	(0.002)
ΔMarket-to-book	0.000***	0.000	0.000	−0.000***	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTangibility	0.024	0.289**	0.072	−0.014	0.161***	−0.008
	(0.050)	(0.119)	(0.058)	(0.030)	(0.060)	(0.006)
ΔImport penetration	−0.170	0.329	−0.152	−0.080	0.014	−0.006
	(0.114)	(0.279)	(0.168)	(0.113)	(0.153)	(0.020)
ΔIndustry concentration	0.009	−0.062	0.084	0.084**	−0.057	−0.001
	(0.041)	(0.136)	(0.066)	(0.040)	(0.069)	(0.012)
Lagged book leverage	−0.093***	0.215**	0.223***	0.235***	0.061	−0.021***
	(0.015)	(0.090)	(0.024)	(0.019)	(0.041)	(0.003)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,327	5,301	4,919	5,157	5,157	4,757
R-squared	0.051	0.066	0.067	0.131	0.030	0.052

Table 9: Effect of Downstream Tariff Reduction on Supplier Cash Holdings and Net Debt

This table presents results from regressions of supplier liquid assets and net debt. *Cash* is estimated as the sum of cash and cash equivalents, scaled by total assets. *NWC* is total current assets minus total current liabilities, scaled by total assets. *Net debt* is interest bearing debt minus cash divided by total assets. Detailed variable definitions are provided in the appendix. Robust *t*-statistics, adjusted for industry-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Cash		NWC		Net debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reduction	0.040***	0.019**	0.044***	0.028**	−0.093***	−0.038**
	(0.009)	(0.008)	(0.015)	(0.012)	(0.019)	(0.017)
Log (Total assets)	−0.000	−0.003	0.005	−0.018*	−0.014*	0.025**
	(0.002)	(0.006)	(0.005)	(0.010)	(0.008)	(0.012)
Market-to-book	0.010***	0.008***	−0.019***	0.005	−0.001	−0.011***
	(0.002)	(0.002)	(0.005)	(0.004)	(0.005)	(0.004)
Tangibility	−0.321***	−0.238***	−0.546***	−0.407***	0.597***	0.514***
	(0.026)	(0.026)	(0.040)	(0.044)	(0.053)	(0.074)
Import penetration	0.223**	0.150**	0.045	−0.035	−0.371*	−0.330*
	(0.093)	(0.070)	(0.164)	(0.126)	(0.212)	(0.179)
Industry concentration	−0.083*	−0.109***	0.049	−0.084	−0.174*	0.055
	(0.044)	(0.036)	(0.084)	(0.066)	(0.105)	(0.072)
Industry FE	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,757	6,757	5,760	5,760	6,757	6,757
R-squared	0.487	0.072	0.338	0.066	0.398	0.079

Table 10: Effect of Downstream Tariff Reduction on Supplier Trade Credit

This table presents results from regressions of supplier trade credit measures. In column (1), the dependent variable is accounts payable scalded by total assets. In column (2), the dependent variable is accounts receivable scaled by total assets. In column (3), the dependent variable is accounts payable scalded by cost of goods sold (COGS). In column (4), the dependent variable is accounts receivable scaled by sales. Detailed variable definitions are provided in the appendix. Robust standard errors, adjusted for firm-level clustering, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Accounts payable scaled by total assets	Accounts receivable scaled by total assets	Accounts payable scaled by COGS	Accounts receivable scaled by sales
	(1)	(2)	(3)	(4)
Post-reduction	−0.012**	−0.018***	−19.609	−0.006
	(0.005)	(0.005)	(13.383)	(0.004)
Log (Total assets)	−0.010***	−0.007***	94.170***	0.001
	(0.002)	(0.002)	(9.696)	(0.002)
Market-to-book	0.004***	−0.005***	13.091***	−0.001
	(0.001)	(0.001)	(2.987)	(0.001)
Tangibility	−0.025	−0.073***	−74.421	−0.064**
	(0.029)	(0.022)	(104.062)	(0.028)
Import penetration	0.035	−0.153***	−290.401*	−0.070*
	(0.052)	(0.053)	(160.899)	(0.042)
Industry concentration	0.029	0.035	112.744	0.032
	(0.024)	(0.028)	(72.890)	(0.020)
Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	5,809	5,757	5,757	5,753
R-squared	0.180	0.317	0.445	0.191