Small lending big:
The real effects of trade credit demands on constrained suppliers

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ABSTRACT

We examine a novel but economically important characterization of trade credit relationships in which smaller, often credit constrained, suppliers provide financing for their larger investment-grade buyers. Using variation in large retailers' cash management policies to instrument for how quickly individual vendors are paid, we show that firms are forced to cut back on investment in new plants and equipment when their buyers pay more slowly. By way of example, a one month delay in payment by Wal-Mart causes a 1.5% reduction in capital expenditures for the representative Wal-Mart supplier. We find limited evidence of adjustment along financial margins. Meanwhile, the underinvestment comes at the cost of long-term profitability, with declining return on assets evident for up to 4 years. Our tests suggest this is due to suppliers facing limitations in their own ability to raise debt, in spite of the quality of receivables being funded. Using data on warranty claims, we find support for the hypothesis that uncertainty regarding product quality is an important driver of upstream financing.

Introduction

As of 2009, trade payables—financing for the purchase of goods extended by suppliers to their customers—represented the second largest liability on the aggregate balance sheet of non-financial businesses in the United States (U.S. Flow of Funds Account, 2011). Second only to corporate bond liabilities, trade payables outstanding more than tripled the amounts owed to banks and were more than twentyfold the value of assets financed in commercial paper markets. Yet relative to its volume as a source of corporate funding, there is a paucity of research dedicated to the origins or the effects of trade credit relationships on other financial and real activities of the firm.[1] Moreover, much of the prior literature on trade credit has focused on an intuitive, but incomplete, characterization of the typical trade credit relationship between buyers and suppliers—one in which small, credit-constrained buyers are financed by their larger, more established suppliers when access to traditional financing markets is limited.

This paper examines consequences (and causes) of the inverse relationship—one in which large investment-grade buyers borrow from their smaller, credit-constrained suppliers. Using a hand collected panel of 1,032 unique buyer-supplier relationships involving 41 large investment-grade retail buyers matched to 702 smaller suppliers, we find that the upstream flow of credit is costly and has a sizeable effect on the real activities of capital constrained suppliers. Specifically, variation in the average payment speed of retailers such as Wal-Mart, Target, and Costco strongly relates to the capital expenditures of their vendors, who appear to forgo profitable investment, rather than raise new capital in traditional markets, in order to finance their larger trade partners

Aside from being perhaps a somewhat unexpected and understudied financial relationship, a point we will return to shortly, the large buyer–small supplier setting allows us to move closer to a causal interpretation of the interaction of trade credit flows with other aspects of firm behavior. Because suppliers are small relative to their buyers, they have limited ability to affect the overall average payment speed we observe at the buyer level. Meanwhile, changes in average buyer payment speed have a large impact on the cash-flows enjoyed by their suppliers.[2] As a result, we can exploit variation in the payment policy of big-box retailers to study the opportunity costs of otherwise endogenous working capital choices of matched suppliers.

Immediately, we find that for firms tied to Wal-Mart and its competitors, the financing aspect of the trade relationship is a significant driver of investment activity. Trade credit demands of these customers have a first-order effect on suppliers' capital expenditures, with a one month delay in average

[1] Throughout, we refer to the financing of purchased goods by suppliers to their buyers as trade credit, trade finance, and vendor financing. In each case, our meaning is the same.

[2] In our sample, while supplier sales to a matched buyer represent on average 22% of the supplier's total sales, they average just 0.167% of their buyers' cost of goods sold)

payment time by a retailer inducing a 1.5% contraction in new investment in plants and equipment and a 2.3% reduction in operating expenditures such as salaries, advertising, and research and development. A closer look at alternative sources of financing which might reasonably be used to fill the gap caused by slower collections shows that, for the average firm, the gap is not financed by new debt, nor by equity issuance. Instead, firms partially finance the trade credit via a reduction in cash, with the balance coming from reductions in spending.

The evidence that, rather than issuing in external markets, suppliers tend to sacrifice their own growth in order to finance their buyers' purchases, is consistent with suppliers facing financing constraints or other frictions associated with external capital raising. To test this, we consider the extent to which suppliers' sensitivity to buyer payment speed depends on cross-sectional and time-series measures of financing constraint. These tests are premised on the assumption that the responsiveness of supplier investment (for example) to buyer payable days should not correlate with measures of constraint, unless limited access to external finance drives the large opportunity costs of lending via trade credit. We consider three proxies for supplier constraint— the presence of a long-term credit rating, the Federal Reserve's survey based measure of the time series of bank credit standards, and the failure of a major lender to small and medium sized manufacturers— and find consistent evidence for all three.

First, we compare the response of suppliers to changing payment terms based on whether or not they have a long-term debt rating. Following Faulkender and Petersen (2006), we assume rated firms face less binding credit constraints, or alternatively, have less costly sources of external financing. Consistent with access to capital being an important river of the documented effect, we find that the sensitivity to buyer payment speed on investment is eliminated for rated firms. A closer look at financing patterns reveals that rated suppliers cover the cash shortfall arising from delays in payment by matched buyers through new debt issuance and by drawing down cash reserves.

Similar results obtain when comparing suppliers' reaction to slower payment across time periods with varying degrees of credit constraint. Interacting buyer payable days with the Federal Reserve Board's survey-based measure of credit tightness, we find that in periods of loose credit standards, the supplier's investment sensitivity to average buyer payment terms is substantially attenuated. Again, this finding points in the direction of credit constraints at the supplier level generating substantial opportunity costs of sending financing upstream. Moreover, the notion that trade credit as a use of financing is most costly in periods of tight credit provides a sharp contrast to prior work characterizing trade credit as a fortunate backstop (as a source of financing) for small firms during periods of credit tightness (Nilsen (2002)).

Finally, having shown that firms' responses to longer trade credit demands line up with both cross-sectional and time-series measures of credit constraint, we put both dimensions together and

compare the differential response of suppliers formerly financed by CIT—a large source of both loan finance, leasing, and receivables factoring for small and medium sized suppliers— before and after the lender's collapse. We find that CIT-linked suppliers' were particularly sensitive to changes in payment terms of their buyers during the period of CIT's distress and ultimate bankruptcy, as compared to otherwise similar firms.

Given the evidence, it may be natural to ask whether the foregone investments represented missed opportunities (or even required maintenance) or whether payment delays serve to discipline overinvestment by managers. For example, Patatoukas (2010) shows that concentrated buyer relationships may be related in enhanced supplier efficiency. Without being able to directly speak to the welfare costs (or benefits) of the forgone investment spending, as a rough approximation, we consider the long-term return on firm assets following changes in buyer payable policy. We find that for credit constrained firms, growth in buyer payable days signals a long term reduction in profitability. Scaled by assets in place, operating income atrophies over a five year horizon, suggesting that firms forgo positive net present value projects to fund their buyers' purchases.

In light of the apparent economic costs faced by small, credit-constrained suppliers in serving as implicit lenders to big and less constrained buyers, the relationship is *prima facie* perverse. Assuming some dead weight loss associated with external issuance, the typical Coasean framework predicts the party with a comparative advantage in raising external capital will finance inventory, regardless of who holds the bargaining power.

Consider the case of Wal-Mart and its primary supplier of candied fruit for use in holiday fruitcakes, Paradise Fruit Company. Assume that both suffer some deadweight costs associated with issuing externally, but that these costs are smaller for Wal-Mart, who can issue under its AA rating in public bond markets at 5%. Assume Paradise Fruit can either issue at 10%, or alternatively, must finance its sales using internal cash, for which it has an opportunity cost of 10%. Then with a take-it-or-leave-it offer, Wal-Mart can buy a quart of fruit cake mix at the supplier's cost (say $1) if it pays cash. If it sells the mix for $2, it earns a profit of $0.95 after paying off its interest. Alternatively, Wal-Mart can use trade credit to delay payment until it receives payment from the end customer, in which case the supplier will charge $1.10 to cover its costs, including interest costs for financing the inventory itself, resulting in a $0.05 dead-weight loss. Albeit crude, the example illustrates that, as long as the relative financing frictions facing Wal-Mart are smaller than those facing its suppliers (and further, in the absence of countervailing frictions), it will always be efficient for Wal-Mart to pay cash on delivery and then negotiate on price.

The final section of the paper considers possible departures from this Coasean framework. We follow an early paper by Long, Malitz, and Ravid (1993) which predicts that information asymmetry

regarding product quality induces buyers to withhold payment as a quality guarantee, with the resulting financing arrangement an ancillary benefit. We test this hypothesis by exploring the link between the trade credit extension and a measure of product quality.[3]

Beginning in 2003, the Financial Accounting Standards Board (FASB) guidance on disclosure requirements for guarantees (FASB FIN 14b) requires disclosure of warranty data in financial statements. Using warranty claim data disclosed by manufacturers as a measure of product quality, we establish a clear link between how quickly suppliers are paid and the quality of goods they provide. Specifically, within different industries, large retail buyers pay manufacturers of relatively high-quality products faster than they do manufacturers of low-quality products. This is consistent with trade credit effectively collateralizing or guaranteeing risky transactions between buyers and sellers. Yet, controlling for industry fixed effects in firm level regressions reveals a substantial amount of variation in supplier receivable days between industries. In particular, we show that suppliers in industries where product quality is relatively fixed are paid more quickly than suppliers in industries where product quality is more diffuse.

Finally, we explore the idea that information about product quality may arrive over time, as supplier-buyer relationships progress. As a result, if trade finance serves as a product quality guarantee in this context, we might expect suppliers to be paid more quickly as buyers learn about the product. Focusing on suppliers who announce a new trade financing relationship with the largest buyers in our sample reveals that after being paid slowly in the initial years, conditional on relationship survival, suppliers are paid approximately one day faster for each year they work with the buyer. While by no means conclusive, the evidence is consistent with trade credit serving as a performance bond on product quality. Thus, information asymmetry between buyers and sellers, when combined with frictions in the market for financing between suppliers and their lenders, appears to generate significant economic costs, including underinvestment and slow growth for young firms.

The paper will proceed with a brief review of the literature on trade credit and how this paper fits within it, before providing a detailed account of our data set and identification scheme. After describing our key results, we conclude with a discussion of open questions and areas for future research.

Literature Review

Similar to bank funded lines of credit for working capital, trade credit provides bridge financing to cover the gap between the purchase of inputs and the sale of output, or in the case of a retailer-manufacturer relations, the gap between inventory acquisition and final sale.

[3] See Hartman-Glaser et al. (2009) for an analogy to loan securitization as to how delayed payment may help resolve information asymmetry over product quality.

The determination of who should finance this gap—buyers, sellers, or third party investors—is a horse race between competing frictions.[4] On one hand, buyers and sellers who are engaged in trade face information asymmetry regarding each other and the underlying goods. On the other hand, outside investors face uncertainty about the prospects of buyers and the suppliers themselves and are wary of providing financing to firms with poor prospects.

Consider, for example, the likelihood that frictions between buyers and sellers are small relative to those between buyers and external markets, presumably because suppliers have better information about their buyers' prospects or have alternative commitment devices to prevent strategic default. Under this argument, suppliers will fund buyers more efficiently than banks or other investors. Meltzer's (1960) "substitution hypothesis" proposed that trade credit provides a backstop of sorts to traditional credit markets, whereby large suppliers accommodate their smaller buyers' working capital needs in periods of tight credit. The implied effect is to soften shocks transmitted via the bank credit channel in the broad macroeconomy, an effect confirmed by Nilsen (2002).

This time-series hypothesis has found its natural extension in the cross section by way of analogy as well. In particular, theory and evidence provided by Schwartz (1974) and Petersen and Rajan (1997) respectively, suggest that smaller firms receive trade credit when financial institutions are unavailable or too costly.

The characterization of trade credit as a second-best funding source for credit-constrained borrowers finds strong support in the data, both in published record as well as basic Compustat summary statistics. Indeed, as of 2009, an examination of net trade credit borrowing days (payable days less receivable days) based on size decile suggests that the smallest firms were the largest borrowers, with the median firm paying its suppliers 60 days later than it is paid by its buyers (Table 1(b) documents these statistics). Beyond deciles one and two (also net borrowers by six days), the median firms in deciles three through eight are net trade credit lenders, providing liquidity to the smallest Compustat firms (and non-Compustat firms, presumably). However, we are also faced with the largest two deciles, who like their small counterparts, are also net trade credit borrowers as defined by the difference in their net payable days, with the median firms in their respective deciles paying suppliers 1.3 and 6.1 days later than they are paid by buyers. We are also faced with firms like Wal-Mart, a highly rated and, by any standards, large buyer for whom accounts payable represent nearly all its short-term funding and approximately three quarters of its total debt (Wal-Mart 2009 Annual Report).

[4] This characterization of the trade credit relationship as the outcome of competing frictions is borrowed from Frank and Maksimovic (2005), who consider the interaction of information asymmetry and legal rights in the use of trade credit.

This is not the first paper to document this phenomenon. A number of recent papers using cross-sectional international data have found it may not be uncommon for large buyers to fund themselves off the backs of their smaller suppliers. Fabbri and Klapper (2008) show for Chinese SME's, firms with weak market power are more likely to extend trade credit and have a larger share of goods sold on credit. Klapper, Laeven, and Rajan (2010) also consider an international cross section of trade credit contracts for which buyers receiving trade credit are, on average, larger than the suppliers providing it.

While most theories of trade credit better speak to the large supplier–small buyer setting, there are a handful of papers which provide some manner of economic motivation for large unconstrained firms to leverage trade credit as a funding source. Brick and Fung (1984) provide a tax model that would predict credit flowing from firms with higher to lower taxable income, regardless of firm size. Meanwhile, a number of authors have pointed to the underlying goods serving as better collateral for suppliers than for banks which might otherwise finance trade (Longhofer and Santos (2003) and Frank and Maksimovic (2004)). Finally, Long, Malitz, and Ravid (1993) hold that information asymmetry regarding product quality induces buyers to withhold payment as a quality guarantee, with the resulting financing arrangement an ancillary benefit. This model most closely fits our setting and guides our tests in the second half of the paper which considers the necessity of apparently costly small supplier–big buyer trade finance relationships.

Within the trade credit literature, however, our paper is alone in asking how this implicit financing relationship impacts real investment and growth at the supplier level. In addressing this question, we lean heavily on the literature concerning the costly external financing and the manner in which cash flows and investments may be related. In our context, trade credit serves to delay cash flows received by the supplier, thereby compressing current period cash with the resulting shortfall to be financed internally (via cash and/or other uses of cash; i.e., investment) or externally (debt or, perhaps, equity markets). Of course, like many other papers in the literature on costly external financing and firm investment, our paper will face the challenge of identifying variation in working capital and related cash-flows which are not directly driven by unobserved growth opportunities. The next section describes these issues more deeply and our attempt to address them.

Data and Methodology

Our paper begins with the following question: when buyers pay their suppliers more slowly for goods and services provided, what effect does this have on real and other financial activities of the firm? As a reduced form estimate, we might consider the coefficient β_1 in the following regression:

$$\frac{I_{i,t}}{A_{i,t-1}} = \alpha_i + \eta_t + \beta_1 ReceivableDays_{i,t} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} + \beta_3 Q_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $I_{i,t}$ captures investment in period *t* for firm *i*, scaled by beginning period assets, *ReceivableDays* denotes the average days it takes for a supplier to be paid after delivering goods to a buyer and is measured by trade receivables divided by sales. $CF_{i,t}$ is a measure of cash flow or operating profit during the same period and $Q_{i,t-1}$ is typically measured as the market-to-book ratio of firm assets valued as of the beginning of period *t*. Note that while this measure of *Q* is an average over all firm *i*'s assets, it serves as a proxy for marginal *Q*, which has been shown to relate linearly to firm investment under certain conditions (Hayashi (1982)). Meanwhile fixed effects at the firm level will capture unobservable heterogeneity which may jointly drive cross-sectional variation in the average investment and trade credit policies of different firms. This regression replicates the typical investment cash flow sensitivity regression, while adding the incremental variable of receivable days to capture any effects payment terms have on real variables. Moreover, we could (and will) restate this specification in terms of other financial variables such as debt (or equity) issuance, operating expenses, and changes to cash position in order to understand how trade credit, as a use of cash, is funded via the supplier's other sources of cash.

Immediately, however, the reader will note that receivable days, like investment, are chosen by the firm, limiting the regression's ability to make causal inference about the effect of trade credit on investment, or any other left-hand side variable for that matter. Consider, for example, that new investment may crowd out trade credit. If this is the case, spending increases correlated with faster repayment demands will generate negative β_1 coefficients, but as an implication of the reverse causal effect. If *Q* is measured with error—and it is—then endogeneity may be of the omitted variable ilk: unobservable investment opportunities correlate with both the decision to extend trade credit and new expenditures. Or rather, the opposite relation may exist—firms which are growing may do so by offering generous trade credit terms. Regardless of the relation, it is clear that reduced form estimates of equation 1 are insufficient to understand any causal effects of payment terms on other firm decisions.

Instead, it becomes necessary to consider payment terms which were, in some sense, chosen *for the supplier* rather than *by the supplier*. To this end, we consider a sample of suppliers who have substantial sales contracts with large retail stores (substantial enough to report in the annual disclosures) and then use variation in the payment speed by these retail buyers as the source of variation in the payment speed enjoyed by suppliers. Because each large retailer typically has numerous vendors, each of which individually accounts for only a tiny fraction of the retailer's total cost of goods sold, we will argue that an individual vendor is unlikely to determine the retailer's overall payment speed. Take as an example, two identical small garden hose manufacturers (A and B) who sell their products to Home

Depot and Lowes, respectively, each of whom are also served by a large number of other vendors. Under boilerplate purchase agreements, both manufacturers are paid in 45 days, providing the retailers an adequate window to sell the hoses to end customers before paying their suppliers. Now imagine that Home Depot adjusts the boilerplate contract offered to suppliers such that new orders are paid in 60 days, affecting firm A but not B. As long as hose manufacturers are sufficiently small such that their own growth options, operating environment, and financial characteristics are irrelevant to the overall payable policy of the retailer, firm A will take the new policy as an external shock to its own receivable days, assuming its sales to Home Depot are sufficiently large to have a meaningful impact on its overall receivable days. Meanwhile, as long as the only consequence of the buyer's delayed payment scheme on the supplier is through its own receivable days, then the effect of the payables policy of Home Depot on supplier behavior can be interpreted as direct effect of trade credit extension. Of course, the plausibility of this interpretation will be the subject of much of our analysis.

Note, we have chosen retail stores, specifically large ones (hereafter, big-box retailers), as our buyers for a number of reasons. First, big-box retailers buy from a number of suppliers. Thus, we can focus on a relatively small sample of homogeneous buyers and still generate a large sample of suppliers on which to test our hypotheses. Second, from an economic perspective, retail stores are by-and-large the end users of trade credit as they receive payment at the point of sale or within 3-5 business days at a maximum (via credit card settlement). As a result, they sit at the top of the supply food chain, giving us a natural place to start an empirical study on the real effects of trade credit relationships in the economy. We discuss the selection and collection of buyers later in the Methodology section.

To formalize the proposed identification example, assume a two stage model:

$$ReceivableDays_{i,t} = \alpha_{i,j} + \eta_t + \gamma_1 BuyerPayableDays_{j,t} + \cdots + \upsilon_{i,t} \quad (2)$$

$$\frac{I_{i,t}}{A_{i,t-1}} = \alpha_{i,j} + \eta_t + \beta_1 ReceivableDays_{i,t} + \cdots + \varepsilon_{i,t}. \quad (3)$$

In particular, note the inclusion of *BuyerPayableDays* in the first stage equation (2). *BuyerPayableDays* measures the average time a buyer *j* for supplier *i* takes to pay *all* its suppliers and is calculated based on total trade payables at *t*, divided by cost of goods sold plus any change in inventories (this reflects total buyer purchases) over the same period. The measure captures the aggregate cash management policies of the buyers—i.e., it measures how Home Depot might adjust payable terms on average for its vendors. Note that we do not observe the buyer's payable terms to individual suppliers, to the extent that they vary. This is important, since any supplier-to-supplier variation in payment terms are

almost certainly linked to other aspects of firm policy. By focusing on the aggregate buyer policy, we sidestep this type of endogenous variation in the terms of trade.

The system of equations can be estimated—and in particular, the coefficient of interest, β_1— if and only if the proposed instrument satisfies rank and exclusion conditions. In our context, the rank condition requires that the overall buyer's payable policy is relevant to the supplier's receivable days. In theory, this relationship should be mechanical, but could be potentially weak if sales to these buyers are small. To help ensure the rank condition is satisfied, we therefore focus on a sample of suppliers for which sales to the large retail buyers we track represent a substantial percentage of sales. This is baked into our sample selection given that firms only report material relationships with customers in their annual disclosures.

Moreover, it must be the case that, in the first-stage equation, *BuyerPayableDays* drives *ReceivableDays* and not vice versa. Otherwise, $v_{i,t}$ will be mechanically correlated with *BuyerPayableDays*. To ensure this, we will focus on firms which are small relative to the buyers. Specifically, we will limit sales to the buyer to less than 1% of buyer cost of goods sold.

Meanwhile, the exclusion condition requires that *BuyerPayableDays* is related to real investment and/or the financial decisions of the suppliers only through the suppliers' *ReceivableDays*. A sufficient condition for this to hold is that the payment terms which a buyer offers to suppliers *i* should not dictate investment at supplier *j*. Of course, many of our tests and discussion in the results section will consider possible failures of this assumption and the extent to which these failures could affect our results. In particular, we will pay special attention to the possibility that suppliers may use average payable days of their buyers as a signal of distress or growth opportunities and adjust their investment plan as a result, although the inclusion of appropriate controls in X may mitigate these concerns.

Also note that the proposed model includes buyer–supplier fixed effects. These effects sidestep issues of how suppliers match to their buyers. If for example, growth firms prefer buyers who pay cash, or rather buyers are less willing to pay quickly for young, growing firms for which information asymmetry is greatest, then a cross-sectional regression of investment on trade credit terms may reflect this type of matching. Instead, we'll take matches as given and then examine how changing trade credit terms impact investment growth or financial policies of the supplier.

Sample selection

Our sample is comprised of buyers first, with each buyer then matched to all suppliers reporting a material relationship with it via mandatory 10-K and 10-Q disclosures. Our sample of buyers was selected based on three criteria. First, each buyer must be reported as an identifiable customer in Compustat's customer segment data, thus allowing a starting point to find matched suppliers. Second, we limit our

buyer sample to the retail industry (NAICS 44 and 45 or GICS group 2550). This maximizes our sample size since retailers work with large numbers of suppliers, but also helps identification because few suppliers then are individually critical to the buyers' operation. Third, we require each buyer to have investment-grade credit rating (a S&P Domestic Long Term Issuer Credit Rating of BBB- or higher). Similar to our buyers, each seller must have a unique identifier in the customer segment data and must have at least one identifiable investment-grade rated customer in the retail sector. We also eliminate sellers in financial services and real estate. Requiring buyers to have an investment-grade credit rating restricts our sample to the years from 1985 to 2010, when the S&P ratings are available on Compustat.

Matching of buyers to their suppliers is done using the Compustat customer segments files, which, on an annual basis, reports major customers listed in the firm's annual disclosure of significant concentrations of credit and customer risk. Examples of these disclosures are provided in the appendix. Unfortunately, these segment data lack a unique buyer identifier and inconsistently report buyer names.[5] As such, we have manually matched reported buyer names and merged them to historical company names from CRSP (COMNAM) in order to obtain unique Compustat buyer identifiers (buyer GVKEY). After excluding buyers with less than 30 supplier-year observations, we are able to identify 1,032 unique buyer-seller pairs involving 41 big retail buyers and the 702 sellers that supply them. We provide a list of the 41 retail buyers that we identify and use for our analyses in the appendix. The level of observation in our data is then a unique buyer x supplier x year combination representing a period during which the two firms had a relationship.

Table 1(b) describes characteristics of the buyer-seller pairs. The mean (median) buyer-seller relation in our sample is 7.38 (6.0) years long. About 25% of the buyer-seller relations exceed 10 years, while about 25% are 4 years or less. Note that our retail buyers are large firms by most measures—after all, they were selected for having multiple suppliers. The total sales for our mean (median) retail buyer is $25.7 ($13.6) billion. In comparison, the total sales of the mean (median) seller in our sample is only $606 ($147) million. Furthermore, the mean (median) seller accounts for only about 0.167% (0.075%) of a matched buyer's cost of goods sold. In contrast, the mean (median) buyer accounts for 22% (15%) of each matched supplier's sales. This underscores the relative bargaining power that buyers have over the sellers and is reassuring that while buyers may have a large impact on their suppliers' fortunes, individual suppliers are unlikely to affect aggregate buyer payable policy. A buyer's payable days, calculated as accounts payable (item AP) divided by purchases (cost of goods sold + change in inventory) and multiplied by 360, is a proxy for the average speed with which a buyer repays suppliers. Our mean

[5] For example, the Compustat customer segment file uses numerous aliases to report a single buyer, Wal Mart, i.e., Wal-Mart, Wal-Mart Stores, Wal Mart Stores, Wal Mart Wal Mart Store, Wal-Mart Inc., Wal Mart Strs, Wal-Mart Stor, Wal-Mart Sam's club, Sam's clubs, Sams Club, Sams clb, Sams clbs, Sams club wholesale, Sams club whsl.

(median) buyer pays suppliers in about 39 (35) days. A seller's receivable days, calculated as trade accounts receivable (item RECTR) divided by sales and multiplied by 360, is a proxy for the average speed with which a seller receives payment. Our mean (median) seller collects payment for outstanding trade receivables in about 54.5 (50.9) days. The disparity of these two numbers may be explained by firms excluded from our sample which do business with either the buyer or supplier, or because the numbers are equally weighted by firm.

Results

We have argued that investment and working capital policies are jointly chosen by the firm, complicating the task of making any causal inference from reduced form regressions of either one or the other. Our solution to this problem is to examine a setting in which the terms of trade credit extended to buyers are plausibly exogenous with respect to the supplier in the sense that the supplier takes trade credit terms as given. To this end, we consider the suppliers of big-box retailers, who, as we have shown in the prior section, are small relative to their buyers and are unlikely to influence store-wide payment policy. Under this assumption, we can use store-wide variation in how quickly buyers pay their suppliers as a source of exogenous variation to see how trade credit terms impact supplier behavior and performance.

Throughout, we will report both two-stage least squares regressions (using buyer payable days as an instrument for supplier receivable days), as well as reduced-form estimates (using buyer payable days as a right-hand side variable in a reduced form regression). Either case will be appropriate if buyer payable days satisfy exclusion and rank conditions described in the identification section. Table 2 begins the analysis by presenting direct evidence for the rank condition, which will be satisfied as long as the supplier's ability to manipulate its terms of trade with all its buyers is limited (i.e., a delayed payment by Wal-Mart cannot be financed by faster payment from other buyers) and if the buyer is a significant contributor to the suppliers' sales.

We find that the effect of a big-box retailer's payable days on its supplier's receivable days is positive and significant at the 1% level. As Column 1 of Table 2 reports, a one month payment delay by a single big-box retailer causes a delay in the supplier's receivable days of 4.5 days (or .15 months, as it is reported in the tables). Whereas Column 1 only includes buyer–supplier fixed effects, time dummies, and a set of dummy variables capturing the difference in fiscal year end between the buyer and supplier (intended to capture misalignment between reporting dates), Column 2 includes controls for traditional determinants of investment, such as Tobin's Q and firm level cash flows, as well as a dummy representing whether or not the supplier has a long-term debt rating from S&P. These controls are in anticipation of second stage investment and financing regressions, but also improve the fit of the first stage. Although we will return to a discussion of weak instruments in the next table, the (unreported) F-

statistic of the regressors for which coefficients are reported in Column 2 (buyer payable days and sales, supplier cash flows, q, and a credit rating dummy) exceeds 30.

In some sense, the reader may view the results Table 1 as mechanical—a means to setting up more economically relevant second stage regressions in which the predicted variation in how quickly a given supplier is paid will be used to assess the impact of trade credit on other aspects of firm behavior. However, the regressions also serve as confirmation of what the individual disclosures have suggested—that, in fact, large, investment-grade rated buyers are borrowing from their smaller suppliers. In the absence of this result, we might imagine that Wal-Mart pays cash to all its small suppliers, and then borrows massive amounts from a few comparably large vendors (Proctor and Gamble, for example). In unreported results, we find that the regression in specification 2 holds up well in subsamples of even the smallest suppliers, suggesting that Wal-Mart's payment policy is fairly invariant with respect to supplier size.[6]

Using the variation in buyer payable days established in Table 2, in Table 3, we begin by estimating the effect of trade credit terms on supplier capital expenditures. If, as we argue, a big-box retailer's trade payables capture the terms of credit that are exogenous to the supplier, we can draw causal inference from the relation between these payables and the supplier's capital expenditures. Column 2 in Table 2 uses a straightforward reduced form regression of investment directly on the proposed instrument (buyer payable days). We find a payment delay of one standard deviation (.53 months or 15.9 days) by a single big-box retailer linked to our supplier reduces capital expenditures as a percentage of lagged assets for the retailer's suppliers by 0.79 percentage points. Column 1, meanwhile, provides the two-stage regression of investment on the fitted values for receivable days from the regression in Table 2 (in practice, first and second stage estimates are estimated simultaneously and not sequentially as described). The coefficients reported can be interpreted as the effects of variation in total receivable days of the supplier on investment. Note the results from Columns 1 and 2 would be equal if the supplier had only one buyer and it received exactly the buyer's average terms, or if all buyers offered the same terms and adjusted simultaneously. In such a world, if the average speed by which a supplier gets paid by all its buyers were to decline by one standard deviation, the supplier would reduce capital expenditures as a percentage of lagged assets by 4.8 percentage points. This effect is economically significant, given that the standard deviation of capital expenditures scaled by lagged sales is 6.5%.

[6] For more details on the small supplier–large buyer lending relationship, we have hand collected the actual receivables numbers owed by several of our largest buyers (Home Depot, Wal-Mart and Toys"R"Us) to individual suppliers. Although these numbers are rarely explicitly reported, for the 181 supplier X buyer annual observations for which the actual receivables are reported, receivables owed by an individual buyer represent, on average, 4% of the supplier's total assets (and as high as 20% of total assets) and 21% of total receivables. Meanwhile, in terms of assets, buyers are on average 44 times larger than the suppliers they owe.

We repeat this exercise for selling and administrative expenses, under the hypothesis that suppliers may not only scuttle long-term investments captured by capital expenditures, but also short-term expenditures. We find that a one standard deviation increase in the supplier's receivable days reduces SG&A as a percentage of lagged assets by 7.1 percentage points. Meanwhile, the sample mean (standard deviation) of SG&A to lagged assets is 47.5% (38.6%). This result follows recent evidence from Bakke, Whited (2010) that firms facing cash shortfalls make adjustments to other (non-capital expenditure) uses of cash such as research and development and hiring.[7]

Our interpretation of the evidence so far rests heavily on whether the payable policy of our buyers, after the inclusion of appropriate controls, is independent of the supplier's unobserved growth options. An alternative explanation for our results, however, is that the extension of payment terms may signal adverse news about a major customer's growth or financial health. Firms in distress, for example, are often known to "stretch their payables" when lenders pull back. Suppliers, observing this signal would reasonably cut back on capital expenditures and SG&A, in anticipation of decline in future sales to the buyer. Ideally, buyer distress would be captured by the buyer's Q, or as a backup, the supplier's own Q. Moreover, we limit our sample to only on investment grade rated buyers. In practice, however, the controls by themselves have an admittedly limited ability to rule out unobservable distress captured by delayed payment terms.

In Panel B of Table 3, we consider only the sample of firms which are linked to either 1) buyers which have seen their Q values appreciate more than the median buyer in our sample during the observation year or 2) buyers which were rated A+ or better under their long-term S&P credit rating. The coefficients for buyer payable days are significant in each subsample and are, for the most part, virtually unchanged based on buyer health, making an interpretation of the slowed investment based on buyer distress seemingly less likely.

Financing Receivable Growth

The tables so far have suggested that, in response to delayed payment terms by their buyers and a resulting growth in their working capital requiring financing, small suppliers resort to cutting back on both capital expenditures for the long term, as well as selling and administrative expenses for the short term. The link between trade credit and real activity, however, requires frictions between suppliers and external capital markets, such that external financing is more costly than the reduction in investment and spending we observe.

[7] Looking at either R&D or hiring separately, the evidence is less clear, suggesting some heterogeneity in which aspects of operating expenses firms find least costly to adjust.

We begin this section by directly confirming that suppliers are unable or unwilling to finance receivable growth using outside investors. Table 5 begins by examining the response of supplier cash and debt issuance to trade credit balances. We focus on changes in debt and cash balances, each scaled by lagged assets. Both are flow variables, comparable to capital expenditure or selling and administrative expenses. Both are also considered "informationally insensitive" relative to other sources of funds under pecking order models of capital structure, such that small firms might be expected to finance investment, or other uses of cash, first via these sources first.

Indeed, beginning with OLS regressions (as before) of the firm's cash burn rate, defined as the change in cash over lagged assets on buyer payable days, Column 4 of Table 4 reports that a one month delay in payment by a buyer maps into a 1.2 percentage point increase in the rate of cash burn experienced by the supplier, while Column 3 suggests that the same month-long delay on all receivables maps into a 7.5 percentage point change. Meanwhile, however, Columns 1 and 2 of Table 4 suggest that on average, suppliers are unable or unwilling to use debt growth to finance their buyer's working capital. In unreported results, we find similar non-results for other potential sources of external financing (i.e., new equity issuance, changes to dividends, and receivables growth to the suppliers' own downstream firms).

Combined, the evidence suggests that the reduced investment which earlier tables linked to working capital financing for buyers is perhaps attenuated by suppliers increasing the rate at which they draw down their cash reserves—the most informationally-insensitive source—but not by increased borrowing in debt (or equity) markets. This result is particularly puzzling given that (1) the buyers in our sample are investment-grade big-box retailers, reflecting the high quality of receivables in question and (2) the project (new receivables) is relatively visible and verifiable. In the last section of the paper, we'll consider some of the issues which we think may limit outside investors from financing receivable growth. For now, however, we'll remain agnostic on this specific issue and instead simply examine the extent to which suppliers' investment sensitivity is in fact related to some form or another of financing constraint, or if investment activity simply reflects changes in the suppliers' investment opportunity sets coincident with slower buyer payment.

If the established relation between payment speed and investment is perpetuated by some form of financing constraint, then we should expect the relation to grow stronger (or attenuate) based on variation in ex-ante characterization of such constraint. We begin by comparing investment sensitivity to buyer payable days based on a cross-sectional measure of constraint—whether or not a supplier had a long term credit rating in the prior year— and continue with a time series measure of constraint based on credit market looseness for the aggregate economy. Finally, we'll combine time-series and cross-sectional variation in suppliers' access to external financing by comparing the behavior of a sample of suppliers

which we've linked to the failed lender CIT, leading up to and after CIT's failure, to the behavior of a set of similar control firms.

Table 5 examines the differential effects of buyer payable days on rated and unrated suppliers. Following earlier work, we focus on the presence of a rating as an indicator of the degree of credit constraint faced by a given supplier (Whited (1992), Faulkender and Petersen (2006)). Credit ratings have also been interpreted as a proxy for the information asymmetry banks face when evaluating the prospects of a borrower. In either case, if frictions between suppliers and their sources of capital are behind the observed reduction in spending, we would expect to see the effect diminished for rated firms for which the wedge between internal and external financing are relatively low.

Using interaction terms between a dummy variable indicator for whether or not the supplier was rated and buyer payable days, as well as Tobin's *Q* and cash flow, Column 1 of Table 5 suggests that the reduction in capital expenditures is indeed larger for unrated firms. In fact, rated firms' investment is (almost) exactly unchanged in response to delayed payment. Column 3 provides evidence as to why this might be the case. Immediately we note that, as before, unrated firms are unable or unwilling to issue new debt to finance receivable growth. Rated firms, on the other hand, show significant growth in new debt issuance in response to buyers' extended payment terms.

To show how the effect varies based on time-series variation in the degree of financing constrain suppliers are likely to face, we repeat a similar specification to Table 6, this time replacing the ratings dummy with a time series measure of credit market tightness provided by the Federal Reserve Board—the percentage of senior loan officers responding to their quarterly survey and reporting tightening credit standards. Because our observations are annual, we average the quarterly FRB measure over the fiscal year to which a supplier observation is linked. We find the interaction between credit tightening and the severity of supplier response is strong, with a two standard deviation in tightness nearly doubling the magnitude of the effect (as in 2008). Meanwhile, in periods of extremely loose credit such as 2004, the investment response to slower buyer payment nearly disappears.

Finally, we take advantage of the failure of a major lender to small and medium sized manufacturers (similar to the firms on our sample) during the financial crisis to examine how a shock to financing constraints interacts with the demand for longer payment terms by a significant buyer. Similar to studies which exploit firms' links to Lehman Brothers at the point of its failure (Ivashina and Schafstein (2009) and Chitru, May, and Megginson (2012)), we match our sample of suppliers to the DealScan loan database where we can identify firms with which CIT had a lender relationship prior to 2007, at which point the lender began facing significant financial difficulties. Within our full sample of firms, we find 43 suppliers which can be linked to the lender via at least one DealScan loan facility. Because we are interested in a "CIT effect" and not a "DealScan effect", we use firms which could be

linked to non-CIT lenders via DealScan as our control and exclude firms from the analysis which had no linked lenders in the loan database. The appendix reports summary statistics for the two samples prior to 2007. Among the key variables in our tables, none are statistically different between the two samples. Finally, to keep a relatively tight estimation period, we limit the time period for our analysis to the 10 years from 2000 to 2009. Meanwhile, we establish the period of CIT distress as beginning in 2007.[8]

Our identification strategy is premised on the idea that, even in the event that overall buyer payment speed is somehow endogenously linked to the supplier's investment opportunity set, the observed correlations between investment and payable days should not depend on shocks to financing constraints, unless access to financing is a key mechanism in the observed relationship. Using CIT's decline, beginning in 2007, as a shock to some firms' degree of financial constraint, Table 7 measures the change in sensitivity of investment to buyer payable days for these firms, as compared to a sample for which the shock to financing constraint was less severe. In particular, in Table 7, we are interested in the triple interaction between *BuyerPayableDays*, a dummy for firms linked to CIT, and a dummy for observation in the post 2007 period. Controlling for each of these variables in levels and including interactions among each other, the coefficient on *BuyerPayableDays X CIT X post2007* measures the impact of CIT's failure on how linked suppliers respond to changes in payment speed via investments, compared to the simultaneous change in response observed for non-CIT linked firms. Columns 1 and 2 estimate the interaction with and without buyer X supplier fixed effects. In each case, we find a significant differential response for the CIT-linked firms. Consistent with the prior two tables, we interpret this as further evidence that the link between real investment and the speed at which a supplier receives payment from an important buyer depends critically on firms' access to outside financing.

Finally, one would naturally like to know how costly the reduced spending is to the supplier, if at all. While our prior has been that adjustment along real margins such as capex must be costly, this is only true to the extent that suppliers have a tendency not to overinvest when paid cash on delivery. To get a rough sense of the long run costs of slowed spending resulting from slow payment, we consider the effect of payment delays on suppliers' future profitability. Table 8 measures the effect of buyer payable days on ROA, defined as annual operating income divided by lagged total assets, for the current period, as well as 4 leading periods (*t+1* through *t+4*). In each case, operating income is scaled by the assets in place at the beginning of period *t*. Meanwhile, we focus on the unrated sample, given this is the group for which capital expenditure reductions were noted.[9]

[8] The result is robust to shifting the period of CIT distress to 2008. However, an examination of CIT's equity performance and activity in the DealScan sample suggests that its trouble and resulting reduction in lending began in mid-2007.

[9] In this particular regression, we measure buyer payable days in logs. Although the results are qualitatively similar in levels (as used throughout the rest of the paper), there is considerably better fit under the reported specification.

Note that in the years during and immediately following changes to payable days, there is no change in profitability. However, as Columns 4 and 5 report, by the fourth and fifth year we find that profitability significantly decreases.[10] Controlling for other determinants of operating income, a doubling of buyer payable days decreases operating income in years 4 and 5 (scaled by the fourth and fifth lag of assets) by 7.5% and 14.7%, respectively. Moreover, doubling the buyer's payable days reduces the five year sum of ROA of suppliers by 21.5%. These numbers are appreciably large in light of a mean 5-year ROA which is 80.7%. However, it is also worth noting that, as a result of the variance of annual operating income adding up over multiple periods, the standard deviation of 5 year ROA is also large (161%).

Trade Credit Flows and Product Quality

Why do large, seemingly unconstrained buyers appear to demand trade credit from smaller, often constrained suppliers? The naïve response to this question is that buyers have all the bargaining power and therefore can ask for (and receive) any terms that they specify, including the provision of costly trade credit. This argument fails, however, as long as suppliers are free to walk away from negotiations when economic profits go below zero. Assuming buyers have all the bargaining power, suppliers will always sit at the margin of abandoning the transaction. At this point of indifference, longer payment terms must be offset by price concessions to the supplier of equivalent value. Said otherwise, suppliers will be willing to lower prices for any improvement in payment speed the buyer can offer. The introduction provided a simple example which attempted to suggest that, as long as the buyer has an absolute advantage in raising capital, in a first-best outcome, the buyer should raise the capital itself and pay cash to the supplier, thereby extracting the lowest price possible. In a setting in which the supplier represents the less constrained party on the other hand, we would expect to see the supplier providing financing to its constrained buyers, consistent with the more traditional characterization of trade credit.

Consider, however, the possibility that in addition to frictions between firms and financial markets which drive differential costs in external financing between buyers and suppliers, buyers also may face uncertainty regarding the quality of the product they have contracted to buy. Long, Malitz, and Ravid (1993) consider the effect of product quality uncertainty on buyer–supplier terms and show that a delayed payment by the buyer, during which time the product can be evaluated, may provide the optimal contract.

The interpretation of using logs is natural here—that the effect of a change in payment speed on profitability depends on the payment speed initially enjoyed by the supplier.

[10] Initially, there appears to be a small bump in profitability, although not significantly so. This is possibly due to the cut back in operating expenditures which happens immediately, but like capital expenditures, may have a lagged effect on revenues.

Under this hypothesis, the flow of financing which is linked to the transaction is less clear. On one hand, frictions between the small suppliers and their lenders may predict cash payment, especially when buyers are more transparent credit risks. On the other hand, if uncertainty regarding product quality is sufficiently severe, we may observe the otherwise the counterintuitive flow of credit we observe in practice. Moreover, if we take seriously the payment delay as a period during which the buyer can still reject low quality goods, then receivables on the balance sheet of the supplier now face repayment risk linked to product quality. As a result, the financing of these receivables in external markets will be subject to many of the same frictions and costs of any other external issuance of the supplier.

To test the hypothesis that information asymmetry regarding product quality between buyers and seller dictates the speed with which suppliers are paid, we look at the product warranty claims of manufacturers, which based on recent FASB mandates, are now provided in 10-K and 10-Q disclosures. Warranty costs represent a loss contingency required to be reported in financial statements by FASB when estimable. Specifically, however, we focus on warranty claims, which represent charges to a reserve account established by the manufacturer to cover expected product returns, recalls, or repairs. So whereas generous warranties might provide a signal for high quality manufacturers to separate themselves from low quality manufacturers, a large volume of realized claims ex-post suggests low product quality.

Our data on warranty claims come from WarrantyWeek newsletter, which has been collected from individual firm disclosures in mandatory filings since 2003. Since that time, we have claims data for 542 firms. Because only a handful of the suppliers in our original sample overlap with the sample of firms providing full warranty data, Table 9 estimates the effect of lagged warranty claims as a percentage of average lagged sales (over two periods) on receivable days for a larger sample of Compustat firms reporting warranty data. Since information asymmetry regarding a manufacturer products is likely to primarily vary in the cross section, we excluded firm fixed effects, but do include fine (3 digit NAICS) industry effects.

Column 1 of Table 9 finds evidence of a strong relationship linking a firm's product quality ranking within its industry to the speed at which it is paid. Meanwhile, controlling for firm size (and in unreported results, credit rating dummies, or Altman's Z-score bankruptcy distance measure) does not dilute the relation.

However, it should be noted that the level of product quality is not the same as the uncertainty regarding product quality (although one might imagine that low quality may be correlated with information asymmetry). Columns 3 through 5 present the industry level variance in warranty claims (where variance is calculated for each 3 digit NAICS industry, pooling across year) as a more direct measure of the uncertainty a buyer faces. Industries with high within-industry variance in warranty claims to sales are more likely to represent products where the range of possible product qualities is diffuse,

whereas an industry with a tight variance in warranty claims across manufacturers may represent a known quantity for buyers. As a hypothetical example, consider the expected variance for a group of firms producing electronics and a group of firms producing cutting boards. The former will invariably have a large amount of variation in product quality, while the latter will not. Given that our right-hand side variable moves only by industry, we exclude industry fixed effects, but do cluster our standard errors at that level.

Our results imply that firms which are paid more slowly tend to come from industries with more diffuse product qualities. Columns 4 and 5 compare this relation to the industry-wide level of warranty claims to sales (at the median) and show that it is the spread, and not the level of product quality that dictates trade credit terms.

While admittedly stylized, the evidence above suggests that the tendency for small suppliers to finance larger buyers, while counterintuitive in the context of financing market frictions, may stem from countervailing frictions between suppliers and their buyers related to product quality.

If this is correct, we might predict that these issues could be overcome over time as information asymmetry is resolved. To test this, we track the payment speed enjoyed by firms over time following the establishment of a new relationship with a major buyer. To this end, we focus on firms which are linked to the buyers in our sample who have the most matched suppliers—Wal-Mart, Target and JCPenney.[11] We then follow the aggregate receivable days of suppliers who reported one or more of these buyers as a significant customer and that, specifically, during the course of their relationship, the buyer represented 25% or more of their total sales on average. Because we do not observe the receivables owed by specific buyers to a firm, we rely on these important relationships being a major driver of overall receivable levels of the supplier over time.

The filters above leave us with a total sample of 88 firms. Of course, over time, the sample dwindles as relationships are terminated—by the fifth year of the reported relationship, only 47 firms remain. By ten year, we track only 18 firms.

Figure 1 plots the mean change in total receivable days experienced by these suppliers over the course of the relationship, controlling for age and time effects and conditional on relationship survival. On the y axis, we report the average ΔSupplierReceivableDays, defined as the current period's receivable days, demeaned by the average receivable days for non-financial Compustat firms of the same age during the same fiscal year, less their receivable days in the first year they reported a relationship with the buyer (also time and age demeaned). By way of example, suppose that Paradise Fruit Company began a relationship with Wal-Mart in 2000 and was paid in 32 days at that point, but that in 2001, it was paid in

[11] Sears would be another natural choice—however it is difficult to differentiate new relationships following Sears' acquisition of Kmart.

30 days. Also assume that in 2000 and 2001, firms of a similar age were paid in 35 days and 36 days, respectively. Then ΔSupplierReceivableDays for Paradise Fruit Company would be (30-36)-(32-35)=-3. Demeaning by age and year removes mechanical effects which might be related to older firms being paid more quickly, or any time trend in the data. Meanwhile, by focusing on changes, we limit ourselves to within firm variation. Otherwise, we might interpret a downward sloping path as telling us that firms which are paid more slowly are less likely to continue their relationship.

With the exception of the first full year of the firm relationship, for which we see a pronounced bump in receivable days, the plot suggests that over time, conditional of maintaining a relationship with your buyer, suppliers are paid roughly 1 day sooner by the buyer for each year together. The increase in period one is consistent with buyers ramping up their relationships over time—note that the first year of the reported relationship is likely to in fact be a partial year.

Again, we view the evidence as consistent with buyer-supplier information asymmetry as being an important factor that dictates the terms of trade credit, and in particular, the extension of trade credit by constrained suppliers to unconstrained buyers.

Concluding Remarks

The evidence presented seems to suggest an alternative characterization of the trade credit relationship in which firms which we would predict to be relatively more constrained in their ability to raise external financing provide credit to firms for which financing frictions are limited. This new view of trade credit is not only a curiosity, but seemingly an important one, given the economic costs associated with it and the ubiquity of trade credit in the economy. Our evidence appears consistent with the severity of buyer-supplier frictions outweighing the buyers' comparative advantage in external capital markets.

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Table 1: Summary Statistics

Panel A: Trade credit usage by firm size. Using the full Compustat sample (excluding financials) as of 2009, median net trade credit days, defined as payable days minus receivable days, are presented for 10 size deciles, as measured by total assets.

Size decile (assets)	Smallest 1	2	3	4	5	6	7	8	9	Largest 10
Median Net Trade Credit Days (payable days - receivable days)	61.51	6.60	0.00	-6.84	-3.07	-2.75	-2.13	-1.55	1.34	6.10

Panel B: Sample description. The sample period is from 1985 to 2009 and consists of 1,032 unique buyer-seller pairs involving 41 unique retail buyers and 702 unique sellers. Column 1 describes the length of buyer-seller relations in number of years. Column 2 describes trade accounts payable days for buyers, calculated as accounts payable (item AP) divided by purchases (cost of goods sold + change in inventory) and multiplied by 360. Column 3 describes the trade accounts receivable days for sellers, calculated as trade accounts receivable (item RECTR or RECT if RECTR is missing) divided by sales and multiplied by 360. Column 6 describes the percentage contribution of an individual seller to the matched buyer's cost of goods sold. Column 7 describes the percentage contribution of an individual buyer to the matched seller's sales.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Relationship length (years)	Buyer-Payable days	Supplier-Receivable days	Buyer-Sales (millions)	Supplier-Sales (millions)	Supplier-Buyer Sales/Buyer COGS	Supplier-Buyer Sales/Supplier Sales	Supplier CAPX/Lagged Assets	Supplier SG&A/Lagged Assets	Supplier Operating Income/Lagged Assets
Mean	7.38	39.18	54.48	25,695	606	0.0017	0.2200	0.05	0.48	0.11
Std. Dev.	4.87	15.88	26.74	42,041	1,614	0.0022	0.4907	0.07	0.39	0.26
10%	2	26.02	24.37	4,116	16	0.0001	0.0879	0.01	0.17	-0.11
25%	4	31.11	36.16	6,439	49	0.0002	0.1100	0.02	0.25	0.03
Median	6	35.1	50.91	13,644	147	0.0008	0.1500	0.03	0.37	0.12
75%	10	41.02	67.4	31,380	437	0.0021	0.2300	0.06	0.58	0.21
90%	15	60.96	89.43	52,935	1,347	0.0050	0.3700	0.10	0.84	0.34

	(11)	(12)	(13)	(14)
	Buyer All-in-loan spread (DealScan)	Supplier All-in-loan spread (DealScan)	Buyer Rating	Supplier Rating
Mean	0.35%	2.23%	-	-
Std. Dev.	0.65%	1.44%	-	-
10%	0.17%	0.45%	AA	BB-
25%	0.25%	1.25%	AA	unrated
Median	0.35%	2.25%	AA	unrated
75%	0.50%	3.00%	A	unrated
90%	0.102%	4.00%	BBB+	unrated

Table 2: Buyer payable days and supplier receivable days. Columns 1 and 2 estimate the effect of average payable days outstanding of large retailers on their suppliers' receivables. This regression serves as the first stage in 2SLS estimates reported Table 3. The model is estimated assuming buyer-supplier fixed effects,

$$\boldsymbol{SupplierReceivableDays_{i,t} = \alpha_t + \alpha_{i,j} + \beta_1 BuyerPayableDays_{j,t} + \beta_{2-k} X_{i,j,t} + \varepsilon_{i,j,t}},$$

where subscript *i* indexes suppliers and subscript *j* indexes buyers. *BuyerPayableDays* (reported in months) are calculated as the accounts payable of the buyer divided by cost of goods sold, times 30, while *SupplierReceivableDays* are calculated as trade receivables divided by net sales, times 30. Buyer total sales are net sales scaled by lagged assets. Cashflow is operating income divided by last period's assets and q is calculated as the market value of equity plus book value of asset, less shareholders equity and deferred taxes, divided by lagged assets. Q is measured at the beginning of each period for the buyer and the supplier. In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end (see text for examples). Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	(1) Receivable Days (in months)	(2) Receivable Days (in months)
Buyer Payable Days (in months)	0.150***	0.164***
	(0.047)	(0.038)
Buyer q		-0.011
		(0.013)
Cashflow		0.214**
		(0.105)
q		0.012
		(0.022)
Supplier X Buyer Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Ratings Dummy	YES	YES
Fiscal Quarter Dummies	YES	YES
Observations	4,051	3,280
R-squared	0.087	0.105

Table 3: Working capital and investment. Column 1 of panel A estimate the effect of suppliers' average collection time on real investment, using the average payable days outstanding of their retail buyers as an instrument for their receivable days. The first stage was reported in Table 2. As before, both stages are estimated assuming buyer-supplier fixed effects,

$$\boldsymbol{Receivable\ Days_{i,t}} = \delta_t + \delta_{i,j} + \gamma_1 \boldsymbol{Buyer\ Payable\ Days_{i,t}} + \gamma_{2-k}\boldsymbol{X_{i,j,t}} + \upsilon_{i,j,t},$$

$$\boldsymbol{Y_{i,t}} = \boldsymbol{\alpha_t} + \boldsymbol{\alpha_{i,j}} + \boldsymbol{\beta_1 Receivable\ Days_{i,t}} + \boldsymbol{\beta_{2-k}X_{i,j,t}} + \boldsymbol{\varepsilon_{i,j,t}},$$

where subscript *i* indexes suppliers and subscript *j* indexes buyers, and Y represents capital expenditure ($CAPX/AT_{t-1}$) or alternatively selling, general, and administrative expenditures ($XSGA/AT_{t-1}$), hereafter SG&A. In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end. In (3) and (4), cashflow is calculated before selling, general, and administrative expenditures. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

Panel A	2SLS	OLS	2SLS	OLS
	(1) Capital expenditure	(2) Capital expenditure	(3) SG&A expenditure	(4) SG&A expenditure
Receivable Days (in months)	-0.091***		-0.133***	
	(0.027)		(0.033)	
Buyer Payable Days (in months)		-0.015***		-0.023***
		(0.003)		(0.007)
Buyer q	-0.002	-0.001	-0.000	0.001
	(0.002)	(0.001)	(0.003)	(0.003)
Cashflow	0.082***	0.062***	0.579***	0.569***
	(0.016)	(0.009)	(0.029)	(0.025)
q	0.015***	0.014***	0.025***	0.024***
	(0.004)	(0.003)	(0.007)	(0.007)
Supplier X Buyer Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Ratings Dummy	YES	YES	YES	YES
Fiscal Quarter Dummies	YES	YES	YES	YES
Observations	3,273	3,273	3,224	3,224
R-squared	-	0.160	-	0.68

Table 3 (cont.): Working capital and investment. Panel B re-estimates results from panel A using a subsample of firms which were linked to buyers which a) experienced changes in their Q ratio in the most recent period which were above the median change for the sample during the same period (columns (1) and (3)) or which had a long-term debt rating of A+ or better (columns (2) and (4)). In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

Panel B	ΔBuyer Q>Median ΔBuyer Q	Buyer Rating =A+ or better	ΔBuyer Q>Median ΔBuyer Q	Buyer Rating =A+ or better
	(1)	(2)	(3)	(4)
	Capital expenditure	Capital expenditure	SG&A expenditure	SG&A expenditure
Buyer Payable Days (in months)	-0.015***	-0.017***	-0.037***	-0.068**
	(0.004)	(0.006)	(0.012)	(0.032)
Buyer q	0.000	-0.000	0.000	0.001
	(0.002)	(0.001)	(0.008)	(0.004)
Cashflow	0.056***	0.055***	0.251	0.290***
	(0.012)	(0.009)	(0.163)	(0.062)
q	0.012***	0.015***	0.069***	0.055***
	(0.003)	(0.004)	(0.015)	(0.006)
Supplier X Buyer Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Ratings Dummy	YES	YES	YES	YES
Fiscal Quarter Dummies	YES	YES	YES	YES
Observations	1,166	2,280	1,147	2,258
R-squared	0.215	0.169	0.195	0.169

Table 4: Financing receivable growth. Table 4 estimates the effect of the average payable days of buyers on net debt issuance and change in cash, each scaled by lagged assets. Columns 1 and 2 use buyer days as an instrument for the supplier's receivable days (as in Table 3) while Columns 3 and 4 present the direct, reduced form equation. In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	2SLS	OLS	2SLS	OLS
	(1)	(2)	(3)	(4)
	Δ Debt	Δ Debt	Δ Cash	Δ Cash
Receivable Days (in months)	-0.016		-0.075**	
	(0.082)		(0.036)	
Buyer Payable Days (in months)		-0.003		-0.012***
		(0.013)		(0.004)
Buyer q	-0.008	-0.008	-0.001	-0.000
	(0.006)	(0.006)	(0.003)	(0.003)
Cashflow	0.271***	0.268***	0.148***	0.134***
	(0.100)	(0.090)	(0.035)	(0.040)
q	0.017**	0.016**	0.004	0.002
	(0.008)	(0.008)	(0.006)	(0.005)
Supplier X Buyer Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Ratings Dummy	YES	YES	YES	YES
Fiscal Quarter Dummies	YES	YES	YES	YES
Observations	3,278	3,278	3,221	3,221
R-squared		0.071		0.047

Table 5: Credit availability and supplier sensitivity to payment delays (Part I). Table 5 estimates the interaction between whether or not a supplier was rated in the prior period and the effects of buyer payable days on supplier investment and debt issuance. In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	OLS	
	(1)	(2)
	Capital expenditure	Δ Debt
Buyer Payable Days (in months)	-0.016***	-0.009
	(0.003)	(0.014)
Buyer Payable Days X Ratings Dummy	0.016**	0.082**
	(0.007)	(0.041)
Buyer q	-0.001	-0.006
	(0.001)	(0.005)
Cashflow	0.062***	0.260***
	(0.009)	(0.088)
q	0.014***	0.014*
	(0.009)	-0.006
Cashflow X Ratings Dummy	-0.021	0.151
	(0.020)	(0.256)
q X Ratings Dummy	0.002	0.068***
	(0.005)	(0.022)
Supplier X Buyer Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Ratings Dummy	YES	YES
Fiscal Quarter Dummies	YES	YES
Observations	3,273	3,278
R-squared	0.159	0.075

Table 6: Credit availability and supplier sensitivity to payment delays (Part II). Table 6 estimates the interaction between tightness in the bank market (captured by the percentage of loan officers reporting tightening credit standards in a given year) and the effects of buyer payable days on supplier investment. In addition to the controls reported, regressions include buyer-supplier pair fixed effects, time fixed effects, a dummy variable for rated suppliers, and a dummy variable for the fiscal month of the buyer which corresponds to the supplier's fiscal year end. The measure of credit tightening has been demeaned and scaled to have a standard deviation of one for ease of interpretation. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	OLS
	(4)
	Capital expenditure
Buyer Payable Days (in months)	-0.012***
	(0.002)
Buyer Payable Days X Credit Tightening	-0.005***
(FRB Senior Loan Officer Survey)	(0.001)
Buyer q	-0.002
	(0.001)
Cashflow	0.066***
	(0.009)
q	0.015***
	(0.003)
Cashflow X Credit Tightening	-0.020***
	(0.007)
q X Credit Tightening	0.001
	(0.001)
Supplier X Buyer Fixed Effects	YES
Year Fixed Effects	YES
Ratings Dummy	YES
Observations	3,064
R-squared	0.175

Table 7: Credit availability and supplier sensitivity to payment delays (Part III). Table 7 estimates the differential impact of buyer payable days on investment between suppliers linked to CIT Group and those with non-CIT lending relationships, before and after 2007 (inclusive). Lender relationships are identified by matching the supplier sample with DealScan prior to 2007—suppliers with no DealScan transactions are excluded from the sample. We limit the sample period to the final 10 years of data, beginning in 2000. The variable post2007 is a dummy for any observation reported during 2007, 2008, and 2009. Of interest is the interacted coefficient of **BuyerPayableDays X CIT X post2007**, which captures the change in CIT-linked suppliers' sensitivity to buyer payment speed following CIT's financial difficulty, benchmarked against the change in sensitivity for non-CIT linked suppliers. Interaction terms are formed after demeaning Buyer Payable Days, so the coefficients can be interpreted as the marginal effect at the mean. In addition to the controls reported, regressions include buyer-supplier pair fixed effects (column 1 only), time fixed effects, a dummy variable for rated suppliers. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	OLS	
	(1)	(2)
	Capital expenditure	Capital expenditure
Buyer Payable Days (in months)	-0.003	0.004
	(0.005)	(0.003)
Buyer q	-0.002	-0.001
	(0.002)	(0.001)
Cashflow	0.056***	0.022**
	(0.011)	(0.009)
q	0.011***	0.012***
	(0.003)	(0.001)
CIT linked	-0.005	
	(0.007)	
CIT linked x post2007	-0.012	-0.005
	(0.008)	(0.005)
Buyer Payable Days x post2007	0.001	0.005
	(0.005)	(0.006)
Buyer Payable Days x CIT linked	-0.026	-0.013
	(0.021)	(0.018)
Buyer Payable Days x CIT linked x post2007	-0.035**	-0.029**
	(0.018)	(0.012)
Supplier X Buyer Fixed Effects	NO	YES
Year Fixed Effects	YES	YES
Ratings Dummy	YES	YES
Observations	1,025	971
R-squared	0.243	0.204

Table 8: Trade credit, investment, and subsequent performance. Table 8 estimates the effect of payment speed on subsequent performance for rated suppliers. Performance is measured by ROA, defined as annual operating income for a given year, measured in the current period, as well as 4 leading periods (t+1 through t+4). In each case, operating income is scaled by the assets in place at the beginning of period t. Columns 1-5 report reduced form estimates of buyer days' effect on current and future returns to current period assets, while Column 6 reports the effect on aggregate 5 year ROA. In addition to the controls reported, regressions include buyer-supplier pair fixed effects and time fixed effects. Standard errors are double clustered at the level of supplier and buyer, are robust to heteroskedasticity, and are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	Unrated Sample/OLS					
	(1)	(2)	(3)	(4)	(5)	(6)
	ROA (t)	ROA (t+1)	ROA (t+2)	ROA (t+3)	ROA (t+4)	5 year ROA
ln(Buyer Payable Days) (in months)	2.109	4.984	-3.531	-7.567**	-14.731***	-21.544***
	(2.457)	(4.084)	(3.166)	(3.510)	(4.856)	(6.888)
Buyer q	0.505	1.450**	0.769	0.965	0.825	4.417
	(0.465)	(0.676)	(1.171)	(0.812)	(1.677)	(4.362)
q	-1.133	2.072**	1.326	3.713**	8.107**	15.834**
	(1.565)	(0.916)	(1.081)	(1.779)	(3.464)	(6.905)
Supplier X Buyer Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	2,698	2,443	2,165	1,887	1,639	1,625
R-squared	0.026	0.046	0.049	0.065	0.079	0.075

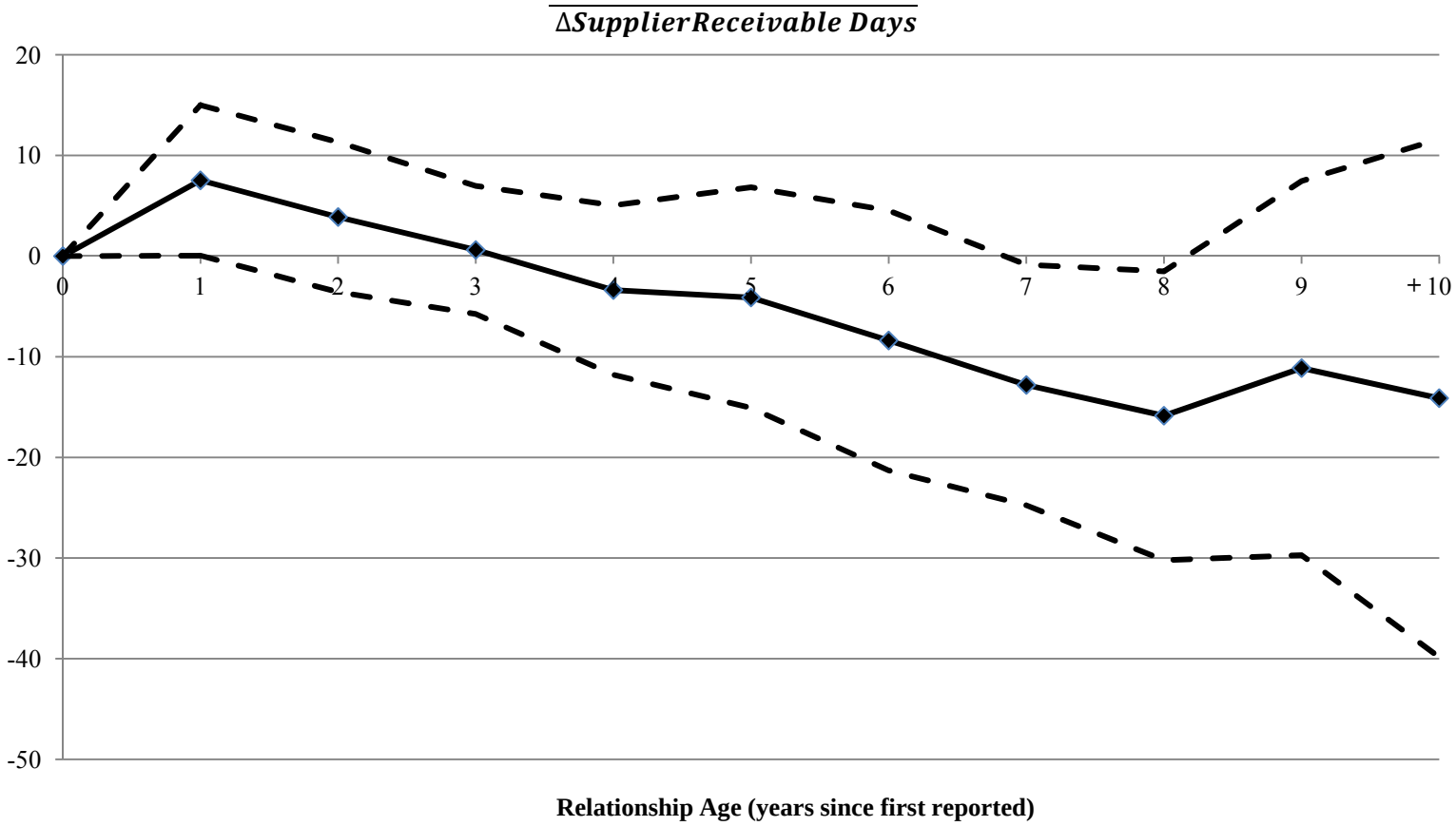
Table 9: Product Quality and Payment Speed. Table 9 presents reduced form regressions of average receivable days on estimates of product quality and information asymmetry regarding product quality. Columns 1 and 2 provide OLS coefficient estimates of a regression of receivable days on one period lagged warranty claims, scaled by the prior year's sales for a sample of Compustat firms reporting warranty data in their annual disclosures from 2002 to 2009. Industry dummies at the 3 digit NAICS level, as well as year dummies, are included. Columns 3 through 5 provide estimates of the effect of industry level variation in product quality, as measured by industry level variance of warranty claims, on firm level receivable days. Columns 3 through 5 focus on the same sample of firms, but do not require a current reporting of warranty claims. Standard errors are clustered at the level of supplier in Columns 1 and 2 and are clustered at the industry level in Columns 3, 4, and 5. In each case, standard errors are reported in parentheses. ***, **, and * signify results significant at the 1, 5, and 10% levels, respectively.

	(1) Receivable Days	(2) Receivable Days	(3) Receivable Days	(4) Receivable Days	(5) Receivable Days
Warranty Claims$_{t-1}$/.5(Sales$_{t-2}$+Sales$_{t-3}$)	177.222***	200.472***			
	(54.019)	(56.243)			
ln(Assets$_{t-1}$)		1.827**			
		(0.764)			
Variance (Warranty Claims$_{t-1}$/.5(Sales$_{t-2}$+Sales$_{t-3}$)) $_{INDUSTRY}$			1.991**		1.982**
			(0.831)		(0.871)
Median (Warranty Claims$_{t-1}$/.5(Sales$_{t-2}$+Sales$_{t-3}$)) $_{INDUSTRY}$				90.544	8.433
				(223.056)	(223.087)
Year Fixed Effects	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	NO	NO	NO
Observations	2,578	2,578	5,170	5,170	5,170
R-squared	0.133	0.146	0.021	0.010	0.021

Figure 1: Relationship Age and Speed of Payment. Figure 1 plots the mean change in total receivable days experienced by suppliers to Wal-Mart, Target, and JC Penney over the course of their relationship with their matched retailer. For suppliers who report Wal-Mart, Target, or JC Penney as a major buyer (25% or more of total sales on average over the course of the relationship), a variable *ΔSupplierReceivableDays* is defined as the current period's receivable days (demeaned by the average receivable days for non-financial Compustat firms of the same age, during the same fiscal year), less their receivable days in the first available year they reported a relationship with the buyer (also time and age demeaned)

$$(\Delta \boldsymbol{SupplierReceivable\ Days}_i = (\boldsymbol{Receivable\ Days}_{i,t} - \overline{\boldsymbol{Receivable\ Days}}_{age,t}) - (\boldsymbol{Receivable\ Days}_{i,0} - \overline{\boldsymbol{Receivable\ Days}}_{age,0}).$$

The figure below plots the average *ΔSupplierReceivableDays* for the first 10 years of the relationship, conditional on relationship survival. Confidence intervals are plotted around the coefficient estimates.



Appendix

Examples of 10-K disclosures

PARADISE INC, 2010

(Notes)

NOTE 11: MAJOR CUSTOMERS

During 2010, the Company derived approximately 18% and 10% of its consolidated revenues from Wal-Mart Stores, Inc. and Aqua Cal, Inc., respectively. During 2009, the Company derived 17% of its consolidated revenue from Wal-Mart Stores, Inc. As of December 31, 2010 and 2009, Wal-Mart Stores, Inc.'s accounts receivable balance represents 83% and 77% of total accounts receivable, respectively, and Aqua Cal, Inc.'s accounts receivable balance represented 14% of total accounts receivable at December 31, 2010.

NOTE 12: CONCENTRATION OF CREDIT RISK

Financial instruments which potentially subject the Company to concentration of credit risk consist principally of cash, cash equivalents and unsecured trade receivables. The Company's cash and cash equivalents are maintained at one financial institution located in Florida. Accounts at this institution are secured by the Federal Deposit Insurance Corporation up to $250,000. Uninsured balances aggregate to $4,522,056 at December 31, 2010. The Company grants credit to customers, substantially all of whom are located in the United States. The Company's ability to collect these receivables is dependent upon economic conditions in the United States and the financial condition of its customers.

UNIVERSAL FOREST PRODUCTS, 2002

(Management Discussion and Analysis)

Cash flows from operating activities decreased by over $61 million in 2002 compared to 2001. This decrease was primarily due to:

- An increase in our inventory levels relative to sales. In November and December 2002, our purchasing managers took advantage of the historically low level of the Lumber Market and increased inventory levels. The product purchased during this period is expected to be sold in the first quarter of 2003. In addition, inventory levels increased in 2002 as a result of both inclement weather reducing sales in November and December and additional inventory purchased to utilize capacity created with our treating services agreement with Quality (see Business Combinations).

- An increase in our accounts receivable as a result of extending our payment terms with The Home Depot by an additional 15 days.

Due to the seasonality of our business and the effects of the Lumber Market, we believe our cash cycle (days sales outstanding plus days supply of inventory less days payables outstanding) is a good indicator of our working capital management. Our cash cycle increased to 47 days in 2002

from 44 days in 2001. This increase was primarily due to a longer receivables cycle resulting from extended payment terms with The Home Depot. This was offset slightly by an extension in our payables cycle.

HOME DEPOT, 2002

LIQUIDITY AND CAPITAL RESOURCES

Cash flow generated from operations provides us with a significant source of liquidity. For fiscal 2001, cash provided by operations increased to $6.0 billion from $2.8 billion in fiscal 2000. The increase was primarily due to significant growth in days payable outstanding from 23 days at the end of fiscal 2000 to 34 days at the end of fiscal 2001, a 12.7% decrease in average inventory per store as of the end of fiscal 2001 and increased operating income. The growth in days payable and decrease in average inventory per store are the result of our efforts to improve our working capital position by extending our payment terms to industry standards and enhancing inventory assortments.

Appendix (cont)

Buyer List

7-ELEVEN INC
ALBERTSON'S INC
AMERICAN STORES CO
AUTOZONE INC
BEST BUY CO INC
CAREMARK RX INC
COSTCO WHOLESALE CORP
CVS CAREMARK CORP
DELHAIZE AMERICA INC
DILLARDS INC
FINGERHUT COMPANIES INC
FOOT LOCKER INC
HECHINGER CO
HOME DEPOT INC
KOHL'S CORP
KROGER CO
LIMITED BRANDS INC
LOWE'S COMPANIES INC
MACY'S INC
MAY DEPARTMENT STORES CO
NORDSTROM INC
OFFICE DEPOT INC
OFFICEMAX INC
PENNEY (J C) CO
PETRIE STORES
RADIOSHACK CORP
REVCO D.S. INC
RITE AID CORP
SAFEWAY INC
SEARS ROEBUCK & CO
STAPLES INC
STOP & SHOP COS
SUPERVALU INC
TARGET CORP
TIFFANY & CO
TJX COMPANIES INC
TOYS R US INC
ULTRAMAR DIAMOND SHAMROCK
VENTURE STORES INC
WAL-MART STORES INC
WALGREEN CO

Table 1A: Comparing CIT and non-CIT linked suppliers. We report means of key variables for suppliers linked to CIT prior to 2007 and compare them to the sample of suppliers who could be linked to lenders other than CIT in DealScan. Column 3 reports differences in means. ***, **, and * signify differences significant at the 1, 5, and 10% levels, respectively. Errors are clustered at the firm level.

	(1)	(2)	
Mean	Non-CIT lender linked suppliers	CIT linked suppliers	(1)-(2)
ln(Assets)	5.72	5.57	0.15
Buyer payable Days	39.3	40.1	-0.8
Cashflow/Assets	0.11	0.14	-0.03
Q	1.60	1.41	0.19
Capex/Assets	0.03	0.04	-.01
Observations	611	104	