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Buyer–Supplier Relationships and the Stakeholder Theory of Capital Structure

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ABSTRACT

Firms in bilateral relationships are likely to produce or procure unique products—especially when they are in durable goods industries. Consistent with the arguments of Titman and Titman and Wessels, such firms are likely to maintain lower leverage. We compile a database of firms' principal customers (those that account for at least 10% of sales or are otherwise considered important for business) from the Business Information File of Compustat and find results consistent with the predictions of this theory.

OVER THE PAST TWO DECADES, a literature has evolved to address how a firm's relationship with its stakeholders affects overall corporate strategy, including its capital structure choice. An important aspect of that relationship is the interaction between a firm and its customers and suppliers. Titman (1984) and Titman and Wessels (1988) argue that a firm's customers face switching costs in the event the firm is liquidated, and that these costs are especially high when the firm's products are unique because they induce specific investments by the customers (see also Grinblatt and Titman (2002)). These costs affect the firm's optimal capital structure. Maksimovic and Titman (1991) further argue that a firm's incentive to maintain product quality is less if it faces the prospect of liquidation, and that this may cause the firm to lose customers concerned about product quality.

To date, however, little empirical evidence exists on how buyer–supplier relationships shape the financial policy of corporations. The most well-known evidence comes from Titman and Wessels (1988), who find that firms in durable goods industries (which supposedly produce more unique products and therefore impose higher liquidation costs on customers) have lower leverage. Yet, many factors may explain why firms in durable goods industries have lower leverage. In this paper, our objective is to exploit additional sources of variation

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within these industries to provide stronger evidence that uniqueness and investment specificity matter for capital structure decisions.[1]

Titman's (1984) model is in the context of a firm selling to a large number of customers. When a firm sells to a few big customers, however, the relationship is often bilateral. The firm depends on the big customers for a large proportion of its sales, which makes the firm's assets specific to the big customers. Joskow (1988) identifies this kind of asset-specificity as "dedicated assets," referring to investments by the seller made with the expectation of a considerable amount of trade with particular buyers. Further, with the amount of trade so big, the product is likely to be customized, leading to physical asset specificity.

Such bilateral buyer–supplier relationships are of particular interest for studying the effect of specific investments on capital structure. If a supplier firm is dependent on a customer in the sense that the customer accounts for a major part of its sales, then the customer's liquidation (and hence debt ratio) is a relevant consideration for the supplier. Thus, unlike in Titman's (1984) model, the supplier may be more concerned about the difficulty of redeploying its own specific assets should the customer fail than about its own leverage affecting the customer's decision to make relation-specific investments.[2] Given such difficulty, the supplier may prefer to remain less levered to reduce the cost of financial distress and may also prefer the principal customer to be less levered.

In this paper we build on Titman and Wessels (1988) by exploiting firm-level proxies for the importance of bilateral relationships. Prior to 1998, U.S. firms were required to disclose the names of their principal customers, defined as those that account for at least 10% of sales or are otherwise considered important for business. We obtain information on the principal customers of U.S. firms from the Business Information File of Compustat 98. Then, by inverting this database, we create another database that contains information, for each Compustat-listed firm, on the amounts purchased from Compustat-listed manufacturing suppliers that identify the firm as a principal customer in a given year.[3]

[1] Kale and Shahrur (2004) use input–output accounts for the U.S. economy to identify supplier and customer firm industries for firms in their sample. They find that firms with higher R&D intensity in supplier industries have lower debt ratios. They also find that customer firms in higher R&D industries have lower debt ratios. These results are also consistent with specific investment being important for capital structure. See also Kale and Shahrur (2007).

[2] If the customer accounts for a major part of the supplier's sales, then the customer determines whether the supplier is in financial distress. In other words, the customer will only withdraw if the cost of losing its specific investment in a supplier exceeds the benefit of switching.

[3] Several other studies use the information on principal customers from Compustat: Kalwani and Narayandas (1995), Kim (1996), Dasgupta and Kim (1997), Fee and Thomas (2004), Banerjee, Dasgupta, and Kim (2004), and Fee, Hadlock, and Thomas (2006). Kim (1996) and Kalwani and Narayandas (1995) look at the effect of principal customer relationships on the seller's profit margin. Dasgupta and Kim (1997) examine how principal customer relationships affect bilateral bargaining between the supplier and the customer and the supplier's capital structure, while Banerjee, Dasgupta, and Kim (2004) examine the effect of principal customer relationships on the provision of trade credit. Fee and Thomas (2004) examine whether sources of gain in horizontal mergers depend on downstream anti-competitive collusion or increase in upstream buying power. Fee et al. (2006) examine whether principal customers own equity stakes in the supplier.

Based on these two databases, we investigate how the supplier–customer relationship affects the financing choices of the customers and the suppliers. First we examine whether customer firms maintain lower leverage when they have a more extensive network of dependent suppliers (i.e., suppliers for whom purchases by the customer firm constitute a significant proportion of sales). For such firms, the suppliers are important stakeholders, for they make specific investments in the relationship, which also benefit the customer firms. However, since the suppliers are undiversified and are dependent on the customers' purchases, their incentive to make specific investments is affected by the customer's financial condition. To encourage its suppliers to make specific investments, therefore, the customer should maintain lower leverage.

We find that in manufacturing industries producing durable products (henceforth "durable goods industries" or the "durable sector"), customer firms that purchase a higher proportion of their inputs from "dependent suppliers" maintain lower leverage ratios. However, the results are much weaker for customer firms in manufacturing industries that produce nondurable products (henceforth "nondurable goods industries" or the "nondurable sector"), and are totally nonexistent for nonmanufacturing customer firms.[4] Moreover, even for customers in the durable sector, the results are driven by the proportion of purchases coming from suppliers that are also in durable sectors. These results support our hypothesis that customers in durable sectors maintain conservative capital structures to encourage their suppliers to commit more relationship-specific investments.

We also investigate how the customer–supplier relationship affects the dependent suppliers' capital structure choice. As mentioned above, the dependent suppliers may themselves maintain low leverage to protect themselves against the devastating effect of losing principal customers. We find such a negative relationship, but, here too, this result is only present for suppliers in durable goods industries. Moreover, we find that the presence of the "government" as a large customer does not affect supplier firms' debt levels even in the durable sectors.[5] One notable result is that there is a very high proportion of zero leverage firms among those with principal customers. The question of why firms have zero leverage has received attention recently. Our findings suggest one possible reason, namely, the customer profile of these firms. We also show direct evidence that the termination of sales to principal customers adversely affects the suppliers in various respects.

The rest of the paper is organized as follows. Section II presents a brief overview of the stakeholder theory of capital structure and develops our hypotheses about buyer–supplier relationships and capital structure. Section III

[4] We follow Titman and Wessels (1988) in classifying industries with primary SIC codes of 3,400 and above but less than 4,000 as those producing durable products, and those with primary SIC codes of 2,000 and above but less than 3,400 as producing nondurable products.

[5] There are several possible explanations for this result. For example, the government buyers are least likely to go bankrupt, they may not be driven by the profit motive, and can sometimes place orders to distressed firms to help them stay afloat, thereby saving the distressed firms' employees from losing jobs. Thus, the risk of a supplier firm entering financial distress from losing sales to the government buyers may be perceived to be low.

describes the data source and sample. Section IV defines the variables and explains the methodology for our empirical tests. Section V presents the results of our empirical analysis, and Section VI concludes.

I. Principal Customers and Capital Structure

A. Hypothesis Development

It has been argued that the possibility of liquidation can impose costs on a firm's nonfinancial stakeholders such as employees, customers, and suppliers (Titman (1984), Grinblatt and Titman (2002)). For example, employees may not only lose their jobs, but also find it difficult to identify a new employer if the liquidated firm had been producing unique products. Since liquidation is more likely if a company has higher leverage, employees would be reluctant to work for such companies and would demand higher wages, particularly if the firm produces unique or specialized products. Customers purchasing durable and sophisticated goods often require after-sales services and/or spare parts, and so would prefer to buy a durable or unique product from a company that is financially healthy. A highly levered company may face lower demand or may have to offer price discounts to attract customers.[6]

Titman and Wessels (1988) test the empirical implications of the above arguments. They show that firms manufacturing machines and equipment (primary SIC codes from 3,400 to 3,990) are financed more conservatively. Using research and development expenses, selling expenses, and quit rates as indicators for product uniqueness, they find that firms producing unique products indeed maintain lower debt ratios. Opler and Titman (1994) find that highly levered firms in declining industries suffer sales declines relative to less levered firms, and that the impact of high leverage on sales loss is more pronounced for firms with a higher ratio of R&D to sales, that is, firms producing unique products.[7]

In this paper, we exploit information about a firm's *principal customers* to test several implications of the stakeholder theory of capital structure. The key aspect of a principal customer relationship is that the relationship is *bilateral*. In bilateral relationships, the product being produced is likely to be unique, especially in durable goods industries, and hence requires specific investment (recall that Titman and Wessels (1988) argue that firms in durable goods industries produce unique products). In contrast, if a firm sells to a large number of customers, the product is likely to be standardized.

There is a huge literature on the subject of how relation-specific investments and hold-up problems affect the organizational form of transactions, such as

[6] See the HBS case Massey Ferguson Ltd. (1980), in *Case Problems in Finance*, 10th ed. (Homewood, Ill.: Irwin, 1992), pp. 175–194, for an example of customer-driven financial distress costs.

[7] Maksimovic and Titman (1991) show that customers might be unwilling to do business with a highly levered firm, even if they do not incur substantial costs in the event that the firm goes bankrupt. This is because firms with high levels of long-term debt may reduce standards of quality control to mitigate short-term cash flow problems.

make-or-buy decisions. Here, our focus is on how relation-specific investments affect capital structure decisions. The fact that the principal customer decided to "buy" a particular product from the supplier implies that the hold-up problem is not serious enough to prevent outsourcing of that product. Moreover, the supplier can benefit from concentrating its sales on a few principal customers in terms of lower inventory and administrative costs, some of which are passed on to the principal customers in the form of a lower price for the product (Kalwani and Narayandas (1995)). However, the transacting parties are still likely to be concerned about the other party's financial health, since their relation-specific investments would become worthless if their transaction partner defaulted on debt payments and ended up being liquidated. Such concern is especially serious for suppliers that depend on the principal customers for a significant portion of their business and are in the durable goods manufacturing sector. Thus, customer firms in durable goods industries must be financially stable in order to persuade their suppliers to undertake relation-specific investments, especially if their purchases account for a significant part of their suppliers' sales. Therefore, we expect that a firm that buys a higher proportion of its inputs from dependent suppliers (i.e., suppliers for whom the firm is a major customer) would maintain lower debt, particularly in the durable manufacturing sector, where specific investments are more important. These considerations lead to our first testable hypothesis:

Hypothesis 1: (i) A customer firm's debt ratio will be decreasing in the importance of its purchases from dependent suppliers. (ii) This effect will be stronger for customers in durable goods industries producing unique products, and for customers with dependent suppliers in durable goods industries producing unique products.

The principal customer relationship can also affect the capital structure choice of the *supplier* firms. Since a firm selling a major part of its sales to a few customers is less diversified, it is likely that the potential loss of business from a principal customer may destabilize the firm. As a consequence, the supplier firms may prefer to maintain *lower* leverage themselves. Supplier firms in durable sectors may be especially sensitive to this possibility, since the investments they make are likely to be specialized, so that it is difficult to switch production easily. This leads to our second testable hypothesis:

Hypothesis 2: (i) A supplier firm's debt ratio will be decreasing in the importance of its sales to principal customers. (ii) This effect will be stronger for suppliers in durable goods industries producing unique products.

Many supplier firms identify the government as a principal customer. The government is likely to represent a more stable source of demand than other types of principal customers, thanks to its high creditworthiness and concern for public interest. This is especially true if the loss of demand from the government is likely to plunge the firm into financial distress, with potentially harmful

consequences for the firm's stakeholders, including its employees. Thus, one should expect a weaker or no effect on leverage when the principal customer is an agent of the government.[8] Therefore, we have the following.

Hypothesis 3: Suppliers' debt ratios should be less affected by the importance of sales to government buyers than sales to nongovernment principal customers.

B. Further Discussion

Hypothesis 2 is motivated by the idea that principal customer relationships are inherently risky, and likely to break down after several years. Especially for supplier firms producing unique products, such breakdowns are costly, since these suppliers are producing to a customer's specification, not the market. To mitigate these costs, they should have less debt. It should be pointed out, however, that there could be other reasons why dependent suppliers might maintain less debt. For example, it could be the case that principal customers prefer the suppliers to have less debt because the latter are then more likely to remain solvent and deliver the product. It could also be the case that suppliers maintain less debt (more financial flexibility) to avoid expropriation by principal customers.[9]

When a firm's stakeholders are concentrated or can act collectively and contracts are incomplete, ex post bargaining and opportunism can arise after the firm and the stakeholders have made specific investments in the relationship. Capital structure can be used to affect the outcome of such bargaining. This issue has been explored in the context of worker-firm bargaining by Bronars and Deere (1991), Dasgupta and Sengupta (1993), and Perotti and Spier (1993), who show that leverage can mitigate the wage demands of workers. It might be supposed that higher leverage might provide some bargaining advantage to the customer firm against the suppliers and vice versa. However, it seems highly unlikely that this factor would motivate the capital structure decisions of either the customer firms or the suppliers. If the customer firm's purchases constitute a significant fraction of the sales of a supplier firm, then the customer firm will

[8] Another difference between government and nongovernment customers is that while nongovernment large customers (which are almost always other companies) usually use the goods as inputs in their own production process or for reselling, the government generally purchases for consumption. Thus, reputational or monetary losses from poor quality products procured from the suppliers may be less important when the government is a principal customer. Therefore, if leverage adversely affects supplier incentives to maintain quality, government customers are less likely to be concerned about the suppliers' leverage. Moreover, rigorous administrative control over procurement contracts makes the decision-making process of government agents mainly dependent on price and the stated quality features of the products rather than the financial status of the suppliers.

[9] Hennessy (2007) argues that while high leverage increases a firm's bargaining share in the relational supply chain, it also reduces the incentives for the suppliers to deliver high quality that is nonverifiable. He predicts that a firm dealing with competitive suppliers will maintain low leverage. Our results are consistent with this prediction.

have considerable bargaining power anyway by virtue of the sheer importance of its order for the supplier. Thus, the bargaining advantage would appear to be a less important factor compared to the effect of the customer firm's leverage on the specific investments of the supplier firm. Moreover, a supplier firm is not likely to maintain high leverage to extract bargaining concessions from principal customers as such high leverage would make it vulnerable to both financial and operational risk. Unlike a firm bargaining with a union, a supplier firm does face the risk that the customer might terminate the relationship voluntarily or involuntarily, and brinkmanship may cause the principal customer to seek alternative sources of supply.

There is also a possibility that the principal customer–supplier relationship is accompanied by cross-shareholdings between the two, implying that the relationship is not entirely at arm's length. However, according to a recent study (Fee et al. (2006)), a principal customer has a block holding of equity in its supplier in only about 3.31% of the cases. A principal customer may also assist dependent suppliers financially. Banerjee, Dasgupta, and Kim (2004) present evidence that principal customers settle their accounts payable with supplier firms more promptly (i.e., use less trade credit) when the supplier is in financial trouble. This is consistent with the hypothesis that the principal customers value their specific investments in the relationship, and the recent examples of Delphi and Visteon[10] suggest that, for this reason, principal customers are sometimes prepared to bail their major suppliers out. However, principal customer relations do not last forever: Many relationships in our data are terminated after several years. While we do not investigate in detail the reasons for such terminations, it is clear that the supplier's financial well-being and even survival is closely linked to the demand from and the financial condition of the principal customer.[11]

II. Data and Preliminary Analysis

A. Data

Our sample consists of all U.S. manufacturing firms (primary SIC code within 2,000 and 3,990) included in Compustat in the period 1979 to 1997. Segment customer data are obtained from the Business Information File of Compustat

[10] Visteon—a parts supplier to Ford—was spun-off from Ford in 2000. Plagued with declining demand from the big three car manufacturers, it has been bailed out twice by Ford.

[11] There is a fairly substantial literature on how capital structure interacts with the competitive environment in the firm's product market. Perhaps the most robust empirical evidence (Chevalier (1995)) is that a less-levered firm can benefit from more leverage if it has several other competitors who have debt. However, the presence of a dominant less-levered rival may make it susceptible to predation. These results are consistent with multiperiod models in which consumers have switching costs and firms have an incentive to set low prices today to lock in customers (Chevalier and Scharfstein (1996), Dasgupta and Titman (1998)). Campello and Fluck (2007) find that highly levered firms lost market share during the 1990 to 1991 recession in industries with high switching costs, especially if these industries were low-debt industries. These high switching cost industries largely overlap with the durable goods industries considered here.

98. The Statement of Financial Accounting Standards No. 14 (SFAS No. 14-"Financial Reporting for Segments of Business Enterprise") of the Financial Accounting Standards Board (FASB) requires firms to disclose the names of and the sales to their principal customers, if the revenue generated from the sales to a particular customer exceeds 10% of total revenue of the firm, or if the firm considers the sales important to its business.[12] Compustat keeps records of up to four nongovernment principal customers for each business segment (however, some of these reported principal customers contribute less than 10% of total sales). We restrict our sample period to 1997 because in June 1997, the FASB issued SFAS 131, revising SFAS No. 14, which affected disclosure requirements of some of the segment information, including the customer segment.[13]

We classify the reported customers as a "public company," as a "private company," as "government," or as "unidentified." The classification requires some amount of discretion since the reported principal customer names do not follow a set pattern. For example, while the "diesel engine and parts" segment of Cummins Engine reports FORD MOTOR as one of its principal customers in 1980 and 1981, it reports FORD MTR as its customer in the subsequent 2 years. While both of these could be identified easily as Ford Motor Co. (gvkey = 4,839), there are cases that are far more ambiguous. When a customer abbreviation matches more than one company in the historical names file of the CRSP/Compustat merged data file and an Academic Universe search on Company Financials, we first look into the business description of the matched firms in the merged database and eliminate the ones that do not seem to have anything to do with the product of the segment concerned.[14] We then do the same for the unlisted firms identified in an Academic Universe search. After this exercise, if we are left with one listed company or one private company that seems to be the only possible match, then we classify the customer accordingly. However, if we are left with more than one public company or at least one public and one private company, we classify the customer as "unidentified." The "unidentified" category also includes customers reported as "2-Customers" or "Not reported," and any customers that cannot be traced in an Academic Universe search. If more than one private and no public company meet the criteria, we classify the customer as "private." Finally, if we cannot find a match in the Company Financial menu of Academic Universe, we conduct a news search around the time period to determine whether the customer was a wholly owned subsidiary of a listed company. If we find the possibility of any such linkage from any news item, we check the "Subsidiaries of the Registrant" section of the 10K filing of the possible parent company to confirm the linkage. If a linkage is confirmed, the parent company is identified as the principal

[12] SEC regulation S-K has similar requirements.

[13] As of 1998, firms are no longer required to report the identity of their principal customers, but they still need to report the sales to each of them. As a result of the change in regulation, some firms restated their segment information.

[14] We prefer visual examination of the possible matches rather than write a program that lists the possible matches from the name history files because the reporting firm often removes the vowels from the customer name in order to abbreviate, or uses popular brand/store names rather than the company name.

customer. Customers reported as "Domestic Government" or "U.S. Navy," etc., are classified as "government." Some companies report foreign governments as their principal customers. However, these cases are very few, so we include both domestic and foreign government customers into a single group. The final sample includes 22,785 manufacturing firm-years reporting at least one large customer within the sample period 1979 to 1997, and a total of 35,391 large customers, 37% of which are identified as firms included in Compustat, 15% as government agents, and 11% as private customers.[15] The number of all manufacturing firm-years in Compustat in the sample period is 68,988. Table AI shows the industry-wise distribution of sample firms. Inverting the principal customer information, we can compile a database that contains, for each Compustat-listed firm, information on its Compustat-listed dependent suppliers, that is, other Compustat-listed firms for whom the firm is identified as a principal customer in a given year.

Table I shows the mean and the median values of some firm characteristics for all manufacturing firms, manufacturing customer firms (i.e., firms reported as principal customers), and supplier firms (i.e., firms reporting principal customers). These samples are divided into durable sector (primary SIC from 3,400 to 3,990) and nondurable sector (primary SIC from 2,000 to 3,390) firms. On average, the customer firms are much larger and older, while suppliers are smaller and younger, than the average manufacturing firm. The mean and the median profitability of the customer firms are somewhat higher than those for the whole sample, which in turn are higher than those for the supplier firms. Consistent with Titman and Wessels (1988), firms in all three groups have lower debt ratios in the durable sectors than in the nondurable sectors. Overall, Table I reveals differences across these three groups in many dimensions—with firm size being the most noticeable. To understand which firm characteristics differ systematically between supplier or customer firms and their peers, and could potentially affect the choice of capital structure, we carry out industry and size-matched comparisons, described in detail below.

B. Comparison with Control Groups

We first try controlling for the two most obvious differences: size and industry composition. That is, we compare the firm characteristics between dependent supplier (customer) firms and control firms of similar size in the same industry. We select the sample of dependent supplier (customer) firms and the control group in the following manner. First, for each two-digit SIC code, we identify all supplier (customer) firms and retain those that fall between the 5^{th} and the 95^{th} percentile values of firm size (deflated total assets). Next, we select all firms in each industry that are not dependent supplier (customer) firms but that fall in the size range of their peer supplier (customer) firms in the samples created

[15] Firms sometimes report principal customers that account for less than 10% of total sales because the supplier considers the sale important to its business. In calculating total sales to various categories of large customers, we need an objective cutoff point to maintain uniformity. We therefore drop those customers that account for less than 10% of net sales for the firm.

Table I
Summary Statistics

The mean ($\bar{x}$) and the median (*Me*) values of firm characteristics for firm-years between 1979 and 1997 in the manufacturing sector in Compustat are reported in Panel A. Panels B and C report the same statistics for the sample of customer and supplier firms, respectively. The variables are described in Appendix B. All variables are censored at the 1st and 99th percentile values.

	(A) All Manufacturing Firms in Compustat				(B) All Customer Firms in Compustat in the Manufacturing Sector				(C) All Supplier Firms in the Manufacturing Sector with Principal Customers			
	Durable Sector		Nondurable Sector		Durable Sector		Nondurable Sector		Durable Sector		Nondurable Sector	
	$\bar{x}$	*Me*	$\bar{x}$	*Me*	$\bar{x}$	*Me*	$\bar{x}$	*Me*	$\bar{x}$	*Me*	$\bar{x}$	*Me*
Total Assets	647	33	1,182	90	5,314	1,515	5,851	2,593	303	23	261	40
Q	2.02	1.39	1.93	1.30	1.77	1.37	2.12	1.63	2.05	1.44	2.19	1.40
FA/TA	0.23	0.21	0.34	0.32	0.26	0.24	0.36	0.36	0.22	0.20	0.30	0.29
ROA	−0.07	0.03	−0.05	0.04	0.04	0.05	0.05	0.07	−0.06	0.03	−0.08	0.03
Margin	−0.49	0.34	−1.86	0.28	0.35	0.33	0.14	0.38	0.20	0.33	−0.78	0.25
AGE	10.87	7.00	12.97	8.00	21.40	20.00	25.97	31.00	11.12	8.00	11.37	7.00
R&D	0.08	0.02	0.08	0.00	0.07	0.05	0.07	0.02	0.09	0.04	0.14	0.00
SGA	0.29	0.24	0.22	0.15	0.25	0.24	0.29	0.24	0.32	0.25	0.23	0.16
Dividend	0.37	0.00	0.52	1.00	0.60	1.00	0.82	1.00	0.22	0.00	0.30	0.00
CV(Sales)	1.05	1.02	1.05	1.01	1.04	1.02	1.02	1.01	1.05	1.02	1.06	1.02
S/A	1.92	1.31	2.01	1.37	1.40	1.20	1.33	1.13	1.29	1.23	1.34	1.28
LDM	0.11	0.06	0.15	0.11	0.11	0.09	0.11	0.09	0.10	0.05	0.13	0.08
LDB	0.15	0.10	0.20	0.16	0.14	0.12	0.17	0.14	0.15	0.08	0.19	0.14
Number of Firms	3,202		4,114		416		292		2,430		1,445	
Number of Obs[a]	34,716		27,528		1,840		1,170		14,474		7,643	

[a]The figures are the numbers of firm-years for which data on total assets are available. However, there are some missing values for most of the other variables.

in the first step. Note that the two samples differ in terms of the skewness of the distribution of firm size. In particular, supplier (customer) firms are biased towards smaller (larger) sizes. Consequently, we make some adjustments to match the sample and the control groups better.

For example, there are 772 dependent supplier firms in the food and kindred products industry, and the 5th percentile, median, and 95th percentile values of supplier firm size are 1.84, 32.8, and 552 million dollars, respectively. For other firms in the same industry, the number of firms between sizes 1.84 and 32.8 million is 512, and that between 32.8 and 552 million is 1,204. We randomly pick 347 firms[16] from both these size ranges to create the control group for supplier firms in the food and kindred product industry. Finally, we pool together the samples from all industries in the manufacturing sector. Such a selection process makes the median firm size of the supplier (customer) sample and the control group roughly similar, and their number of observations exactly the same.

In Table II, Panel A, we report mean and median values of firm characteristics of the supplier firms and the control group after pooling all the manufacturing industries into one group. We find that dependent supplier firms have significantly lower debt (both market (*LDM*) and book (*LDB*) leverage) than their size and industry-matched peers. Dependent suppliers are younger and have lower selling costs (*SGA* and *Advert*), have higher R&D and intangibles (*Intang*), and have higher profitability (*ROA*) and growth opportunities (*Q*) than their peers. The lower selling costs and the higher profitability of supplier firms are consistent with the findings of Kalwani and Narayandas (1995). The higher R&D, intangibles, and growth opportunities are consistent with the profile of firms producing unique products for their principal customers.

In Table II Panel B, we report mean and median values of firm characteristics of the customer firms and the control group. We find that customer firms also have lower debt ratios than firms in the control sample. The customer firms are quite different from the other firms of similar size in many other respects as well. They have significantly higher profitability, growth opportunity, selling costs, R&D, and sales-to-assets (S/A) than firms of similar size in the same industry. Sales-to-assets is an interesting variable in this particular study. Both S/A and large purchases from outside suppliers can be used as a proxy for the vertical integration of a firm.[17] While it is not surprising that firms making large purchases of intermediate goods have higher S/A, it remains to be seen whether the stakeholder effect on capital structure persists even after controlling for vertical integration through S/A.

The comparisons between supplier/customer firms and their peers confirm that the dependent supplier firms and customer firms do have lower debt after controlling for the differences in firm size and industry composition. However,

[16] There are 347 supplier firm observations between the 5th percentile and median value of supplier firm size in this sample.

[17] A firm that employs a larger fraction of its assets for internal sales is more vertically integrated, and will have a lower S/A ratio than a firm that markets the same quantity to customers but procures the intermediate products from outside suppliers.

Table II

Comparison of Firm Characteristics of Dependent Suppliers and Customers with their Respective Control Group Firms

The mean ($\bar{x}$) and the median (*Me*) values of firm characteristics for the sample of dependent supplier firms in the manufacturing sector and the corresponding control group are shown in Panel A and those for the sample of customer firms and its control group are shown in Panel B. The null hypotheses of no difference between mean firm characteristics of the samples and their respective control groups are tested and the *t*-values are shown. The control groups have the same number of observations and same industry composition as their respective supplier or customer sample. Their median firm sizes, measured by deflated total assets, are also very similar. Refer to Section II of the paper for a detailed explanation of how the two control samples are constructed. Variable definitions are in Appendix B. All variables are Winsorized at the 0.5 percentile on both tails. *** (**, *) denotes significance at the 1% (5%, 10%) level.

	(A) Comparison of Dependent Supplier Characteristics					(B) Comparison of Customer Firm Characteristics				
	Dependent Suppliers		Control Group		Supplier Minus Control = 0	Big Customers		Control Group		Customer Minus Control = 0
	$\bar{x}$	*Me*	$\bar{x}$	*Me*	*t*-ratio	$\bar{x}$	*Me*	$\bar{x}$	*Me*	*t*-ratio
LDM	0.112	0.057	0.122	0.070	−9.14***	0.109	0.085	0.144	0.117	−16.67***
LDB	0.161	0.100	0.167	0.112	−4.05***	0.151	0.128	0.186	0.158	−13.60***
Age	10.54	7.000	11.40	8.000	−12.33***	24.26	28.00	19.84	18.00	15.47***
R&D	0.113	0.019	0.104	0.013	5.535***	0.062	0.038	0.053	0.018	4.252***
SGA	0.286	0.220	0.322	0.254	−20.42	0.241	0.221	0.214	0.183	9.150***
Advert	0.018	0.002	0.024	0.010	−14.26***	0.029	0.014	0.021	0.009	7.161***
ROA	−0.05	0.031	−0.06	0.031	3.89***	0.055	0.063	0.034	0.047	11.37***
Q	2.111	1.430	2.062	1.338	3.14***	1.912	1.475	1.567	1.283	12.54***
FA/TA	0.251	0.218	0.251	0.228	−0.74	0.304	0.286	0.317	0.289	−4.549***
Intang	0.037	0.000	0.040	0.000	−5.48***	0.048	0.000	0.052	0.002	−2.438**
STDE	12.00	3.601	13.80	3.456	−8.46***	459.2	163.6	277.7	83.59	11.39***
CV(Sales)	1.057	1.022	1.058	1.019	−1.18	1.033	1.013	1.029	1.011	3.231***
Dividend	0.231	0.000	0.314	0.000	−26.88***	0.682	1.000	0.699	1.000	−1.837*
S/A	1.275	1.234	1.277	1.253	−0.43	1.233	1.171	1.137	1.087	10.49***
Sales	140.9	30.19	168.1	36.13	−10.27***	6,126	2,378	4,910	1,498	5.537***
Obs			18,830					2,554		

they also show that the differences in most other variables persist after controlling for size and industry, indicating the need to further control for other firm-specific attributes, observed and unobserved. We address these issues in our regression specifications discussed below.

C. Characteristics of Customer–Supplier Relationships

Our proxies for the importance of purchases from dependent suppliers (Hypothesis 1) and sales to principal customers (Hypothesis 2) are as follows:

Purchases/COGS—All identified suppliers: This is a measure of a customer firm's reliance on dependant suppliers, that is, suppliers for whom the customer is identified as a principal customer. We define this variable to be the total purchases from all Compustat-listed manufacturing sector suppliers that record the current firm as (one of) their principal customer(s), as a proportion of Cost of Goods Sold of the customer firm.

BIGALL: Proportion of a firm's sales to all customers that it reports as principal customers.

C.1. The Importance of Purchases from Dependent Suppliers

By definition, sales to principal customers are important for the supplying firm. How important are the purchases from dependent suppliers for the principal customers? Table III, Panel A, presents summary information on the proportion of purchases from dependent suppliers to estimated total materials costs for four size groups of customer firms. The mean and median values of this variable decrease monotonically in the size of the customer firms, perhaps because larger firms are more vertically integrated. For the smallest size group,

Table IIIA

Proportion of Purchases from Dependent Suppliers in the Customer Firm's Materials Cost

Summary statistics for the amount of purchase by customer firms from their dependent suppliers as a proportion of the customer firms' materials cost are reported. Materials cost of a firm is obtained by multiplying the firm's Cost of Goods Sold with the relevant industry's ratio of materials cost to Cost of Goods Sold. Industry data are available at the four-digit SIC level in the National Bureau of Economic Research site. The sample consists of customer firm-years between 1979 and 1997 only and the observations are partitioned into size quartiles.

Size Groups of Customer Firms	All Manufacturing Sector Customer Firms		Durable Goods Sector Customer Firms		Nondurable Goods Sector Customer Firms	
	Mean	Median	Mean	Median	Mean	Median
0–25 percentile	13.0%	7.0%	14.1%	7.0%	10.7%	6%
25–50 percentile	4.0%	1.7%	5.1%	2.1%	2.3%	1.4%
50–75 percentile	2.2%	0.7%	2.9%	0.8%	1.3%	0.3%
75–100 percentile	1.9%	0.7%	2.5%	1.0%	1.0%	0.4%

Table IIIB

Proportion of Purchases from Dependent Suppliers during High and Low Sales Years

Columns 1 and 2 report the mean and median purchases from dependent suppliers as a fraction of total sales when sales growth in that firm-year is in the highest quartile (high sales growth) or in the lowest quartile (low sales growth) for each firm. The sample consists of customer firm-years between 1979 and 1997.

	(A) Durable Goods Manufacturing Customers		(B) Nondurable Goods Manufacturing Customers		(C) Nonmanufacturing Customers	
	(1) Low Sales Growth	(2) High Sales Growth	(1) Low Sales Growth	(2) High Sales Growth	(1) Low Sales Growth	(2) High Sales Growth
Mean	0.043	0.046	0.028	0.038	0.033	0.039
Median	0.012	0.013	0.006	0.005	0.010	0.010
Number of Firms	509	555	332	329	502	517

Table IIIC

Distribution of Purchases from Durable versus Nondurable Dependent Suppliers

The first column reports the number of years in which a customer firm makes purchases from dependent suppliers in the manufacturing sector between 1979 and 1997. The following three columns show the number of cases in which such purchases were made only from durable goods suppliers, nondurable goods suppliers, and both types of dependent suppliers.

	Number of Obs. with Purchases from Dependent Suppliers	Number of Obs. with Purchases from Durable Dependent Suppliers	Number of Obs. with Purchases from Nondurable Dependent Suppliers	Number of Obs. with Purchases from both Types of Dependent Suppliers
Durable Sector Customers	1,829	1,661	375	207
Nondurable Sector Customers	1,144	367	892	115
Nonmanufacturing Customers	1,803	1,262	776	235

however, the proportion is quite large: The mean and median values are 13% and 7%, respectively, for customers in the durable goods sector, and are comparable for customers in the other sectors. Given the diminishing importance of supplier dependence for the bigger customer firms, we would expect any effects of supplier dependence on customer firms' capital structure to be present mainly for the smaller size groups.

C.2. Durable versus Nondurable Sector Purchases

Titman and Wessels (1988) argue that manufacturing firms in durable goods sectors are more likely to produce unique products. Below, we provide additional

evidence on the nature of products purchased by customer firms from durable and nondurable sector suppliers.

First, by directly investigating the products purchased by customers in durable and nondurable goods sectors, we find that durable goods sector customers are likely to buy unique products from durable goods sector suppliers, but standardized products from nondurable goods sector suppliers. Consider, for example, Chrysler Corp., a manufacturer in the durable goods sector. Chrysler purchased engines, rebuilt automotive parts, electronic components, resistance wielding components, and structural automotive parts. Most of these are unique products specially made for them by their dependent suppliers. Chrysler also bought fiber materials, carpets and vinyl, polyurethane foam, automobile seating systems, and batteries from their nondurable goods suppliers. Although a large order from Chrysler is important for any supplier, these products need little or no investment that would be unique for Chrysler as opposed to any other large customer. In contrast, consider Abbott Labs, a company in the nondurable sector producing pharmaceutical, medical, and nutritional products. Abbott purchased chemical compounds, containers, and other packaging materials from their nondurable goods suppliers. They also purchased urological catheters, disposable medical devices, and air purification equipment from their durable goods sector suppliers. None of these items require significant relation-specific investments from the dependent suppliers and the durable goods purchased are largely finished products rather than specialized inputs. Thus, it appears that durable goods manufacturers buy specialized inputs from suppliers in durable goods sectors, but general purpose products from suppliers in nondurable sectors, whereas, manufacturers in nondurable sectors buy general purpose products from suppliers in both durable and nondurable goods sectors. We investigate the items purchased by a large number of customer firms from the two sectors and find that, in most cases, the properties of the purchased items show a similar pattern.

Second, we find that the dependent suppliers of customer firms in the durable goods sector are largely in the same durable goods sector themselves, and we find a similar pattern for the nondurable goods sector customers. In Table III, Panel C, we report that 91% of the customer firms in the durable goods sector have at least one dependent supplier from the durable goods sector and only 20% of them have suppliers producing nondurable goods (11% have suppliers from both sectors). Similarly, nondurable manufacturing sector customers have more suppliers that manufacture nondurable goods (78%) and only 32% of them have dependent suppliers from the durable goods sector. Thus, durable goods sector customers are likely to buy mostly unique products, and nondurable goods sector customers mostly standardized products.

C.3. Frequency and Duration of Purchases by and Sales to Principal Customers

Table IV presents statistics on the frequency and duration of customer–supplier relationships. In Panel A, we note that, on average, a customer firm in the durable goods sector has dependent suppliers for 4.39 years (column 1), or

Table IV

Descriptive Statistics for the Frequency and Duration of Customer–Supplier Relationships

Panel A reports summary statistics for the number (proportion) of years a firm, identified at least once as a principal customer, purchases from dependent suppliers and Panel B reports summary statistics for the number (proportion) of years a suppler firm reports sales to principal customers. For each panel, the four columns report the summary statistics of the following items for the respective subgroup of customer and supplier firms:

Column (1): Total number of years a customer (supplier) firm reports a dependent supplier (large customer).

Column (2): Number of *consecutive years* a customer (supplier) firm reports a dependent supplier (large customer). If a customer firm has more than one stretch of consecutive years of purchases from dependent suppliers, the stretch with the maximum number of consecutive years is used.

Column (3): Proportion of years a customer (supplier) reports a dependent supplier (large customer) as a fraction of years the firm appears in the sample.

Column (4): Proportion of *consecutive years* a customer (supplier) firm reports a dependent supplier (large customer) as a fraction of years the firm appears in the sample.

Panel A

	(A) Durable Goods Manufacturing Customers				(B) Nondurable Goods Manufacturing Customers				(C) Nonmanufacturing Customers			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Mean	4.39	3.73	0.35	0.31	3.96	3.36	0.31	0.28	4.16	3.53	0.32	0.29
SD	4.48	4.04	0.27	0.26	3.80	3.24	0.25	0.24	4.38	3.88	0.27	0.25
5th percentile	1	1	0.05	0.05	1	1	0.05	0.05	1	1	0.05	0.05
25th percentile	1	1	0.13	0.11	1	1	0.11	0.10	1	1	0.11	0.11
Median	3	2	0.26	0.21	2	2	0.25	0.20	2	2	0.21	0.17
75th percentile	5	4	0.50	0.42	5	4	0.42	0.37	5	4	0.47	0.36
95th percentile	16	14	1	1	13	11	0.92	0.83	14	12	1	1
Number of Firms	431				299				440			

Panel B

	(A) Durable Goods Manufacturing Suppliers				(B) Nondurable Goods Manufacturing Suppliers			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Mean	5.29	4.73	0.55	0.51	5.96	5.37	0.60	0.56
SD	4.06	3.75	0.29	0.29	4.75	4.49	0.29	0.30
5th percentile	1	1	0.11	0.11	1	1	0.125	0.11
25th percentile	2	2	0.31	0.25	2	2	0.33	0.30
Median	4	4	0.5	0.47	4	4	0.6	0.50
75th percentile	7	6	0.8	0.75	8	7	0.875	0.831
95th percentile	14	12	1	1	17	16	1	1
Number of Firms	1,445				2,430			

about a third of the years it is in the sample (column 3). Moreover, these years tend to cluster together. This can be seen from the fact that the sample average of the maximum number of *consecutive* firm-years for which a principal customer has dependent suppliers is 3.73 (column 2), which is close to the average

number of firm-years for which a dependent supplier is reported. The consecutive firm-years constitute 31% of the firm years a firm is in the sample, on average (column 4). We do not find any evidence, however, that the importance of dependent suppliers is associated with major increases or decreases in sales growth. As can be seen from Table III, Panel B, the proportion of purchases from dependent suppliers as a fraction of total sales is not different between high and low sales growth years for the customer firms. Therefore, supplier dependence appears to be the result of either a change in procurement policy or a need for new inputs for new production processes—presumably eventually eliminated through vertical integration or another change in procurement policy.[18]

In Panel B of Table IV, we report similar statistics for dependent suppliers. The pattern is very similar: On average, a dependent supplier reports a principal customer for 5.3 years (column 1), which amounts to 55% of the years in the sample (column 3). Clustering is even stronger here—the sample average of the maximum number of consecutive firms-years for which a principal customer is reported is 4.73 (column 2), and these firm-years constitute 50% of the firm-years a firm is in the sample (column 4). It is also noticeable from a comparison of the means and medians in columns 1 and 2 of Panels A and B that both the number of customer firm-years and the maximum consecutive duration are more skewed for the customers than the corresponding variables for the dependent suppliers.

III. Regression Analysis

A. Regression Specification

As we can see in Table II, customer firms and supplier firms are substantially different from other firms in many respects. Further, the observed differences strongly suggest that there should be unobserved differences in many other characteristics. Therefore, the cross-sectional differences in capital structure may well reflect those factors that affect both the supplier–customer relationship and the capital structure. In this context, the best empirical strategy to capture the effect of the customer–supplier relationship is to examine the changes within the same firm as the firm's relationship with its customers or suppliers changes over time. As mentioned in Section II.C.3, the customer–supplier relationship changes slowly over time and tends to be clustered in time. This gives us an opportunity to test the theories advanced in Section I by taking advantage of the panel structure of the data, controlling for the observed and the unobserved heterogeneity across firms.

We employ a regression model that allows slow adjustments of capital structure to the year-by-year changes in the proportion of purchases from dependent suppliers or the proportion of sales to principal customers. We start with the partial adjustment model

[18] In support of vertical integration being associated with less supplier dependence, in unreported regressions we find that the probability of not having a dependent supplier is positively related to a decrease in sales over assets.

$$d_{it} - d_{it-1} = \beta\left(d_{it}^{*} - d_{it-1}\right), \tag{1}$$

where d_{it} and d_{it}^{*} denote, respectively, the actual and the target debt ratios for firm i at time t, and β denotes the speed of adjustment ($0 < \beta < 1$). We also assume that the target itself is a function of a set of variables X_{it}:

$$d_{it}^{*} = \sum_{k} a_k X_{kit}, \tag{2}$$

where X_{kit} is a determinant of the target leverage ratio and a_k is its coefficient. Substituting d_{it}^{*} from equation (2) into equation (1) yields,

$$d_{it} = \beta \sum_{k} a_k X_{kit} + (1 - b)\, d_{it-1}. \tag{3}$$

We perform two distinct sets of panel regression analyses to test the hypotheses laid out in Section I: one for customers and the other for suppliers. Most of the results reported in the tables are based on the market long-term debt ratio as the dependent variable, which we define as

$$LDM = \frac{\text{Total Long-Term Debt}}{\text{Total Debt } + \text{Market Value of Equity}}.$$

However, all our results hold if we consider the book long-term debt ratio, defined as

$$LDB = \frac{\text{Total Long-Term Debt}}{\text{Total Assets}}.$$

Our results are also robust to the inclusion of short-term debt in the definition of the debt ratio. The results for these alternative definitions of the debt ratio are available on request.

Our key variables among the determinants of capital structure (i.e., X_{kit}) are those related to supplier–customer relationships. For the customers, we consider the following variables to represent the importance of purchases from the dependent suppliers:

Purchases/COGS–All identified suppliers: Please see Section II.C.

Purchases/COGS–Durable suppliers: Total supply from all Compustat-listed durable manufacturing sector suppliers (primary SIC from 3,400 to 3,990) who record the current firm as (one of) their principal customer(s), as a proportion of Cost of Goods Sold of the customer firm.

Purchases/COGS–Nondurable suppliers: Total supply from all Compustat-listed nondurable manufacturing sector suppliers (primary SIC from 2,000 to 3,390) who record the current firm as (one of) their principal customer(s), as a proportion of Cost of Goods Sold of the customer.[19]

[19] *Purchases/COGS–Durable suppliers* and *Purchases/COGS–Nondurable suppliers* add up to *Purchases/COGS–All identified suppliers*.

Consistent with Hypothesis 1, we expect that in equation (3), the effect of *Purchases/COGS–All identified suppliers* will be negative, but the effect should be stronger for customer firms in the durable manufacturing sector.[20] Moreover, even for customers in this sector, the importance of supplier-specific investment is expected to be greater for suppliers in durable goods industries. Thus, we hypothesize *Purchases/COGS–Durable suppliers* to have a stronger negative effect than *Purchases/COGS–Nondurable suppliers* on the debt ratio of the customer firms. In addition, we expect these effects to be stronger for smaller customer firms, which are likely to be less vertically integrated (more reliant on purchases from dependent suppliers) and less creditworthy.

For suppliers, we consider the variables related to the importance of sales to principal customers. Specifically, the following variables feature in our regressions:

BIGALL: Please see Section II.C.

BIGNONGOV: Proportion of sales to all of the firm's big customers identified as Compustat firms, private companies, or not identified ("unidentified"). Private companies are identified from Academic Universe and include companies listed elsewhere but not included in Compustat.

BIGGOVT: Proportion of sales to all big customers identified as "government."

Note that *BIGNONGOV* and *BIGGOVT* add up to *BIGALL*.

Consistent with Hypothesis 2, we expect that the effect of *BIGALL* on the debt ratio of supplier firms in equation (3) will be negative, but the effect should be stronger for supplier firms in the durable manufacturing sector. Moreover, consistent with Hypothesis 3, we expect *BIGNONGOV* to have a stronger negative effect on the supplier's capital structure than *BIGGOVT*.

Definitions of these supplier and customer related variables are summarized in Appendix A. Other control variables include some of the conventional factors affecting debt. Definitions of these variables are in Appendix B. We also include time (year) dummies to control for any factors that affect all the firms at the same time, such as a recession, a trend in capital structure, a general change in the corporate procurement process, etc. Moreover, all the reported t-ratios are based on standard errors that are heteroskedasticity-consistent and allow for clustering at the firm level.

We report the pair-wise correlation between the independent variables in Table V. The stakeholder-related variables (*Purchases/COGS* from all dependent suppliers and proportion of sales to all big customers) are not highly correlated with the control variables.

[20] Recall the evidence discussed in Section II.C.2 that (i) customer firms in nondurable or nonmanufacturing sectors tend to buy mostly from suppliers in the same sectors, and (ii) even when customer firms in nondurable manufacturing or nonmanufacturing sectors have dependent suppliers in the durable goods sector, the purchases appear to be standardized items requiring little specific investment.

Table V
Pair-Wise Correlations between the Explanatory Variables for the Sample of All Firms

The sample contains all firm-years for firms between 1979 and 1997 in the manufacturing sector in Compustat that have no missing values for any of the listed variables. There are 59,526 such observations. The list of variables includes all the independent variables used in the subsequent regressions. The definitions of these variables are in Appendices A and B. The significance level is reported below the correlation coefficients.

	Q	Log (Sales)	FA/TA	ROA	Age	R&D	SGA	Dividend Dummy	S/A	BIGALL
Log(Sales)	−0.255									
	0.000									
FA/TA	−0.052	0.299								
	0.000	0.000								
ROA	−0.214	0.462	0.068							
	0.000	0.000	0.000							
R&D	0.172	−0.412	−0.168	−0.529	−0.220					
	0.000	0.000	0.000	0.000	0.000					
SGA	0.133	−0.403	−0.249	−0.420	−0.219	0.283				
	0.000	0.000	0.000	0.000	0.000	0.000				
Dividend Dummy	−0.193	0.560	0.258	0.284	0.462	−0.234	−0.252			
	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
S/A	0.018	0.171	−0.011	0.162	0.062	−0.373	−0.225	0.079		
	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000		
BIGALL	0.079	−0.247	−0.111	−0.112	−0.163	0.201	0.015	−0.216	−0.055	
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Purchases/ COGS	−0.009	0.074	−0.024	0.021	0.017	0.008	0.000	0.003	0.004	0.006
All Suppliers	0.028	0.000	0.000	0.000	0.000	0.043	0.960	0.488	0.375	0.175

B. Further Discussion on Empirical Methodology

Our regression strategy builds on the results of Titman and Wessels (1988), but further refines their results by specifically and directly testing whether, within the same "durable goods" industries and after controlling for the effects of R&D and selling expenses, certain groups of stakeholders have a significant impact on the capital structure of their partner firms. We expect dependent suppliers and customers with a network of dependent suppliers to have lower leverage within the durable goods industries. However, when the suppliers and customers are outside the durable goods industries, we expect supplier dependence to have little effect on the capital structure of either the suppliers or the customers. Thus, for our results to be spurious, certain firm characteristics would have to simultaneously cause firms to enter into stakeholder relationships and also cause them to maintain lower debt ratios; moreover, these firm characteristics would have to affect capital structure only in durable goods industries.

To further ensure that unobserved or observed firm characteristics are not driving our results, we follow several strategies. First, because we find that

many observed firm-specific variables differ significantly between the firms in stakeholder relationships and their control groups in Table II, we include these variables and the fixed firm effects as controls in our regressions to mitigate the concern that differences in firm characteristics between firms in stakeholder relationships and other firms explain our results. Second, to control for the effects of economy-wide phenomena, we include year dummies in our regressions. We also break up our analysis into subperiods and check for the robustness of our results across subperiods.[21] Next, to mitigate the concern that customer–supplier variables are correlated with firm growth, which in turn affects leverage ratios, we include variables such as Tobin's q, sales growth, and profitability as controls. Finally, we also estimate our main results in a 5-year difference form. Our specification examines how the debt ratio responds, over a 5-year period, to yearly changes in customer/supplier variables within the period. If adjustment to a target is costly (Strebulaev (2007), Leary and Roberts (2005)), we expect the change in leverage to be more strongly related to the earlier changes in the customer/supplier-related variables. An additional advantage of this specification is that if the debt ratio responds to annual changes in customer/supplier variables at lags as long as 5 years, it mitigates the concern that our results are spuriously driven by factors that are correlated with such changes.[22]

C. Regression Results

C.1. Customer Firms' Capital Structure

In Tables VI and VII, we report the results concerning the effect of purchases from dependent suppliers on customer firms' capital structure. The dependent variable is long-term market leverage, and the explanatory variables of interest are the ones that indicate the importance of the purchases from Compustat-listed manufacturing suppliers that identify the customer as a principal customer (i.e., dependent suppliers). The sample in Table VI consists of all firm-years for firms that are identified as a principal customer by another Compustat firm *at least once* during 1979 to 1997. As a result, the samples in this table consist mostly of large firms and the sample sizes are relatively small. In Table VII, we consider all firms in Compustat, including those that are identified as principal customers. We control for fixed firm effects for the results reported in Tables VI and VII. In each of these tables, the sample is divided according to whether the firms belong to the durable goods manufacturing sector (Panel A), nondurable goods manufacturing sector (Panel B), or nonmanufacturing sector

[21] The results of subperiod analysis are not reported in the paper.

[22] For example, it is known that more profitable firms have retentions, which affects the denominator of the book debt ratio, whereas higher stock returns affect the denominator of the market debt ratio. If increases in purchases from dependent suppliers or sales to principal customers are correlated with these variables, our regressions could be picking up these spurious effects. However, these effects are likely to manifest immediately rather than at long lags.

Table VI

The Effect of Dependent Suppliers on the Market Leverage of Customer Firms

The following model is estimated: $LDM_{it} = \alpha + \gamma LDM_{it-1} + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit} + \kappa_i + u_{it}$, where the market leverage, LDM_{it}, is defined as the ratio of long-term debt to the market value of equity plus total debt. B_{kit} represents purchases from dependent manufacturing suppliers from different sectors as a fraction of *Cost of Goods Sold* of the customer firms. Please see Appendix A for exact definitions of these variables. F_{lit} refers to control variables in the regressions. It includes log of total sales (*Log*(*Sales*)), profitability (*ROA*), tangibility (*FA*/*TA*), growth opportunities (*Q*), R&D to sales (*R&D*), selling general and administrative expense (*SGA*), dividend dummy (*Dividend*), and total sales to total assets (*S*/*A*). The definitions of these variables are in Appendix B. The regressions also include firm and year dummies, but their coefficients are not reported. The sample contains all firm-years for firms in Compustat that are identified as a principal customer by at least one other Compustat firm *for at least one year* between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for the manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990). In column 3 (respectively, column 4), we drop all customer firms whose median size is above median (respectively, below median) among all customer firms. Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400) and Panel C shows the result for nonmanufacturing customer firms (all other sectors except the financial sector). The *t*-values, given in parentheses, are based on standard errors that are heteroskedasticity-consistent and allow clustering at the firm level. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Manufacturing Customers				(B) Nondurable Goods Manufacturing Customers		(C) Nonmanufacturing Customers	
	(1) All Firms	(2) All Firms	(3) Smaller Customer Firms	(4) Larger Customer Firms	(1) All Firms	(2) All Firms	(1) All Firms	(2) All Firms
LDM_{t-1}	0.518	0.517	0.497	0.527	0.536	0.536	0.545	0.545
	(19.73)***	(19.72)***	(13.93)***	(13.17)***	(17.80)***	(17.81)***	(18.65)***	(18.63)***
Purchases/COGS	−0.040				−0.012		0.089	
All identified suppliers	(−1.54)				(−0.30)		(1.44)	
Purchases/COGS		−0.048	−0.071	0.018		0.047		0.110
Durable suppliers		(−1.81)*	(−2.43)**	(−0.26)		(0.92)		(1.44)
Purchases/COGS		0.120	0.160	−0.414		−0.039		0.015
Nondurable suppliers		(1.23)	(1.55)	(0.99)		(−0.69)		(0.23)

Q	−0.013	−0.013	−0.011	−0.019	−0.010	−0.010	−0.022	−0.022
	(−6.78)***	(−6.77)***	(−5.31)***	(−4.22)***	(−4.91)***	(−4.92)***	(−7.04)***	(−7.03)***
Log(Sales)	0.016	0.016	0.017	0.014	0.018	0.018	0.011	0.012
	(3.72)***	(3.76)***	(2.93)***	(3.15)***	(4.53)***	(4.56)***	(2.10)**	(2.12)**
FA/TA	0.088	0.089	0.157	−0.006	−0.012	−0.012	0.051	0.051
	(2.14)**	(2.15)**	(2.54)**	(−0.16)	(−0.44)	(−0.45)	(1.90)*	(1.90)*
ROA	−0.051	−0.051	−0.061	−0.071	−0.032	−0.032	−0.080	−0.080
	(−2.82)***	(−2.83)***	(−3.06)***	(−1.51)	(−1.06)	(−1.06)	(−3.08)***	(−3.12)***
R&D	0.011	0.011	−0.031	0.079	−0.015	−0.015	−0.069	−0.070
	(0.29)	(0.28)	(−0.76)	(0.83)	(−0.61)	(−0.61)	(−1.03)	(−1.04)
SGA	−0.035	−0.035	−0.064	−0.007	0.010	0.010	−0.012	−0.012
	(−1.38)	(−1.38)	(−1.80)*	(−0.24)	(0.79)	(0.81)	(−0.51)	(−0.49)
Dividend	−0.015	−0.015	−0.012	−0.020	−0.008	−0.008	−0.018	−0.018
	(−2.13)**	(−2.15)**	(−1.28)	(−1.84)*	(−0.77)	(−0.78)	(−1.90)*	(−1.91)*
S/A	−0.041	−0.041	−0.044	−0.035	−0.056	−0.055	−0.033	−0.033
	(−4.61)***	(−4.61)***	(−4.82)***	(−2.43)**	(−5.64)***	(−5.59)***	(−4.93)***	(−4.94)***
Constant	0.008	0.006	0.022	0.019	0.010	0.008	0.072	0.072
	(0.25)	(0.22)	(0.64)	(0.48)	(0.28)	(0.25)	(1.57)	(1.56)
Firms	408	408	230	178	266	266	394	394
Observations	4,675	4,675	2,309	2,366	3,414	3,414	4,436	4,436
R-squared	0.72	0.72	0.70	0.76	0.78	0.78	0.80	0.80

Table VII

The Effect of Dependent Suppliers on Market Leverage of Customer Firms (Sample of All Firms)

The following model is estimated: $LDM_{it} = \alpha + \gamma LDM_{it-1} + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit} + \kappa_i + u_{it}$, where the market leverage, LDM_{it}, is defined as the ratio of long-term debt to the market value of equity plus total debt. B_{kit} represents purchases from manufacturing suppliers from different sectors as a fraction of *Cost of Goods Sold* of the customer firms. Please see Appendix A for exact definitions of these variables. F_{lit} refers to control variables in the regressions. It includes log of total sales (*Log(Sales)*), profitability (*ROA*), tangibility (*FA/TA*), growth opportunities (*Q*), R&D to sales (*R&D*), selling general and administrative expense (*SGA*), dividend dummy (*Dividend*), and total sales to total assets (*S/A*). The definitions of these variables are in Appendix B. The regressions also include firm and year dummies, but their coefficients are not reported. The sample contains all firms in Compustat between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for the manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990). In column 3 (respectively, column 4), we drop all customer firms whose median size is above median (respectively, below median) among all customer firms. Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400) and Panel C shows the result for nonmanufacturing customer firms (all other sectors except the financial sector). The *t*-values, given in parentheses, are based on standard errors that are heteroskedasticity-consistent and allow clustering at the firm level. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Manufacturing Customers				(B) Nondurable Goods Manufacturing Customers		(C) Nonmanufacturing Customers	
	(1) All Firms	(2) All Firms	(3) Smaller Customer Firms	(4) Larger Customer Firms	(1) All Firms	(2) All Firms	(1) All Firms	(2) All Firms
LDM_{t-1}	0.472	0.472	0.466	0.469	0.481	0.481	0.453	0.453
	(34.94)***	(34.94)***	(32.94)***	(32.44)***	(31.38)***	(31.38)***	(48.21)***	(48.21)***
Purchases/COGS	−0.046				−0.008		0.073	
All identified suppliers	(−1.85)*				(−0.20)		(1.05)	
Purchases/COGS		−0.056	−0.075	0.025		0.051		0.091
Durable suppliers		(−2.17)**	(−2.70)***	(0.37)		(1.18)		(1.06)
Purchases/COGS		0.133	0.140	0.051		−0.034		0.011
Nondurable suppliers		(1.17)	(1.19)	(0.09)		(−0.64)		(0.14)

Q	−0.009	−0.009	−0.009	−0.009	−0.009	−0.009	−0.011	−0.011
	(−14.3)***	(−14.3)***	(−13.7)***	(−13.3)***	(−11.9)***	(−11.9)***	(−17.7)***	(−17.7)***
Log(Sales)	0.015	0.015	0.015	0.015	0.017	0.017	0.015	0.015
	(9.81)***	(9.82)***	(9.29)***	(9.54)***	(9.10)***	(9.11)***	(12.61)***	(12.61)***
FA/TA	0.144	0.144	0.155	0.142	0.112	0.112	0.106	0.106
	(10.51)***	(10.52)***	(10.78)***	(10.43)***	(8.16)***	(8.16)***	(13.92)***	(13.92)***
ROA	−0.040	−0.040	−0.038	−0.038	−0.026	−0.026	−0.016	−0.016
	(−8.06)***	(−8.06)***	(−7.72)***	(−7.59)***	(−4.17)***	(−4.17)***	(−4.11)***	(−4.11)***
R&D	−0.005	−0.005	−0.007	−0.004	0.013	0.013	0.002	0.002
	(−0.54)	(−0.55)	(−0.76)	(−0.41)	(1.45)	(1.45)	(0.27)	(0.27)
SGA	−0.020	−0.020	−0.020	−0.018	−0.006	−0.006	−0.006	−0.006
	(−3.17)***	(−3.17)***	(−3.09)***	(−2.83)***	(−1.07)	(−1.06)	(−1.07)	(−1.07)
Dividend	−0.012	−0.012	−0.012	−0.012	−0.014	−0.014	−0.009	−0.009
	(−3.81)***	(−3.81)***	(−3.52)***	(−3.60)***	(−3.35)***	(−3.35)***	(−3.01)***	(−3.02)***
S/A	−0.029	−0.029	−0.028	−0.028	−0.035	−0.035	−0.025	−0.025
	(−10.8)***	(−10.8)***	(−10.2)***	(−10.1)***	(−9.22)***	(−9.22)***	(−14.3)***	(−14.3)***
Constant	0.049	0.049	0.053	0.048	0.055	0.055	0.039	0.039
	(7.12)***	(7.11)***	(7.75)***	(6.84)***	(5.43)***	(5.42)***	(5.85)***	(5.85)***
Firms	3,357	3,357	3,179	3,127	2,517	2,517	6,734	6,734
Observations	25,221	25,221	22,855	22,912	19,751	19,751	44,388	44,388
R-squared	0.72	0.72	0.72	0.72	0.76	0.76	0.78	0.78

(Panel C). This division is based on primary SIC codes.[23] In addition, we split the durable sector customer firms according to firm size, that is, whether the customer firm's size is above or below median. As mentioned before, the regressions contain year dummies and incorporate fixed firm effects, but these effects are not reported in the tables.

From Panel A, Column 1 of Table VI, we see that durable sector customers who rely on dependent suppliers for a larger proportion of their inputs maintain significantly lower market leverage. In column 2, we decompose total manufactured inputs from dependent suppliers into those from durable and nondurable goods suppliers (i.e., those producing durable and nondurable products). We find that the negative effect comes from firms that depend heavily on durable goods suppliers. From Panels B and C of Table VI, we find that the proportion of purchases from dependent suppliers has no significant effect on the customer firms' capital structures in nondurable goods manufacturing and nonmanufacturing industries, regardless of whether the supplier is in the durable sector or the nondurable sector.[24] These results are consistent with the hypothesis that, in the durable sector, where specific investments are more important, customers choose lower debt ratios to encourage more specific investment by dependent suppliers in the durable sector when they purchase more from the latter. Many of such purchases are likely to be intermediate goods specific to the customer firms' products. However, as we discuss in Section II.C, the durable sector suppliers that sell to nondurable sector customers tend to sell general purpose durable goods, such as air purifiers, rather than intermediate goods. We get a very similar picture from the results reported in Table VII.

In both tables, the results reported in columns 3 and 4 of Panel A show that the effect of purchases from dependent suppliers on capital structure comes primarily from the smaller customers. This is reasonable, as the large customers are very large firms and their default is unlikely to be a major concern for the dependent suppliers. They are also likely to be much more vertically integrated (as indicated by the lower sales to assets ratio), and thus are *less* likely to depend on suppliers.[25]

[23] Firms with primary SIC codes from 3,400 to 3,990 are classified as durable goods manufacturing firms and those with primary SIC codes between 2,000 and 3,400 are classified as nondurable goods manufacturing firms. The remaining firms, excluding those in the financial sector (primary SIC codes between 6,000 and 7,000), are classified as nonmanufacturing firms.

[24] Recall that our method of identifying principal customers starts with suppliers in the manufacturing sector. Not all of these principal customers are in the manufacturing sector. Thus, while our supplying firms are all in the manufacturing sector, some of the customer firms are not.

[25] In Tables VI and VII, for a firm that is not identified as a principal customer by any other firm in Compustat in a given year, $purchases/COGS = 0$. This does not mean that the firm does not use any outside supply of inputs; rather, this means that its demand is not considered significantly large by any of the Compustat-listed supplier firms in that particular year. Since none of the suppliers consider the order from such a firm as significant, the firm's leverage ratio is inconsequential for the investment decisions of the suppliers. In other words, the variable *purchases/COGS* should be reinterpreted in these regressions as an interaction of *purchases/COGS* and a dummy variable that takes the value of one if each of the suppliers from whom the purchases are made considers the purchase an important proportion of their sales, and zero otherwise.

In all the above regressions, the economic magnitude of the effect of purchases from suppliers as a proportion of the customer's COGS on leverage is significant. For example, the coefficients reported in Panel A, column 2 of Table VI imply that a 10% increase in the proportion of purchases to COGS from durable goods suppliers would cause the debt ratio to decrease by 0.5 percentage points. This is an economically significant number for two reasons. First, it is economically important in the context of the mean and the median market leverage ratios of 11% and 6%, respectively, for durable sector customer firms (please see Table I). Second, note that the customer firms in our sample are large firms, with generally low default probability. Thus, a significant effect here suggests that the effect would be quite important for smaller customer firms buying from (possibly still smaller) dependent suppliers.

C.2. Dependent Supplier's Capital Structure

In Tables VIII and IX, we report the results concerning the effect of principal customers on the supplier firms' capital structure. The dependent variable is long-term market leverage, and the explanatory variables of interest are the ones that capture the importance of various categories of big customers. In particular, we distinguish between sales to private principal customers and government principal customers. In Table VIII, we consider all firm-years for supplier firms that report sales to a principal customer *at least once* during 1979 to 1997, and in Table IX, we include all Compustat firms in the manufacturing sector. We control for fixed firm effects in all these regressions and include year dummies. In both of these tables, we report results for two groups of firms, namely, those in durable goods manufacturing industries and those in nondurable goods manufacturing industries.

The results support the hypothesis that suppliers selling proportionately more to principal customers maintain lower debt ratios, and that the effect is stronger in the durable sector. The coefficient on *BIGALL* is negative and significant for suppliers in the durable sector; however, the same variable has an insignificant negative coefficient for firms in the nondurable sector. When we break up sales to principal customers into sales to government and nongovernment customers, a clearer picture emerges. Sales to nongovernment principal customers (*BIGNONGOV*) has a significant negative effect for firms in the durable sector, while sales to government principal customers (*BIGGOVT*) has no such effect—consistent with our hypothesis.

These results are consistent with the idea that supplier firms in durable manufacturing sectors maintain lower leverage ratios to attenuate the indirect costs of financial distress that would have to be incurred in the event they lose their principal customers. These costs are likely to be higher for durable sectors for two reasons. First, for reasons discussed earlier, stakeholder-driven losses are likely to be larger for firms producing durable or unique products. Second, it is more difficult to redeploy investments that are specific to major customers in durable sectors.

Table VIII

The Effect of Sales to Principal Customers on the Market Leverage of Dependent Suppliers

The following model is estimated: $LDM_{it} = \alpha + \gamma LDM_{it-1} + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit} + \kappa_i + u_{it}$, where the market leverage, LDM_{it} is defined as the ratio of long-term debt to the market value of equity plus total debt. B_{kit} is the proportion of sales to each category of principal customer as a percentage of total sales. The exact definitions of these variables are shown in Appendix A. F_{lit} refers to the control variables in the regressions. It includes log of total sales (*Log(Sales)*), profitability (*ROA*), tangibility (*FA*/*TA*), growth opportunities (*Q*), R&D to sales (*R&D*), selling general and administrative expense (*SGA*), dividend dummy (*Dividend*), and total sales to total assets (*S*/*A*). The definitions of these variables are in Appendix B. The regressions also include firm and year dummies, but their coefficients are not reported. The sample contains all manufacturing firms in Compustat that have been a supplier to a large customer *at least once* between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A reports the results for manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990) and Panel B shows the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400). The *t*-values, given in parentheses, are based on standard errors that are heteroskedasticity-consistent and allow clustering at the firm level. *** (**) denotes significance at the 1% (5%) level.

	(A) Durable Goods Firms		(B) Nondurable Goods Firms	
	(1)	(2)	(1)	(2)
LDM_{t-1}	0.465	0.465	0.473	0.473
	(27.85)***	(27.86)***	(21.23)***	(21.19)***
BIGALL	−0.013		−0.006	
	(−2.44)**		(−1.04)	
BIGNONGOV		−0.016		−0.008
		(−2.88)***		(−1.34)
BIGGOVT		0.019		−0.005
		(1.41)		(−0.14)
Q	−0.010	−0.010	−0.008	−0.008
	(−12.85)***	(−12.86)***	(−8.99)***	(−8.97)***
Log(Sales)	0.011	0.011	0.016	0.016
	(5.53)***	(5.52)***	(6.61)***	(6.54)***
FA/TA	0.167	0.168	0.123	0.123
	(10.39)***	(10.41)***	(6.59)***	(6.60)***
ROA	−0.043	−0.043	−0.021	−0.020
	(−7.00)***	(−6.92)***	(−2.65)***	(−2.63)***
R&D	−0.030	−0.030	0.011	0.011
	(−2.63)***	(−2.67)***	(1.09)	(1.08)
SGA	−0.031	−0.031	−0.009	−0.009
	(−3.79)***	(−3.73)***	(−1.46)	(−1.43)
Dividend	−0.009	−0.009	−0.014	−0.014
	(−2.56)**	(−2.51)**	(−2.61)***	(−2.61)***
S/A	−0.033	−0.033	−0.034	−0.034
	(−9.58)***	(−9.58)***	(−7.67)***	(−7.67)***
Constant	0.075	0.075	0.069	0.069
	(8.62)***	(8.57)***	(6.02)***	(6.01)***
Firms	2,161	2,161	1,268	1,268
Observations	16,682	16,682	9,946	9,946
R-squared	0.72	0.72	0.75	0.75

Table IX

The Effect of Sales to Principal Customers on the Market Leverage of Dependent Suppliers (Sample of All Firms)

The following model is estimated: $LDM_{it} = \alpha + \gamma LDM_{it-1} + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit} + \kappa_i + u_{it}$, where the market leverage, LDM_{it} is defined as the ratio of long-term debt to the market value of equity plus total debt. B_{kit} is the proportion of sales to each category of principal customer as a percentage of total sales. The exact definitions of these variables are shown in Appendix A. F_{lit} refers to the control variables in the regressions. It includes log of total sales (*Log(Sales)*), profitability (*ROA*), tangibility (*FA*/*TA*), growth opportunities (*Q*), R&D to sales (*R&D*), selling general and administrative expense (*SGA*), dividend dummy (*Dividend*), and total sales to total assets (*S*/*A*). The definitions of these variables are in Appendix B. The regressions also include firm and year dummies, but their coefficients are not reported. The sample contains all manufacturing firms in Compustat between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A reports the results for manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990) and Panel B shows the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400). The *t*-values, given in parentheses, are based on standard errors that are heteroskedasticity-consistent and allow clustering at the firm level. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Firms		(B) Nondurable Goods Firms	
	(1)	(2)	(1)	(2)
LDM_{t-1}	0.472	0.472	0.480	0.480
	(35.21)***	(35.22)***	(30.38)***	(30.35)***
BIGALL	−0.012		−0.004	
	(−2.27)**		(−0.62)	
BIGNONGOV		−0.015		−0.006
		(−2.73)***		(−0.93)
BIGGOVT		0.018		−0.004
		(1.36)		(−0.09)
Q	−0.009	−0.009	−0.009	−0.009
	(−13.86)***	(−13.86)***	(−11.66)***	(−11.64)***
Log(Sales)	0.014	0.014	0.017	0.017
	(8.00)***	(7.99)***	(8.71)***	(8.65)***
FA/TA	0.145	0.145	0.120	0.120
	(10.43)***	(10.45)***	(8.51)***	(8.52)***
ROA	−0.046	−0.046	−0.028	−0.028
	(−8.92)***	(−8.85)***	(−4.31)***	(−4.29)***
R&D	−0.022	−0.022	0.006	0.006
	(−2.23)**	(−2.26)**	(−0.73)	(−0.72)
SGA	−0.029	−0.029	−0.011	−0.011
	(−4.13)***	(−4.09)***	(−1.93)*	(−1.91)*
Dividend	−0.012	−0.012	−0.014	−0.014
	(−3.84)***	(−3.80)***	(−3.52)***	(−3.53)***
S/A	−0.035	−0.035	−0.042	−0.042
	(−12.33)***	(−12.34)***	(−11.98)***	(−11.98)***
Constant	0.067	0.067	0.063	0.063
	(8.75)***	(8.73)***	(6.59)***	(6.58)***
Firms	3,348	3,348	2,477	2,477
Observations	25,200	25,200	19,512	19,512
R-squared	0.73	0.73	0.76	0.76

Notice that a firm's sales to a principal customer have negative effects on the capital structure only when the principal customer is in the private sector. Sales to nongovernment principal customers (*BIGNONGOV*) have a significant negative effect for firms in the durable sector, while sales to government principal customers (*BIGGOVT*) have no such effects—consistent with our hypothesis. This is because the government is highly creditworthy and also likely to be concerned about the potential impact of a loss of its orders to the owners, employees, or other stakeholders of a supplier firm; thus, the potential for financial distress when the principal customer is the domestic government may be deemed less likely by the supplier firms. Below (in Section IV.F), we will present some evidence based on a univariate analysis suggesting that the potential for financial distress subsequent to the loss of a principal customer's business may indeed be a motivation for firms to maintain lower leverage.

The impact of sales to principal customers on supplier firms' debt ratios is economically significant. Consider the effect of *BIGNONGOV* (proportion of sales to nongovernment principal customers) in Panel A of Table VIII, column 2. This coefficient implies that a firm directing 75% of its sales to nongovernment principal customers would have a long-term debt ratio that is lower by 1.2 percentage points than that of supplier without principal customers. This difference is economically important given that the mean and the median long-term debt ratios of supplier firms in our sample are, respectively, 11% and 6%.

C.3. Other Control Variables in the Regressions

Lastly, we discuss the other control variables in Tables VI to IX. Most of the control variables have the expected signs and are significant except *R&D*.

A control variable of interest but not previously extensively discussed in the capital structure literature is the sales-to-assets ratio.[26] This variable consistently shows a strongly significant negative effect. We interpret this variable as a proxy for the extent of outsourcing. For example, this ratio should be high for retail firms that basically outsource all production, while mining firms should have low values of this ratio. Firms with a high value of sales-to-assets are more dependent on outside suppliers, some of whom may have high stakes in the relationships. The stakeholder theory of capital structure predicts that firms with higher values of this ratio should maintain lower leverage to encourage specific investment by outside suppliers. This is exactly what we find: In Tables VI to IX, firms with a higher sales-to-assets ratio have lower leverage. Interestingly, we find that excluding the sales-to-assets from the regressions in Tables VI to IX has a material effect on the impact on the estimated coefficients on the ratio of customer purchases to COGS: The estimated coefficients become larger and statistically more significant.

[26] An exception is Demirgüç-Kunt and Maksimovic (1999), who consider the ratio of sales *to net fixed assets*. They argue that a firm with a high ratio of sales-to-net fixed assets is more likely to need short-term financing to support sales, since it has more short-term assets on the balance sheet.

IV. Alternative Regressions, Additional Evidence, and Robustness Checks

A. Long-term History of Purchases from Dependent Suppliers

Our regressions so far control for fixed firm effects and hence capture how "within variation" of the observed firm-specific variables affects the debt ratio. We noted earlier that the summary statistics reported in Table IV suggest that purchases from dependent suppliers are clustered in time. Therefore, it is possible to examine directly whether the customer firm's debt ratio is higher if it had no history of purchases from dependent suppliers in the recent past. To this end, we define a new dummy variable:

No previous purchase dummy: This variable takes the value of one if there are no purchases from dependent suppliers in the past 5 years, and zero otherwise.

Table X shows the results. The *no previous purchase dummy* has a positive and significant coefficient for the sample of durable sector customers, implying that, if a firm did not have dependent suppliers for the past 5 years at least, its leverage is significantly higher. Columns 2 and 3 estimate the model on subsamples of larger- and smaller-than-median customer firms, respectively. They show that it is mostly the smaller-than-median customers that adjust leverage to changes in their procurement process. In column 4, we rerun the regression by dropping the firm-years in which purchases from dependent suppliers is positive. The *no previous purchase dummy* still has a positive coefficient. This implies that even if a firm currently has no purchases from dependent suppliers, its debt ratio is lower if in the last 5 years it had at least one such supplier. In other words, the effect of purchases from dependent suppliers is somewhat persistent, consistent with slow adjustment to a target debt ratio.

B. Five-Year Changes in Leverage

There is increasing evidence that adjustment costs affect capital structure decisions (Leary and Roberts (2005)). Since firms do not rebalance their capital structures every year, we are more likely to pick up effects of changes in customer/supplier related variables on capital structure if we examine changes in debt ratio over longer periods. We estimate regressions similar to Kayhan and Titman (2007) in which the dependent variable is the change in a firm's debt ratio from period $t - 5$ to t, and the independent variables are also in terms of 5-year changes. In addition, for customer (supplier) firms, the 5-year change in purchases from dependent suppliers (sales to principal customers) is split up into annual changes so that we are able to examine whether the change in the debt ratio is more affected by past changes as opposed to more recent changes, consistent with slow adjustment. The results are reported in Table XI, Panels A and B. Following Kayhan and Titman (2007), who run similar regressions, we bootstrap our results and report the 95% confidence intervals for the key variables. The results in Table XI, Panel A, show that for durable goods sector cus-

Table X

The Effect of Past History of Purchases from Dependent Suppliers on Market Leverage of Customer Firms

The dependent variable is LDM_{it}, defined as the ratio of long-term debt to market value of equity plus total debt. The *No previous purchases dummy* is our variable of interest and it takes the value one if there are *no purchases* from dependent suppliers in the past 5 years. We control for lagged market leverage (LDM_{it-1}), log of total sales (*Log(Sales)*), profitability (*ROA*), tangibility (*FA/TA*), growth opportunities (*Q*), R&D to sales (*R&D*), selling general and administrative expense (*SGA*), dividend dummy (*Dividend*), and total sales to total assets (*S/A*). The sample contains all firm-years for firms in Compustat that are identified as a principal customer by at least one other Compustat firm *for at least 1 year* between 1979 and 1997 and this dummy variable is computed only for observations that at least have 5 years of past data. Panel A shows the results for the manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990), Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400), and Panel C shows the result for nonmanufacturing customer firms (all other sectors except the financial sector). We control for firm fixed effects and allow for clustering at firm level. The *t*-values, given in parentheses, are based on heteroskedasticity-consistent standard errors. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Manufacturing Customers				(B) Nondurable Goods Manufacturing Customers	(C) Non-manufacturing Customers
	(1) All Customer Firms	(2) Larger Customer Firms	(3) Smaller Customer Firms	(4) All Customer Firms: "No Purchases" Years Only	(1) All Firms	(1) All Firms
LDM_{t-1}	0.457	0.497	0.403	0.482	0.462	0.460
	(15.62)***	(13.23)***	(9.65)***	(12.87)***	(10.51)***	(12.66)***
No previous	0.006	0.003	0.010	0.007	0.001	0.005
purchases dummy	(1.99)**	(0.72)	(2.27)**	(1.65)*	(0.47)	(1.41)
Q	−0.016	−0.026	−0.013	−0.019	−0.008	−0.025
	(−8.73)***	(−5.81)***	(−6.52)***	(−7.03)***	(−5.66)***	(−7.51)***
Log(Sales)	0.022	0.025	0.021	0.020	0.021	0.007
	(5.10)***	(4.36)***	(3.73)***	(3.46)***	(5.60)***	(1.93)*

FA/TA	0.129	−0.041	0.245	0.152	0.006	0.045
	(3.40)***	(−1.07)	(4.55)***	(2.68)***	(0.21)	(1.51)
ROA	−0.045	−0.034	−0.064	−0.033	−0.020	−0.089
	(−1.90)*	(−0.75)	(−2.43)**	(−1.04)	(−0.83)	(−3.22)***
AGE	−0.171	−0.195	−0.227	−0.180	−0.279	−0.140
	(−3.39)***	(−3.38)***	(−2.87)***	(−2.69)***	(−6.39)***	(−2.68)***
R&D	−0.026	0.060	−0.099	−0.049	−0.009	−0.138
	(−0.43)	(0.64)	(−1.35)	(−0.60)	(−0.30)	(−2.68)***
SGA	−0.037	0.013	−0.088	−0.032	0.005	0.007
	(−1.42)	(0.54)	(−1.87)*	(−0.77)	(0.49)	(0.40)
Dividend	−0.015	−0.010	−0.015	−0.011	0.000	−0.010
	(2.03)**	(0.88)	(1.61)	(−1.14)	(0.01)	(−1.07)
S/A	−0.045	−0.032	−0.055	−0.037	−0.079	−0.032
	(−4.40)***	(−2.59)***	(−4.95)***	(−2.99)***	(−8.19)***	(−5.78)***
Constant	0.024	0.003	0.064	0.028	0.104	0.154
	(1.02)	(0.07)	(1.89)*	(0.84)	(3.62)***	(5.24)***
Firms	383	173	210	326	247	364
Observations	3,255	1,681	1,574	1,980	2,377	3,085
R-squared	0.72	0.76	0.71	0.74	0.79	0.80

Table XIA

The Effects of Year-by-Year Changes in Purchases from Dependent Suppliers on Five-Year Changes in Market Leverage of Customer Firms

The following model is estimated: $\Delta LDM_{it} = \alpha + \Sigma_k \delta_k \Delta B_{kit} + \Sigma_l \delta_l \Delta F_{lit} + \gamma(LDM_{it-5} - LDM^*_{it-5}) + \kappa_i + u_{it}$, where the market leverage, LDM_{it}, is defined as the ratio of long-term debt to the market value of equity plus total debt. The symbol Δ stands for 5-year changes in the variable. $LDM_{t-5} - LDM^*_{t-5}$ is the deviation of market leverage from its predicted value at year $(t-5)$. LDM^*_{it} is predicted using the model, $LDM_{it} = \alpha + \Sigma_k \delta_k B_{it} + \Sigma_l \delta_l F_{lit-1} + \kappa_i + u_i$ for each of the three sectors separately. B_{it} is purchases from dependent manufacturing suppliers as a fraction of *Cost of Goods Sold* of the customer firms. F_{lit} refers to control variables in the regressions. Please see Appendix B for exact definitions of these variables. In the model reported here, we break down 5-year changes in *Purchases*/*COGS* into 5 year-by-year changes. The regressions also include firm and year dummies but these dummies and the constant are not reported. In each panel, the sample in regression (1) consists of all firms in Compustat between 1979 and 1997 and that in regression (2) consists of firms in Compustat that are identified as a principal customer at least once during the same period. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for the manufacturing firms in the durable goods industries only (primary SIC codes from 3,400 to 3,990), Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400), and Panel C shows the result for nonmanufacturing customer firms (all other sectors except the financial sector). The regression for each column is replicated 500 times by drawing firm clusters, with replacement, from the relevant sample.

	(A) Durable Goods Manufacturing Firms						(B) Nondurable Goods Manufacturing Firms						(C) Nonmanufacturing Firms					
	(1)			(2)			(1)			(2)			(1)			(2)		
	Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]	
$\Delta_{t-(t-1)}$ Purchases/COGS	−0.010	−0.091	0.072	−0.009	−0.091	0.073	−0.082	−0.204	0.040	−0.087	−0.217	0.043	−0.017	−0.105	0.071	−0.009	−0.107	0.088
$\Delta_{(t-1)-(t-2)}$ Purchases/COGS	−0.065	−0.143	0.012	−0.055	−0.144	0.033	−0.166	−0.415	0.083	−0.143	−0.373	0.086	0.038	−0.101	0.176	0.039	−0.106	0.183
$\Delta_{(t-2)-(t-3)}$ Purchases/COGS	−0.108	−0.192	−0.025	−0.088	−0.146	−0.031	−0.014	−0.210	0.181	−0.017	−0.210	0.177	0.043	−0.107	0.193	0.039	−0.118	0.196
$\Delta_{(t-3)-(t-4)}$ Purchases/COGS	−0.091	−0.192	0.010	−0.077	−0.169	0.014	0.077	−0.118	0.273	0.087	−0.101	0.276	0.119	−0.014	0.252	0.122	−0.018	0.261
$\Delta_{(t-4)-(t-5)}$ Purchases/COGS	−0.074	−0.152	0.004	−0.058	−0.126	0.011	−0.004	−0.148	0.140	0.018	−0.113	0.149	0.009	−0.124	0.142	0.001	−0.130	0.132
ΔQ	−0.008	−0.009	−0.006	−0.009	−0.013	−0.005	−0.007	−0.008	−0.005	−0.009	−0.015	−0.003	−0.008	−0.009	−0.006	−0.017	−0.023	−0.011
ΔLog(Sales)	0.016	0.012	0.020	0.018	0.006	0.029	0.016	0.011	0.022	0.009	−0.007	0.024	0.014	0.011	0.018	0.014	0.003	0.026
ΔFA/TA	0.133	0.103	0.162	0.146	0.055	0.236	0.092	0.056	0.127	0.070	0.010	0.130	0.096	0.079	0.113	0.007	−0.053	0.066
ΔROA	−0.033	−0.044	−0.022	−0.046	−0.085	−0.007	−0.024	−0.038	−0.010	−0.030	−0.091	0.031	−0.027	−0.037	−0.018	−0.105	−0.162	−0.048
ΔR&D	−0.012	−0.043	0.019	0.009	−0.101	0.119	0.009	−0.011	0.028	−0.018	−0.094	0.059	−0.005	−0.021	0.011	−0.106	−0.258	0.045
ΔSGA	−0.016	−0.033	0.002	−0.063	−0.121	−0.006	−0.012	−0.023	0.000	0.001	−0.020	0.023	−0.019	−0.033	−0.004	−0.032	−0.088	0.023
ΔDividend	−0.034	−0.041	−0.027	−0.042	−0.060	−0.025	−0.031	−0.041	−0.020	−0.021	−0.049	0.007	−0.027	−0.034	−0.020	−0.044	−0.066	−0.022
ΔS/A	−0.021	−0.027	−0.016	−0.032	−0.050	−0.015	−0.027	−0.034	−0.019	−0.038	−0.063	−0.014	−0.019	−0.024	−0.015	−0.018	−0.029	−0.007
$LDM_{t-5} - LDM^*_{t-5}$	−1.078	−1.111	−1.045	−1.025	−1.085	−0.965	−1.061	−1.103	−1.019	−1.016	−1.098	−0.934	−1.071	−1.096	−1.045	−1.010	−1.085	−0.935
Firms		1,809			324			1,387			221			3,256			300	
Observations		12,452			2,750			9,668			2,064			20,064			2,601	
R-squared		0.69			0.72			0.69			0.68			0.70			0.68	

Table XIB

The Effects of Year-by-Year Changes in Sales to Principal Customers on Five-Year Changes in Market Leverage of SupplierFirms

The following model is estimated: $\Delta LDM_{it} = \alpha + \Sigma_k \delta_k \Delta B_{kit} + \Sigma_l \delta_l \Delta F_{lit} + \gamma(LDM_{it-5} - LDM^*_{it-5}) + \kappa_i + u_{it}$, where the market leverage, LDM_{it}, is defined as the ratio of long-term debt to the market value of equity plus total debt. The symbol Δ stands for 5-year changes in the variable. $LDB_{t-5} - LDB^*_{t-5}$ is the deviation of market leverage from its predicted value at year $(t-5)$. LDM^*_{it} is predicted using the model, $LDM_{it} = \alpha + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit-1} + \kappa_i + u_{it}$ for each of the three sectors separately. B_{kit} is the proportion of sales to each category of principal customer as a percentage of total sales. F_{lit} refers to control variables in the regressions. Please see Appendix B for exact definitions of these variables. In the model reported here, we break down 5-year changes, $\Delta BIGALL$, into five year-by-year changes. The regressions also include firm and year dummies but these dummies and the constant are not reported. In each panel, the sample in regression (1) consists of all firms in Compustat between 1979 and 1997 and that in regression (2) consists of firms in Compustat that have been a supplier to a large customer at least once during the same period. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for the manufacturing firms in the durable goods industries only (primary SIC codes from 3,400 to 3,990) and Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400). The regression for each column is replicated 500 times by drawing firm clusters, with replacement, from the relevant sample.

	(A) Durable Goods Manufacturing Firms						(B) Nondurable Goods Manufacturing Firms					
	(1)			(2)			(1)			(2)		
	Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]		Coeff	[95% Conf. Int.]	
$\Delta_{t-(t-1)}$BIGALL	−0.022	−0.041	−0.004	−0.023	−0.041	−0.006	−0.010	−0.029	0.009	−0.012	−0.030	0.007
$\Delta_{(t-1)-(t-2)}$BIGALL	−0.027	−0.049	−0.006	−0.028	−0.049	−0.007	−0.010	−0.033	0.014	−0.013	−0.037	0.012
$\Delta_{(t-2)-(t-3)}$BIGALL	−0.021	−0.041	−0.002	−0.022	−0.042	−0.002	−0.001	−0.026	0.024	−0.003	−0.027	0.022
$\Delta_{(t-3)-(t-4)}$BIGALL	−0.021	−0.038	−0.003	−0.021	−0.038	−0.004	−0.009	−0.037	0.019	−0.012	−0.040	0.016
$\Delta_{(t-4)-(t-5)}$BIGALL	−0.033	−0.049	−0.017	−0.033	−0.049	−0.018	−0.013	−0.036	0.011	−0.014	−0.039	0.012
ΔQ	−0.008	−0.010	−0.007	−0.008	−0.010	−0.006	−0.007	−0.009	−0.006	−0.005	−0.007	−0.003
ΔLog(Sales)	0.017	0.011	0.023	0.014	0.006	0.023	0.018	0.012	0.024	0.017	0.009	0.024
ΔFA/TA	0.147	0.116	0.179	0.162	0.125	0.200	0.098	0.062	0.134	0.120	0.075	0.165
ΔROA	−0.038	−0.051	−0.025	−0.039	−0.054	−0.023	−0.030	−0.045	−0.014	−0.013	−0.032	0.005
ΔR&D	−0.025	−0.062	0.011	−0.043	−0.086	0.000	0.000	−0.022	0.022	0.003	−0.022	0.028
ΔSGA	−0.019	−0.040	0.002	−0.014	−0.041	0.013	−0.017	−0.029	−0.005	−0.012	−0.024	0.001
ΔDividend	−0.035	−0.042	−0.028	−0.031	−0.040	−0.022	−0.028	−0.038	−0.017	−0.033	−0.046	−0.019
ΔS/A	−0.026	−0.032	−0.020	−0.022	−0.030	−0.015	−0.034	−0.042	−0.025	−0.029	−0.038	−0.019
$LDM_{t-5} - LDM^*_{t-5}$	−1.071	−1.104	−1.037	−1.069	−1.110	−1.029	−1.059	−1.102	−1.017	−1.080	−1.133	−1.027
Firms		1,747			1,204			1,332			719	
Observations		12,052			8,167			9,403			4,865	
R-squared		0.70			0.70			0.70			0.69	

tomers, the contemporaneous change in purchases from dependent suppliers has no effect on the change in the debt ratio; however, the effect mainly comes from past changes. For the nondurable goods and nonmanufacturing sector customers, there are no significant effects at any lag.[27] In Table XI, Panel B, we find that for supplier firms in the durable goods sector, the change in sales to principal customers is significant at all five lags. However, once again, the effect is confined to the durable goods sector suppliers: None of the lags is significant for the nondurable sector suppliers. Therefore, it is not the case that our previous results are due to the fact that leverage ratios for firms in durable goods sectors for some reason respond more rapidly to changes in customer/supplier-related variables than do leverage ratios in the nondurable goods sector.

C. Principal Customers and Zero-Debt Supplier Firms

In 15% of all manufacturing firm-years in our sample, firms have zero long-term debt in their books. We examine whether the likelihood that a firm has zero debt increases if it sells a higher proportion of its sales to principal customers. To do so, we estimate a Logit regression in which the dependent variable takes a value of one if a firm has zero debt, and zero otherwise. The explanatory variables are the proportion of sales to various categories of principal customers (this variable is zero if a firm has no sales to principal customers at all in a given year), plus the usual controls for leverage used in the earlier regressions. The results are reported in Table XII. We find that firms in durable industries selling to nongovernment customers have a significantly higher probability of zero long-term debt. This effect is absent for sales to government, and is absent for sales to all categories of principal customers for firms in nondurable industries. The magnitude of the effect is quite large: The odds ratio for a firm selling 100% of its sales to a principal customer is 1.5 times as large as that for a firm not selling to a principal customer at all.

The question of why firms have zero leverage has received attention recently. Strebulaev and Yang (2006) note that it is puzzling that these firms have zero leverage, since they also appear more profitable (and hold more cash as well as pay out more in dividends) than size and industry controlled comparison firms. Our findings suggest one possible reason, namely, the customer profile of these firms.

D. Dynamic Panel Considerations

For the fixed-effect estimator, the presence of a lagged dependent variable implies that the consistency of the estimates depends on T (the number of periods) being large. Since our baseline specification in equation (3) incorporates a lagged dependent variable, we reestimate the baseline model following Arellano

[27] The point estimates of the coefficients on change in purchases from dependent suppliers at the first and second lag are relatively large, but estimated very imprecisely (the 95% confidence intervals are large, and zero lies well within these intervals).

Table XII

Logit Models of the Effect of Principal Customers on the Probability of the Supplier Firm Having Zero Debt

The following Logit model is estimated: $ZERODEBT_{it} = \alpha + \Sigma_k \theta_{lk} B_{kit} + \Sigma_l \eta_l F_{lit} (+ \kappa_i) + u_{it}$, where $ZERODEBT_{it}$ is a dummy variable that takes the value of one if the firm has no long-term debt in that particular year. B_{kit} is the proportion of sales to each category of principal customer as a percentage of total sales. The exact definitions of these variables are in Appendix A. F_{lit} refers to the control variables in the regressions. It includes log of total sales ($Log(Sales)$), profitability (ROA), tangibility (FA/TA), growth opportunities (Q), R&D to sales ($R\&D$), selling general and administrative expense (SGA), dividend dummy ($Dividend$), and total sales to total assets (S/A). The definitions of these variables are in Appendix B. The regressions also include year dummies and firm fixed effects (in column 2s), but their coefficients are not reported. The sample contains all manufacturing firms in Compustat between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990) and Panel B shows the results for manufactured firms in nondurable goods industries (SIC codes between 2,000 and 3,400). In each panel, results for two sets of tests are reported—those that allow for firm-level clustering (column 1) and those that control for firm-fixed effects (column 2). The z-values are given in parentheses. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Firms		(B) Nondurable Goods Firms	
	(1)	(2)	(1)	(2)
BIGNONGOV	0.388	0.362	0.140	−0.108
	(3.20)***	(2.50)**	(0.95)	(−0.59)
BIGGOVT	−0.240	−0.137	−0.679	−1.082
	(−0.68)	(−0.39)	(−1.17)	(−1.39)
Q	−0.012	−0.032	−0.000	−0.002
	(−1.88)*	(−4.29)***	(−0.04)	(−0.21)
Log(Sales)	−0.361	−0.441	−0.470	−0.498
	(−16.58)***	(−12.32)***	(−16.96)***	(−11.06)***
FA/TA	−4.761	−5.381	−3.571	−5.062
	(−14.75)***	(−17.76)***	(−11.08)***	(−14.17)***
ROA	0.460	−0.138	0.368	−0.300
	(5.07)***	(−1.49)	(3.19)***	(−2.48)**
R&D	0.327	−0.260	0.041	−0.526
	(1.97)**	(−1.26)	(0.25)	(−2.21)**
SGA	0.412	−0.049	0.554	−0.104
	(2.89)***	(−0.31)	(3.65)***	(−0.61)
Dividend	0.590	0.631	0.960	0.334
	(5.39)***	(5.61)***	(8.04)***	(2.38)**
S/A	0.162	0.270	0.229	0.426
	(3.32)***	(5.70)***	(4.94)***	(6.45)***
Constant	−0.680		−0.724	
	(−4.52)***		(−4.05)***	
Firms		1,319		682
Observations	33,295	12,969	25,453	6,814

and Bond (1991), who propose a GMM estimator. The results are reported in Table XIII. Our results are essentially unchanged. The supplier and customer variables are significant only for durable goods sector suppliers and customers, and insignificant for those in nondurable goods sectors.

Table XIII

Arellano-Bond Dynamic Panel Data Estimation of the Market Leverage Model

The table reports the results of applying the Arellano-Bond method to our basic model: $LDM_{it} = \alpha + \gamma LDM_{it-1} + \Sigma_k \delta_k B_{kit} + \Sigma_l \delta_l F_{lit} + \kappa_i + u_{it}$, where LDM_{it}, the market leverage, is defined as the ratio of long-term debt to the market value of equity plus total debt. B_{kit} represents purchases from dependent suppliers or sales to large customers. Please see Appendix A for exact definitions of these variables. F_{lit} refers to control variables in the regressions. The definitions of these variables are in Appendix B. The symbol Δ stands for 1-year change in the variable. The regression includes year dummies, but their coefficients are not reported. The sample contains all firms in Compustat between 1979 and 1997. The control variables are censored at the 1st and 99th percentile values to eliminate influence of outliers. Panel A shows the results for the manufacturing firms in durable goods industries only (primary SIC codes from 3,400 to 3,990). In column 2 (respectively, column 3), we drop all customer firms whose size is above median (respectively, below median) among all customer firms. Panel B replicates the analysis for manufacturing firms in the nondurable goods industries only (SIC codes between 2,000 and 3,400) and Panel C shows the result for nonmanufacturing customer firms (all other sectors except the financial sector). The t-values, given in parentheses, are based on heteroskedasticity-consistent standard errors. *** (**,*) denotes significance at the 1% (5%, 10%) level.

	(A) Durable Goods Manufacturing Firms				(B) Nondurable Goods Manufacturing Firms		(C) Nonmanufacturing Customers
	Customer Firms Only	Smaller Customer Firms	Larger Customer Firms	Supplier Firms Only	Customer Firms Only	Supplier Firms Only	Customer Firms Only
$LDM_{t-1} - LDM_{t-2}$	0.497	0.433	0.483	0.546	0.549	0.561	0.549
	(11.1)***	(8.07)***	(7.50)***	(19.07)***	(9.81)***	(13.9)***	(10.27)***
ΔPurchases/COGS	−0.042	−0.078	0.073		0.103		0.113
Durable suppliers	(−1.43)	(−2.60)***	(0.70)		(0.72)		(1.73)*
ΔPurchases/COGS	0.138	0.150	−0.138		−0.023		0.024
Nondurable suppliers	(1.10)	(1.13)	(−0.30)		(−0.21)		(0.29)
ΔBIGNONGOV				−0.021		−0.007	
				(−3.21)***		(−0.89)	
ΔBIGGOVT				0.019		0.004	
				(1.05)		(0.06)	

ΔQ	−0.015	−0.010	−0.030	−0.011	−0.013	−0.009	−0.028
	(−6.91)***	(−4.77)***	(−4.70)***	(−13.27)***	(−4.25)***	(−8.80)***	(−5.17)***
ΔLog(Sales)	0.028	0.037	0.043	0.014	0.046	0.019	0.036
	(3.62)***	(4.17)***	(2.83)***	(4.05)***	(4.68)***	(6.04)***	(2.70)***
ΔFA/TA	0.137	0.269	−0.095	0.232	−0.002	0.149	0.098
	(2.29)**	(3.92)***	(−1.20)	(9.57)***	(−0.04)	(5.81)***	(1.45)
ΔROA	−0.049	−0.061	−0.048	−0.028	−0.037	−0.014	−0.099
	(−2.59)***	(−3.03)***	(−1.03)	(−3.61)***	(−1.38)	(−1.56)	(−2.88)***
ΔR&D	−0.018	−0.034	−0.018	−0.008	−0.013	0.007	−0.099
	(−0.33)	(−0.64)	(−0.06)	(−0.56)	(−0.35)	(0.63)	(−1.02)
ΔSGA	−0.051	−0.042	−0.054	−0.027	0.023	−0.015	−0.060
	(−1.76)*	(−1.22)	(−0.84)	(−2.91)***	(0.97)	(−1.95)*	(−1.17)
ΔDividend	−0.010	−0.020	0.006	−0.006	0.023	0.012	−0.009
	(−1.05)	(−1.65)*	(0.51)	(−0.92)	(1.16)	(1.40)	(−0.57)
ΔS/A	−0.047	−0.065	−0.032	−0.039	−0.128	−0.053	−0.054
	(−3.02)***	(−3.53)***	(−1.85)*	(−7.40)***	(−6.78)***	(−7.28)***	(−5.48)***
Constant	−0.006	−0.010	−0.003	0.002	−0.007	−0.013	−0.007
	(−2.00)**	(−1.99)**	(−1.67)*	(0.61)	(−2.80)***	(−6.00)***	(−1.47)
Number of Firms	390	218	172	1,867	256	1,096	361
Observations	4,067	2,000	2,067	13,685	2,977	8,200	3,837

E. Endogeneity Tests on Purchases from Dependent Suppliers and Sales to Principal Customers

The key right-hand side variables in our baseline regressions—purchases from dependent suppliers and sales to principal customers—could depend on firm attributes. As such, these variables could be correlated with the error terms in our baseline models, which might cause the parameters in our baseline models to be inconsistently estimated. To see whether or not ordinary least squares is a consistent estimator for our baseline models, we perform Davidson and MacKinnon's (1993) augmented regression test. Our tests do not provide any evidence that the ordinary least square estimates of the baseline models are inconsistent.[28]

F. Supplier Characteristics during and after Big Customer Relationship(s)

Our findings imply that the lower leverages of both principal customers and suppliers are due to the destabilizing effect on suppliers of losing principal customers. In this section, we examine whether the termination of relationships with principal customers has a significant impact on the supplier firms. We compare the average supplier firm characteristics during the years that a supplier reported sales to a particular category of principal customers (i.e., government or nongovernment), and during the 3 years immediately following the termination of such relationships.[29] In Table XIV, we report the univariate results for comparison. We find that 3-year averages of investment over net fixed assets, sales growth (beginning 1 year after the relationship terminates),[30] and market-to-book equity show declining trends after the end of nongovernment big customer relationships in both the durable and the nondurable sectors. Altman's Z score also falls in both these sectors after the end of nongovernment big customer relationships. These results confirm that the loss of principal customers has an adverse effect on supplier firms. However, while the declines in investment over assets, sales growth, and market-to-book are sharper for the durable sector compared to the nondurable sector, the declines in the Z-scores are similar. This is consistent with the idea that the suppliers in the durable goods industries adjust their leverage in advance to attenuate the financial distress costs. It is also noteworthy that we do not see any corresponding declines in investment, sales growth, etc. for government principal customers after the end of a relationship. This is consistent with the argument that government principal customers are unlikely to terminate relationships when such terminations

[28] These tests are not reported in a table, but are available on request.

[29] We require a firm to report sales to principal customers for at least 2 consecutive years. We also examine the firm characteristics 3 years before the relationship but do not find particularly remarkable differences.

[30] We consider sales growth beginning 1 year after the end of a relationship because sales growth in the year immediately after the relationship ends will reflect the loss of the principal customer's business.

Table XIV

Univariate Comparisons of Firm Characteristics after and during Big-Customer Relationships

We compare average values of firm characteristics during the length of a principal customer relationship that lasts for at least 2 consecutive years (labeled "During average"), with the 3-year average immediately after the end of the relationship (labeled "Post average"). Means are reported in the upper row, and medians in the lower row. We perform a paired t-test of the means (upper row) and the Wilcoxon matched-pairs signed-rank test of the medians (lower row) for the null hypothesis that post-average minus during-average = 0. In Part I, we report these tests for suppliers of nongovernment big customers in the durable goods sectors and nondurable goods sectors separately. In Part II, we report the results for suppliers of government big customers. *** (**,*) denotes significance at the 1% (5%, 10%) level.

Part I: Average Supplier Characteristics during and after Nongovernment Big Customer Relationship(s)

	(A) Durable Manufacturing Sector				(B) Nondurable Manufacturing Sector			
Firm Characteristics	Post Average	During Average	t-Value (z-Value)	Obs.	Post Average	During Average	t-Value (z-Value)	Obs.
Investment-to-Net	0.414	0.536	−4.461***	317	0.321	0.394	−2.095**	200
Fixed Assets	0.306	0.367	(−4.884***)		0.242	0.241	(−1.717*)	
Total Sales	0.123	0.275	−4.934***	213	0.104	0.178	−1.712*	134
Growth[a]	0.099	0.128	(−4.842***)		0.068	0.071	(−1.136)	
Nonbig-Buyer	0.138	0.310	−3.633***	213	0.118	0.194	−1.589**	131
Sales Growth	0.102	0.132	(−3.101***)		0.074	0.073	(−0.377)	
Selling, Gen. &	0.345	0.340	0.354	345	0.265	0.272	−0.297	217
Admin. Exp.	0.306	0.284	(2.054**)		0.184	0.170	(−3.005***)	
Market-to-Book	1.802	2.079	−4.200***	288	1.978	2.071	−1.123	188
Assets	1.378	1.634	(−4.810***)		1.368	1.430	(−1.857*)	
Market-to-Book	2.274	2.702	−3.414***	288	2.410	2.819	−2.690***	179
Equity	1.701	2.088	(−4.705***)		1.757	2.006	(−2.725***)	
Stock Returns	0.093	0.148	−1.634*	266	0.179	0.102	1.807*	162
	0.052	0.096	(−2.194**)		0.135	0.072	(1.981**)	
Altman's Z-score	11.188	13.342	−4.142***	291	9.534	12.319	−3.625***	177
(1993)	9.566	10.501	(−4.755***)		7.786	8.653	(−3.292***)	

(*continued*)

could have serious consequences for the supplier.[31] Overall, the evidence of an adverse impact of the termination of a principal customer relationship is supportive of the hypothesis that the low leverage of dependent suppliers is due to the suppliers' concerns about demand stability.

G. Robustness Checks

Our results so far indicate that stakeholder relationships have economically and statistically significant effects on the capital structure of the involved firms

[31] For this to be true, it must either be the case that even though no sales to the government are reported that exceed 10% of overall sales, the government does not withdraw totally, or that the government only withdraws when the firm is experiencing rapid sales growth to other (nonprincipal) customers.

Table XIV—*Continued*

Part II: Average Supplier Characteristics during and after Government Big Customer Relationship(s)

	Manufacturing Sector (Both Durable and Nondurable)			
Firm Characteristics	Post Average	During Average	*t*-Value (*z*-Value)	Obs.
Investment-to-total	0.406	0.492	−2.424**	250
Net Fixed Assets	0.305	0.319	(−2.589***)	
Total Sales Growth	0.151	0.191	−1.184	188
	0.104	0.087	(−0.300)	
Nonbig-Buyer	0.183	0.165	0.431	186
Sales Growth	0.107	0.065	(1.355)	
Selling, Gen. &	0.339	0.323	0.714	305
Admin. Exp.	0.259	0.245	(2.509**)	
Market-to-Book	2.268	2.306	−0.440	232
Assets	1.621	1.735	(−0.791)	
Market-to-Book	3.009	3.306	−1.606	222
Equity	2.115	2.372	(−1.732*)	
Stock Returns	0.148	0.128	0.499	190
	0.096	0.061	(0.972)	
Altman's *Z*-score	12.098	13.252	−1.436	228
(1993)	9.279	9.681	(−1.404)	

[a]For total sales growth and nonbig customer sales growth, our starting period is 1 year after the relation terminates. As a result, the number of observations is smaller.

when they are in durable goods industries, but not when they are in nondurable goods industries. Since bigger firms, such as principal customer firms, are likely to operate in many industry segments, the question may arise as to the extent to which this industry classification accurately describes the firms in our sample.

It turns out that very few manufacturing firms have a substantial part of their sales in both durable and nondurable industries. Only 5% of the firms in our sample have sales in excess of 20% of their overall sales in both types of industries. Redefining firms in durable (nondurable) goods industries to be those that have at least 90% of their sales in durable (nondurable) goods industries does not qualitatively change the results (not reported in a table).

Since Compustat only tracks four principal customers per business segment, there may be a concern that our identification of principal customers could be subject to a censoring bias. To mitigate this concern, we reestimate the regressions for supplier firms for whom three or less principal customers are reported per business segment. Again, our results (not reported) remain unchanged.

Finally, there could be some concern that stakeholder relationships are associated with some inherent volatility of sales or risk, and the effect on debt ratios could be picking up this effect. We repeat our estimations with the coefficient of variation of sales as a control variable. Once again, our results continue to hold.

V. Conclusion

In spite of a variety of anecdotal evidence and a well-developed theoretical literature, there are few large-sample studies of how nonfinancial stakeholder relationships affect firms' capital structure decisions. This paper attempts to partially fill this gap by examining how supplier and customer relationships affect the capital structure decisions of firms in the Compustat database. Stakeholder relationships involve relationship-specific investments by the firm and its stakeholders that affect firm value. Titman (1984) is the first to point out that one reason capital structure decisions can affect firm value is that the incentive of any one party to make relationship-specific investments is likely to depend on the liquidation likelihood of the other party. This paper tests and finds support for two hypotheses related to this idea. First, we show that the debt ratio of firms in durable goods industries (where specific investment is important) is decreasing in the importance of purchases from suppliers who are dependent on these firms for a major part of their sales. Second, we show that suppliers in durable goods industries maintain lower debt ratios if they depend on relatively few customers for a major proportion of their sales. The economic magnitudes of these stakeholder effects on capital structure are substantial, and suggest that further research in this area should be worthwhile.

Appendix A: Customer- and Supplier-Related Variables

Dependent Supplier-related Variables:	
Purchases/COGS All identified suppliers	Total supply from all Compustat-listed manufacturing sector suppliers as a proportion of Cost of Goods Sold of the customer.
Purchases/COGS Durable suppliers	Total supply from all durable manufacturing sector suppliers (SIC from 3400 to 3990) as a proportion of Cost of Goods Sold of the customer.
Purchases/COGS Nondurable suppliers:	Total supply from all nondurable manufacturing sector suppliers (SIC from 2000 to 3400) as a proportion of Cost of Goods Sold of the customer.[a]
Big Customer-Related Variables:	
BIGALL	Proportion of sales to all big customers.[b]
BIGNONGOV	Proportion of sales to all of the firm's big customers identified as Compustat firms, private companies or unidentified. Private companies are identified from Academic Universe and they include companies listed elsewhere but not included in Compustat.
BIGGOVT	Proportion of sales to all big customers identified as government agencies.[c]

[a]Purchases/COGS–Durable suppliers and Purchases/COGS–Nondurable suppliers add up to Purchases/COGS–All identified suppliers.

[b]All the components of sales to various categories of big customers are expressed as proportions of the firm's total (net) sales. A reported customer is considered "big" if it accounts for at least 10% of total (net) sales of the firm.

[c]BIGNONGOV and BIGGOVT add up to BIGALL.

Table AI
Industry-wise Distribution of Sample Firms

Two-Digit Sic Code	Industry Description	Number of Firm-Years That Reported Big Customers (1979–1997)	Number of Firm-Years in Compustat (1979–1997)
2,000	Food and Kindred products	772	3,781
2,100	Tobacco products	19	229
2,200	Textile Mill products	452	1,339
2,300	Apparel & other finished products	604	1,574
2,400	Lumber and Wood Pds. Ex. Furn.	188	1,178
2,500	Furniture and Fixture	282	1,069
2,600	Paper and Allied Products	332	1,848
2,700	Printing Publishing and Allied	379	2,579
2,800	Chemicals and Allied	2,635	8,823
2,900	Petroleum refining and related Inds.	125	1,080
3,000	Rubber & Misc. plastic products	828	2,233
3,100	Leather and Leather products	206	459
3,200	Stone, clay, glass, concrete pds.	276	1,288
3,300	Primary metal industries	696	2,641
3,400	Fabr. Metal ex.machy, Trans. Eq.	974	3,150
3,500	Inds. Comml Machy,, Computer Eq.	3,703	10,350
3,600	Electr. Oth. Elec. Eq. ex. Cmp.	4,977	10,870
3,700	Transportation Equipment	1,396	3,435
3,800	Measr. Instr. Photo Gds. Watches	3,313	9,233
3,900	Misc Manufacturing Industries	628	1,829
Total		22,785	68,988

Appendix B: Other Firm Characteristic Variables

Variable Name	Description	Compustat Annual Data Item Number
LDM_t	Total Long-term Debt/(Total Debt + Market Value of Equity)	Item9/[Item6-Item60 + (Item199 ∗ Item25)]
LDB_t	Total Long-term Debt/(Book Value of Total Assets)	Item9/Item6
Q	(Market Value of Equity + Total Liabilities)/ Book Value of Assets	[(Item199 ∗ Item25) + Item6 - Item216]/(Item181+Item216)
Log(Sales)	Natural logarithm of Total Sales (Net).	Log(Item12)
Total Assets	Total Liabilities and Stockholders' Equity	Item6
FA/TA	[Total Fixed Assets (Net)]/ Total Assets	Item8/Item6
ROA	Return on Assets	Item18/Item6
Margin	(Sales(Net)—Cost of Goods Sold)/ Sales(Net)	(Item12- Item41)/Item12
AGE	Number of years the firm has remained in Compustat	
R&D	(Research and Development Expense)/Total Sales (Net)	Item46/Item12
SGA	(Selling, General and Administrative Expenses)/ Total Sales (Net)	Item189/Item12
Dividend	Dummy that is equal to one if the firm pays a common dividend in the particular year; otherwise, zero	Dummy variable based on Item 21
S/A	[Total Sales(Net)]/(Total Assets)	Item12/Item6
CV(Sales)	Coefficient of variation of Total Sales (Net) based on past 5 years' data	SD(Item12)/mean(Item 12)
Advert	Advertising Expense/ Total Sales (Net)	Item45/Item12
Intang	(Intangibles)/(Total Assets)	Item33/Item6
STDE	Standard deviation of a firm's operating income before depreciation, calculated using all available years between 1979 and 1997	*SD* (Item 13)

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