Risk Management and Distress:
Hedging with Purchase Obligations

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Abstract:

Purchase obligations are forward contracts with suppliers. This paper is the first to document that these contracts are a risk management tool and have a material impact on corporate hedging activity. Using a natural experiment, we show that purchase obligations are a substitute for hedging with derivatives. Further, firms increase their use of these contracts as they approach distress even after addressing endogeneity with an exogenous shock. Not only does this paper document an unexplored operational hedge, it extends the literature on risk management by constrained firms. Contrary to the existing literature, we find that many firms do not cease hedging in distress.

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How do firms manage risk and does risk management change as firms approach distress? Hedging is potentially beneficial in a world with capital market frictions such as taxes and agency issues (Smith and Stulz, 1985; Froot, Scharfstein, and Stein, 1993). But empiricists have struggled to map the rich theoretical predictions regarding risk management and distress to observed firm hedging behavior. One potential issue is that theory papers often examine "hedging" without specifying how firms hedge (e.g., DeMarzo and Duffie, 1995) but most empirical analysis focuses on derivatives (e.g. Nance, Smith, and Smithson, 1993; Graham and Rogers, 2002).

In this paper, we focus on a common yet overlooked hedging tool – the purchase obligation. Purchase obligations are non-cancelable contracts with suppliers for materials or services, generally over one to three year horizons. Accounting regulations treat a purchase obligation (PO) as an off-balance sheet liability, but it is also a forward contract with properties similar to a tradable derivative. Like a future, it can minimize input price volatility. However, these contracts are not restricted to exchange-traded products and thus are more common than derivatives use. Of non-financial firms in Compustat during our sample period of 2003-2010, 20.8% use purchase obligations and 15.6% use commodity derivatives. Moreover, these purchase obligations are economically significant contracts, averaging 7.4% of total assets and 13.5% of COGS.

This paper will show that firms recognize the hedging benefits of purchase obligations and use them as a substitute for derivatives. Although most empirical studies use derivatives to proxy for risk management, derivatives are not available to hedge many key exposures (Froot and Stein, 1998) and collateral constraints can limit their use even when they are available (Rampini, Sufi, and Viswanathan, 2014). A broad range of firms use purchase obligations with suppliers to manage a range of input prices and we document the limited availability of financial hedging options affects the use of purchase obligations.

Using hand-collected data on purchase obligations as well as marketable exposures (a proxy for the ability to financially hedge), we first present evidence that these supply contracts are a risk management tool and a substitute for derivatives using multivariate analysis with and without instrumental variables.[1] To our knowledge, this is the first evidence that purchase obligations are used as an operational hedge. We confirm these results using a natural experiment involving the introduction of steel futures contracts. If purchase obligations were not perceived as a risk management tool, the availability of steel futures would have no impact on their use. However, firms with an exposure to steel simultaneously increase their financial hedging and decrease their use of purchase obligations when the new derivative is introduced. This natural experiment is robust to checks of parallel trends and falsification tests.

Demonstrating that forward contracts with suppliers are recognized as a hedging tool contributes to the mounting theoretical and empirical evidence suggesting that derivatives are only a part of risk management activity. Operational decisions can mimic the benefits of hedging with derivatives (Smith and Stulz, 1985; Petersen and Thiagarajan, 2000). Bolten, Chen, and Wang (2011) and Gamba and Triantis (2014) expand the theoretical work in this area while Disatnik et al., (2014), Hirshliefer (1988), Hankins (2011), and Bonaimé et al. (2014) document the operational hedging benefits of cash, vertical integration, and payout flexibility. This compliments the earlier work discussing how to manage unmarketable risks (Froot, Scharfstein, and Stein, 1993).

[1] We instrument for derivatives use with the availability of futures for the firm's inputs and we instrument for purchase obligations with the contracting environment and supplier characteristics.

Perhaps most notably, Guay and Kothari (2003) highlight the limits of financial hedging use, stating:

> "…much of the overall risk facing non-financial firms (e.g., operating risks) cannot be managed through the use of standard derivatives contracts written over asset prices such as interest rates, exchange rates, and commodity prices."

Indeed, Guay and Kothari find evidence that derivatives usage does not have a large economic impact on firms and note that earlier research focusing only on financial hedging may overlook the potentially important effects of operational hedges. While exchange-traded derivatives may be more efficient than individual forward contracts (as discussed in Williamson, 1985), the availability of derivatives is limited. That firms find alternative means to address cash flow volatility lends support to models of Smith and Stulz (1985) and Froot, Scharfstein, and Stein (1993), where the goal of risk management is to minimize costly variance. This also contradicts survey evidence that firms frequently use derivatives to eliminate specific transactional exposures (Bodnar, Hayt, and Marston, 1998). The evidence on operational hedging also contributes to the growing literature on liquidity management (Almeida, *et al*., 2014). Any liquidity management tool (cash retention, financial derivatives, etc.) can reduce the likelihood of underinvestment as well as well as expected bankruptcy costs (Nance, Smith, and Smithson, 1993).

After documenting that purchase obligations are a risk management tool, we explore the use of POs across a firm's life-cycle. Rauh (2009) finds that risk management incentives increase near distress. Yet, at this same time, derivatives (which require collateral), lines of credit (which have covenants), and cash (which requires a liquidity premium) are limited (Acharya *et al.*, 2014; Rampini, Sufi, and Viswanathan, 2014). That is, just as a firm's hedging need is largest, the liquidity is restricted. However, there are numerous reasons to believe that POs may be more flexible at this time. Suppliers are better positioned than financial institutions to provide liquidity during downturns (e.g., Garcia-Appendini and Montoriol-Garriga, 2013). If firms in distress are otherwise constrained with respect to risk management, suppliers may be most willing to write forward contracts. Suppliers also have an additional incentive to assist customers during temporary negative shocks because part of the supplier's value is a function of customers' future cash flows (Petersen and Rajan, 1997). Further, evidence on long-term supply contracts shows that supplier-customer contracts rarely have collateral requirements and frequently are not subject to financial covenants (Costello, 2013). We expect that collateral requirements and financial covenants are even less likely for purchase obligations given their shorter horizon. This flexibility makes POs relatively more useful.

Our results confirm that firms increase purchase obligation usage as their financial condition worsens. Entering distress leads firms to initiate or increase purchase obligation use and this pattern holds whether we use a straight-forward multivariate analysis or examine the response to an exogenous distress shock. This evidence supports the hypothesis that firms adjust their hedging choices as their financial condition deteriorates and that suppliers play a role in the risk management of distressed firms. While our focus is on the customer's incentive to hedge with product-market contracts, IO theory (e.g. Coase, 1937; Williamson, 1985) highlights that long-term contracts can be initiated by either the supplier or customer. We consider supplier incentives in our multivariate tests and control for relationship-specific investments, contracting costs, and relative bargaining power. Further, we both control for trade credit in all of the multivariate regressions and then rerun the analysis on PO usage as the firm approaches distress excluding firms with high trade credit or larger increases in trade credit. This confirms that purchase obligation contracts are an independent risk management tool. Our findings contribute to the literatures on the impact of financial distress (Opler and Titman, 1994; Andrade and Kaplan, 2002) and how constrained firms manage risk (Fehle and Tsyplakov, 2005; Rampini and Viswanathan, 2010).

This paper is organized as follows. Section I describes our hand-collected data on purchase obligations and derivatives use as well as the rest of the panel data used in the analysis. We also present summary statistics, including calculations on the extent to which a firm's inputs are "hedgable" with derivatives. This new measure adds to the large number of studies examining the determinants of corporate derivatives usage (e.g., Jorion, 1991; Nance, Smith, and Smithson, 1993; Graham and Rogers, 2002). Section II explores the substitution of operational and financial hedging in both a multivariate context and a natural experiment. We use instrumental variables to address the endogeneity of both purchase obligation and derivatives use as well as the introduction of steel futures and find evidence of substitution in all settings. In Section III, we document that the use of purchase obligations increases as firms approach distress. These results are robust to using an exogenous distress shock. While this conclusion is consistent with evidence from the trade credit literature on the importance of suppliers to firms in distress (Petersen and Rajan, 1997), it contradicts the implication that distressed firms stop hedging (Rampini, Sufi, and Viswanathan, 2014). By expanding the definition of hedging to include purchase obligations, we gain a broader picture of how distressed firms operate. This has important implications for agency conflicts in distressed firms (e.g., Stulz, 1990). Section V concludes.

I. Purchase Obligations and Risk Management Tools

To examine the role of purchase obligations in risk management, we hand-collect a comprehensive database of the use of purchase obligations and derivatives by non-financial Compustat firms. We then add data on the firms, their contracting environment, and supplier characteristics. We describe the construction of our dataset in detail below.

A. Purchase Obligations

A purchase obligation is an executory contract where both parties have not yet performed their duties - not an asset or liability for either party. However, the downstream firm must disclose purchase obligations with other major contractual obligations such as long term debt, capital leases, and operating leases. All firms are required to report these contracts in 10-K filings since December 15, 2003, following legislation related to Sarbanes-Oxley. The only exception is for small business with revenues and a public float less than $25 million. Thus, the sample consists of all Compustat firm-years with a year-end between 12/15/2003 –12/31/2010 and an available 10-K filing on the SEC's EDGAR site. After excluding financial firms (SIC codes between 6000 and 6999), the eight-year panel dataset consists of 29,640 firm-years.

Firms report up to 5 years of future purchase obligations, but there is a sizable skew in the contracts with the majority due in the following year. The average (median) firm using contracts reports an aggregate contract length of 2.49 years (3 years). The purchase agreements contractually obligate the customer to purchase a fixed or minimum quantity at a fixed, minimum, or variable price from a supplier. Firms with commitments to their suppliers break out the disclosure in a table contained in this footnote, labeled as a separate line item titled "Purchase obligations". As noted above, this line item also usually includes the dollar amount of supplier purchase obligations for the subsequent five years but commitments with variable pricing are omitted. Using the scripting language Perl, we automatically search the contractual obligations footnote in relevant 2003-2010 10-K filings for the "Purchase obligation" line item, and create an indicator variable, *Purchase Obligation*, which equals one for all firms which report purchase obligations, and zero otherwise. Further, we also extract the aggregate dollar amounts of the purchase obligations for the next five years from this footnote.

Roughly 20.8% of all firm-year observations report purchase obligations in their 10-K filings. We also report the dollar amounts under contract for each future year *i* scaled by current year cost of goods sold (Contractual Dollar $\text{Amount}_{t+i}/\text{COGS}_t$). The average firm using contracts commits to purchase 12% of its COGS in year *t*+1, 7% in year *t*+2, 5% in year *t*+3, and less than 1% in future years. POs vary by industry as well as by firm. For example, manufacturers can contract on raw material inputs while retailers often contract on merchandise.

B. Derivatives Use and Exposure

Next we collect information on financial hedging, focusing on commodity derivatives to parallel the potential hedging of input prices with purchase obligations. Input and commodity prices are a 'top ten concern' for U.S. businesses according to the 2014 Duke / CFO Magazine Business Outlook. Again, we use Perl scripts to collect information on derivatives use and report our search keywords in Appendix B. *Commodity Hedger* is equal to one if a firm reports using commodity derivatives, zero otherwise. To ensure that our automated data procedure used to populate *Commodity Hedger* accurately captures commodity derivatives usage in firms, we compare our data to the hand collected data used in Emm, Gay, and Lin (2007). For the 3,000 firm years which overlap, over 99% of observations are coded identically. We read the 10-K filing for observations which are inconsistent with Emm, Gay, and Lin (2007). A manual reading of the 10-K filings indicate that the data used in our paper are correctly coded.

As the exposure to commodity prices varies by firm, we also compute *% of Input Traded* to capture the percentage of a firm's input which is traded on financial markets and proxy for the availability of financial hedging. To construct this variable, we start with the 2002 Bureau of Economic Analysis' (BEA) benchmark Input-Output (IO) tables and the November 2009 issue of *Futures* magazine to identify all six digit Input-Output industries which are traded on a major financial exchange, excluding steel. The industries actively traded on an exchange are listed in Appendix C. *FuturesMarket* is equal to one if the six-digit IO industry output is traded actively on a futures market, zero otherwise. For each downstream industry in the IO tables, we identify all six-digit upstream industries and weight each upstream industry's *FuturesMarket* value by the percentage of input supplied to each customer industry. Thus, *% of Input Traded* is the weighted sum of all upstream industries' *FuturesMarket* value. We map this weighted-average supplier industry variable from the BEA IO Tables to each firm's two-digit NAICS industry in Compustat. We expect *% of Inputs Traded* to be positive related to *Commodity Derivatives.* We also expect *% of Inputs Traded* to be negatively related to *Purchase Obligation*, as these contracts are the solution to a bargaining game and are on average less efficient than competitive market-based outcomes such as the prices on commodity exchanges (Williamson, 1985).

C. Firm and Supplier Variables

We control for a variety of firm characteristics in the multivariate tests. Following Purnandam (2008), which demonstrates the non-monotonic relationship between debt and risk management, we include both *Market Lev* (the book value of debt divided by the sum of the market value of equity plus book debt) and *Market Lev*^{2}. Relatedly, we include three tax control variables as Smith and Stulz (1995) highlight the important of tax issues to risk management. *Non-Debt Tax Shield* is equal to the sum of depreciation and amortization expenses divided by total assets. *Marg Tax Rate* is a firm's pre-interest marginal tax rate, from Graham (1996). *Tax Convexity* is the tax convexity measure calculated using the coefficients in Graham and Smith (1999). As the tax variables restrict the sample size, we run our analysis both with and without these controls. Following Nance, Smith, and Smithson (1993), we control for growth options with R&D and sales growth and control for liquidity needs and operational hedging with cash, inventory, and trade credit (e.g. Petersen and Thiagarajan, 2000; Garcia-Appendini and Montoriol-Garriga, 2013). *R&D Intensity* is defined as a firm's R&D expense divided by total assets while firms which have not reported R&D expenses are assigned a *R&D Intensity* value of zero. *Sales Growth*, defined as $[(sales_t/sales_{t-1}) - 1]$, controls for possible demand-side pressures faced by the customer. *Sales Volatility* is the standard deviation of sales/total assets ratio from *t*-2 to *t*. *Cash* is cash holdings divided by total assets and *Inventory* is total inventory divided by COGS. *Trade Credit* is accounts payable scaled by assets. Finally, we control for capital expenditures with *CAPEX* equaling capital expenditures/total assets and firm size using *Ln(Assets)*, defined as the natural logarithm of total book assets.

Supplier characteristics may affect the availability of purchase obligations. Specifically, Coase (1937) and Williamson (1985) suggest that purchase obligations can be used by the supplier to reduce hold-up problems. Suppliers therefore also have incentives to use purchase obligations for industrial organization-related reasons. We control for these effects in our tests. Specially, Armour and Teece (1980) argue that vertical supply chains with high R&D intensity are more likely to have higher relationship specific investing and Fee, Hadlock, and Thomas

(2006) note R&D affects supplier contracting. Therefore, we control for the supplier's R&D in addition to the firm's own R&D. As the footnote disclosure describing purchase obligations only describes the aggregate contract amount, not individual suppliers, we calculate *Supplier R&D* using the sales weighted average of all supplier industry R&D/Assets. We first replace missing R&D values with zero and then aggregate firm-year R&D by two-digit NAICS code to construct industry characteristics and define *Industry R&D* as aggregate industry R&D divided by aggregate industry assets. Next, we link the industry-year R&D to each six-digit IO industry from the 2002 Input-Output tables from the BEA. For each customer industry, we weight each six-digit supply industry characteristic by the percentage of input they supply to the customer industry according to the "Use" table from the Input-Output tables. For example: if "Energy" has an *R&D Intensity* of 10% and it supplies 50% of a customer industry's input, and "Retail" has an *R&D Intensity* of 0% and it supplies the other 50% of a customer industry's input, the weighted average supplier R&D for that customer would be 5%. We construct *Supplier R&D Intensity* for each firm in industry j as follows:

$$Supplier\ R\&D\ Intensity\ =\ \sum_{\substack{i=1 \\ i\neq j}}^{n} Industry\ Input\ Coefficient_{ij}\ \times Industry\ R\&D_i \quad (1)$$

where j is the firm's primary six-digit IO industry, and i is the six-digit IO industry for each supplier industry, n is the number of industries which sell inputs to the reference firm, *Industry R&D* is the R&D/Assets of the industry and the *Industry Input Coefficient* is the percentage of industry j's input which comes from industry i.

While R&D is one component of contracting issues (Aghion and Tirole, 1994), the legal environment also matters. Contract law could affect not only purchase obligations but also bankruptcy costs and alternative risk management choices such as vertical integration (Smith and Stulz, 1985; Acemoglu, Johnson, and Mitton, 2011; Ahern and Harford, 2014). We proxy for contracting costs with the legal environment for contracting in each state.[2] The annual US Chamber of Commerce State Liability Systems Ranking Survey produces an annual "State Rankings for Overall Treatment of Tort and Contract Litigation". The highest-ranked state in a given year is assigned a value of "50" and the lowest-ranked state a value of "1" based on the location of the headquarters. This variable is *Contracting Index.*

Given that the contract is the outcome of a bargaining game, we also control for the supplier's relative bargaining power. Our proxy variable for relative bargaining power is the ratio of the supplier's and customer's industry concentrations. If the supplier is in a monopolistic industry and the customer is in a competitive industry, the supplier should have more relative bargaining power. We construct Herfindahl indexes at the two-digit NAICS level for each industry-year. For suppliers, we compute the weighted average using methodology identical to that for *Supplier R&D* above and calculate *Supplier Industry HHI*. We then use the ratio of *Supplier Industry HHI* divided by *Customer Industry HHI* to calculate *Relative Bargaining Power.*

D. Summary Statistics

Table 1 presents summary statistics on the variables described above during the 2003-2010 panel of Compustat (non-financial) firms. Of the 29,640 firm year observations, the use of derivatives and purchase obligations is common (15.6% and 20.8% of firm year observations respectively) and some firms use both tools. Although purchase obligations are used most frequently, risk management choice varies by firm. We also find that the median firm has *% of*

[2] One potential concern is that many firms are incorporated in Delaware. However, supplier-customer contracts include a "choice of law" provision outlining the legal jurisdiction in case there are disputes. Based on discussions with attorneys and executives, reading several confidential purchase obligation agreements, and anecdotal evidence, it appears that suppliers and customers generally choose the legal jurisdiction based on the actual location of the supplier and/or customer. That said, we are unaware of an academic empirical study investing the choice of law in supplier-customer purchase obligations.

Inputs Traded of roughly 1%, highlighting that a large portion of U.S. nonfinancial firm's inputs are not directly hedge-able using standard derivative contracts. This is consistent with the evidence from Guay and Kothari (2003).

Table 2 presents the summary statistics separately by risk management choice. Column 1 summarizes the mean variable values for firms which only use commodity derivatives to hedge. Column 2 reports the same for firms only using purchase obligations. And Columns 3 and 4 report the same for firms which use both derivatives and POs, or neither of them. Firms using purchase obligations generally have higher R&D expenses, cash, and inventory while firms using derivatives have higher leverage, total assets, exchange-traded inputs ("hedge-able" risk), and tangibility. Firms using purchase obligations also have higher *Supplier R&D* consistent with relationship specific investing affecting contracting. Firms using both derivatives and POs are the largest firms, consistent with economies of scale playing a role in risk management (Allayannis and Weston, 2001), and have the highest marginal tax rate.

II. Substitution of Purchase Obligations and Derivatives

If purchase obligation contracts are a tool for risk management and firms manage total volatility (as per Froot, Scharfstein, and Stein (1993)), then the use of POs may affect other risk management decisions. In this section, we use three approaches to show that purchase obligations and derivatives are treated by managers as substitute hedges, even if they are imperfect substitutes. In a multivariate context, we examine trade-offs between POs and derivatives use both in a straight panel analysis as well as with instrumental variables estimation. Further, we use a natural experiment – the introduction of steel futures - to document the substitution. Across all three empirical designs, we find consistent evidence of substitution - supporting the notion that firms treat purchase obligations as a hedge for controlling input price volatility.

A. Evidence from Instrumental Variables Analysis

Table 3 presents the multivariate evidence that purchase obligations are a risk management tool. First, financial hedging is modeled as a function of PO use. The first two columns present marginal effects from a probit regression. We recognize, however, that the use of purchase obligations is an endogenous choice. To address this concern, the next two columns report the results from probit with instrumental variables (IV). To identify variables associated with the use of purchase obligations but not derivatives use, we focus on supplier characteristics. *Contracting Index* and *Supplier R&D Intensity* together instrument for PO. Theory predicts relationship-specific investing and the contracting environment should affect the propensity to observe supply contracts but not derivatives use (e.g. Coase, 1937; Williamson, 1985), thereby satisfying the exclusion restriction. These IV choices pass the Hansen J test available for an OLS estimation framework. The first four columns show a negative and generally highly statistically significant negative relationship between purchase obligation use and commodity derivatives use. Firms appear to recognize the two risk management tools are potential substitutes.

Next, we present the probit and IV probit regressions where we model a firm's purchase obligation use as a function of derivatives hedging, firm characteristics, supplier-industry characteristics, and year dummies, adjusting the standard errors for clustering at the firm level. We document a negative relationship between derivatives usage and the use of purchase obligations. Again, we use an instrumental variable to address the endogenous choice to use purchase obligations. Valid instruments will correlate with patterns in financial hedging but not the use of POs. Here we use *% Input Traded* as the instrumental variable. This variable correlates with a firm's opportunity to use financial hedges but should only affect purchase obligation activity via hedging.[3]

Although the standard errors are adjusted for clustering at the firm level, we do not include firm fixed effects in these specifications as *Commodity Hedger* is mostly time invariant at the firm level. However, these regressions include time, industry, and firm controls. These results are robust to controls for tax effects (Graham and Rogers, 2002), linear and non-linear effects of leverage (Purnanandam, 2008), size (Dolde, 1993), and growth opportunities (Froot, Scharfstein, and Stein, 1993).

The control variables match expectations. Firms with a larger percentage of input traded (i.e. potential to hedge with derivatives) are more likely to use financial hedging. These results suggest that exogenous product market factors represent a significant influence on a firm's decision to use commodity derivatives. *Ln_Assets* is positively correlated with risk management. The debt variables (*Market Lev*, *Market Lev*^{2}) match the non-monotonic findings of Purnanadam (2008). Increasing inventory is a (costly) substitute to hedging input prices via futures contracts; consistent with this intuition we find a negative relation between inventory and derivatives usage. We also document a negative relation between cash and derivatives usage, supporting evidence from Haushalter, Klasa, and Maxwell (2007) and Disatnik, Duchin, Schmidt (2014) that cash is an operational hedge.

B. Evidence from a Natural Experiment

[3] Similar results occur if we add a second instrument for large firms. The two instruments pass the Hansen J test but these results are unreported due to concerns that size-related variable violate the exclusion restriction requirement.

To further explore the endogeneity concern, we exploit a natural experiment that altered the set of risk management choices. In 2008, steel future products were introduced on the London Metals Exchange in April and the Chicago Mercantile Exchange in August. Understanding the origination of the steel futures market is important to the validity of the natural experiment. If the futures were introduced in response to changing industry demand, then this would not be an exogenous shift in the risk management choice set. However, this does not appear to be the case. News coverage of the rollout described highly skeptical industry participants expressing concern of speculation. A 2007 GE Industry Research Monitor report asserts, "[M]any steel producers remain reluctant to see the development of a transparent exchange-based pricing system (which invites the bogeyman speculator into the equation), preferring instead to offer direct forward-contract pricing (with raw material surcharges in some cases) to their customers."

If purchase obligations are used to manage risk, the introduction of a new derivative product should affect their use. However, if our multivariate analysis in Table 3 simply picks up a spurious correlation, PO use would not change around the introduction of steel futures. As steel futures are relevant only for those firms with steel exposure, we identify firms with a non-trivial exposure the steel prices based on their input industries. *Steel Exposure* equals ones if the percentage of a firm's input which is steel is higher than the sample mean (1.3%) and *High Steel Exposure* equals ones if the percentage of a firm's input which is steel greater than the 90%. The *Futures Available* indicator equals one after the introduction of steel futures. The interaction of *Futures Available* and either of the steel exposure indicators captures the change in risk management behavior for firms with a steel exposure after the introduction of the new derivative. Panel A of Table 4 presents the results. Consistent with expectation, the interaction coefficient shows that the introduction of steel futures is associated with an increased likelihood of financial hedging for firms with steel exposure. Column (4) shows that this relationship holds even with the smaller sample where tax controls are available.

Relatedly, we document a decrease in the use of POs for these firms when steel futures become available. This result in presented in Panel B. Note that the average purchase obligation is multi-year and often cannot be eliminated in just one year. Therefore we examine the change in the level of purchase obligations - not an indicator of use. This decrease in operational hedging following an exogenous change to the availability of financial derivatives holds for either definition of steel exposure (*Steel*, *High Steel*) as well as with the inclusion of tax controls. Thus, the results from this natural experiment correspond with the earlier findings that purchase obligations are a risk or liquidity management tool.

The above experiment relies on the assumption of parallel trends, i.e., that firms' derivative usage was ex-ante similar and only changed as a result of the introduction of steel futures. To that effect, we graph the percentage of derivative users from 2006 to 2010 among firms who had high steel exposure and low steel exposure, respectively. We present the time-series graph in Figure 1. Firms with high steel exposure are represented by a blue line and firms with low steel exposure are represented by a red line. We note that firms with both high and low steel exposure have nearly identical levels of derivatives usage until 2008. After 2008, the firms with high steel exposure increase derivatives use at a significantly higher rate than firms with low steel exposure. The evidence from Figure 1 supports the validity of the natural experiment.

C. Placebo Tests

To further ensure that the natural experiment is not capturing spurious correlation in either the cross section or the time series, we consider two placebo tests in Table 5. First, we first identify two-digit SIC industries with no steel exposure (defined as steel comprising less than 0.01% of industry input). We next flag these firms as placebo "steel" firms and re-estimate our tests from Table 4. Table 5 Panel A presents the results including the identical control variables as those in Table 4. The introduction of steel futures does not affect either the usage of commodity derivatives usage or purchase obligations by the placebo steel firms. That is, firms do not respond to the introduction of an unrelated derivative product.

In Panel B, we consider an additional falsification test related to the timing of the introduction of steel futures. Specifically, we replace the indicator variable *Steel Futures Available,* which equals one for years after the 2008 introduction of steel futures, with *Placebo Steel Futures Available* which equals one if the year is 2006 or 2007 and zero otherwise. We again report results for both commodity derivatives and purchase obligations and find that firms with steel exposure are not changing in the pre-treatment period. Combined with our parallel trends analysis and the results from Table 4, the falsification tests in Table 5 provide additional evidence that the introduction of steel futures truly represents an exogenous shock to hedging opportunities. These results provide additional support for our hypothesis that purchase obligations and financial derivatives are substitute hedging mechanisms for firms.

III. Changing Risk Management in Distress

Thus far, we have focused on documenting that purchase obligations are a risk management tool. However, our original goal was two-fold. We are interested in both *how* firms hedge but also *when* firms hedge. Recent work finds that firms decrease or cease using derivatives as they approach distress. Rampini, Sufi, and Viswanathan (2014) note that collateral constraints limit a firm's ability to use derivatives as their financial condition worsens and Almeida, *et al*. (2014) highlights that collateral constraints affect a broad range of liquidity management tools. We hypothesize that more flexible purchase obligations will be less subject to such constraints (Costello, 2013). In fact, we expect PO use to increase if collateral constraints bind and POs substitute for financial hedging when appropriate derivatives are not available (as demonstrated with the steel futures natural experiment in Table 4). Our hypothesis that distress leads to an increased reliance on forward contracts with suppliers corresponds with evidence from the trade credit literature. Cunat (2007) and Garcia-Appendini and Monteriol-Garriga (2013) find that suppliers are liquidity providers during periods of financial constraint. Further, Harford, Klasa, and Maxwell (2014) and Acharya, Davydenko, and Strebulaev (2012) present evidence of active liquidity management near distress or refinancing uncertainty. To the extent that purchase obligations are part of the liquidity management tool set, we expect their use should increase as a firm approaches distress.

A. Increased Use of Purchase Obligations Near Distress

To explore how firms hedge as they approach distress, we examine whether firms initiate purchase obligations as their financial condition worsens. Table 6 presents summary statistics and then Tables 7, 8, and 9 provide the multivariate results. *New Contract* equals one if the firm begins reporting purchase obligations in year *t* and we examine four distress indicators. *Enters Distress* equals one if Altman's (1968) Z score is less than 1.81 and was not below that threshold in the prior year. *Enters Grey Distress* captures a less severe or earlier form of financial deterioration and equals one if Altman's (1968) Z score is less than 2.99 and was not below that threshold in the prior year. Since Petersen and Rajan (1997) point out that the value of the supplier firm consists of future cash flows from customers, suppliers may be willing to assist financially distressed but economically viable customers, but avoid more permanently distressed firms. Thus, we also use a variable for financial (but not economic) distress following Andrade and Kaplan (1998). *Enter Fin (not Econ) Distress* equals one if the firm has a positive gross margin but is in distress (as defined by Z-score less than 1.81) and, again, was not distressed by that measure in the prior year. *Enter Econ Distress* is the additive inverse and captures firms in distress according to the Z-score cutoff with a negative gross margin.

The summary statistics in Table 6 indicate that firms adjust their risk management as their financial condition deteriorates. Like Purnanandam (2008) and Rampini, Sufi, and Viswanathan (2014), we document that firms are more likely to stop financial hedging in the earlier stages or grey period of distress. We document these mildly distressed firms also are more likely to report an increase in purchase obligations. A similar pattern emerges when looking at firms entering distress or financial (not economic) distress but stopping derivatives use is no longer significant. Firms start using purchase obligations at every stage of increasing financial distress but are most likely to stop financial hedging upon entering early distress. This is consistent with the story that purchase obligations are an increasingly important risk management tool as other collateral or liquidity management options are restricted. Lastly, we examine the years when firms cease derivatives use and find they are far more likely to initiate purchase obligations during that time. Together, this provides preliminary evidence that firms increase their use of forward contracts with suppliers as they are less able to use financial hedging.

Table 7 presents the initial multivariate results. Panel A documents a positive association between entering various forms of mild distress and new purchase obligation use while Panel B examines more permanently distressed firms. Since entering distress is correlated with our existing control variables, such as leverage, we model the relationship two ways. First, we estimate a probit model and include the firm controls with a one year lag. Second, we include firm fixed effects in an OLS model, following Angrist and Pischke (2009) which recommends linear predictive models when using limited dependent variables with panel data. Both the probit and fixed effects models include year dummies to control for any intertemporal variation in the use of supply contracts and we present the analysis with and without the inclusion of tax control variables. *Enter Fin (not Econ) Distress* and *Enter Distress* both have a positive and significant impact on initiating purchase obligations. Interesting, after controlling for firm characteristics, we find that *Enter Grey Distress* has a positive but statistically insignificant coefficient. Panel B shows that suppliers do not increase POs when customers are economically distressed or when we look at all distressed firms. Petersen and Rajan (1997) would argue this population of more seriously distressed firms is less relevant to suppliers' long term cash flows and, therefore, less able to initiate long term supply contracts,, While we do not address the endogeneity of financial deterioration until Table 8, Table 7 provides initial support to the hypothesis that distress increases a firm's reliance on suppliers for risk management in the early or purely financial stages of distress.

B. An Exogenous Distress Shock

While the prior regressions control for a number of firm characteristics which may associate with risk management, firms do not randomly enter distress. Thus, there may be omitted time-varying factors that contribute to the documented relationship between distress and purchase obligations. To address this, we use the bank failure of a firm's line of credit lead arranger as an exogenous shock to financial distress. Following Chava and Purananadam (2011), which finds that shocks to a firm's bank can affect the firm's investment and profitability, we take bank failures as exogenous to the financial health of the individual firms but very relevant to their financial flexibility. First, we identify firms which have a line of credit using Perl script. We use search terms identical to those in Sufi (2009). After identifying line of credit firms, we identify their lead arrangers using DealScan. *Lead Lender Shock* equals one if the firm's lead arranger on a line of credit failed during the prior year. Bank failures are identified from FDIC data (11 bank failures during 2003-2010) and major investment bank failures during 2008 (an additional 10 failures).

In Table 8, we examine the impact the exogenous financial distress shock on the intiation of purchase obligations using both probit and firm fixed effects models. The regressions include year dummies, are adjusted for clustering at the firm level, and are presented both with and without lagged tax control variables. The failure of a firm's line of credit lead arranger consistently leads to increased use of purchase obligations. This reveals that even an exogenous shock to a firm's financial condition will lead to increase reliance on operational hedging through forward supply contracts.

C. Robustness to Trade Credit Changes

This paper is motivated, in part, by evidence in the trade credit literature that upstream firms are more flexible during buyer distress than a bank or other third-party lenders (Wilner, 2000; Burkart and Elligsen, 2004). While purchase obligations reduce input cost variability and trade credit is a liquidity channel, firms with good supplier relationships may be extended trade credit. One could imagine that captured upstream firms could increase both trade credit and purchase obligations. We explore whether the use of POs during distress is simply part of a broader trade credit story. Although trade credit is included as a control variable in all the previously multivariate analysis, we revisit the impact of distress on purchase obligations either excluding firms with high level of trade credit (above the industry-year median) or a large change in trade credit.

Table 9 presents the robustness to trade credit results. In Panel A, we exclude firms with preexisting high levels of trade credit. We document that entering both general distress as well as financial distress significantly increases the probability of becoming a purchase obligation user. Both are run with and without lagged tax control variables. In Panel B, we exclude firms with large increases in trade credit. We find again that our proxies for worsening financial conditions are significantly correlated with the probability of a firm becoming a purchase-obligation user. Overall, the evidence in Table 9 is inconsistent with an interpretation that our risk management results are spuriously correlated with trade credit flows around distress and support the hypothesis that purchase obligation contracts are a separate risk management channel.

IV. Conclusion

We show that purchase obligations – non-cancellable futures contracts written with suppliers – are a risk management tool and a substitute for financial hedging. Firms appear to use financial derivatives for risk management if they are available and then turn to purchase obligations otherwise. Specifically, we use the introduction of steel futures derivatives to demonstrate that firms with steel exposure decrease their use of purchase obligations when appropriate derivatives become available. Conversely, as collateral constraints limit the use of derivatives or other liquidity management in times of financial distress, we document an uptick in the use of purchase obligations. These results hold even when we examine an exogenous distress shock (a bank failure of the firm's lead arranger on its line of credit) and when we control for changes in trade credit.

Overall, we offer new insights into corporate risk management. Specifically, we investigate purchase obligations as a form of operational hedging which closely mirrors the structure of a forward contract. Secondly, while confirming the empirical findings that firms decrease derivatives usage around distress (e.g. Purnanandam, 2008, Rampini, Sufi, and Viswanathan, 2014), we also show that these firms do not stop hedging. Rather, they substitute another risk management tool when they cannot use financial derivatives.

References

Acemoglu, D., S. Johnson, and T. Mitton, 2009, Determinants of Vertical Integration: Financial Development and Contracting Costs, *Journal of Finance* 64, 1251-1290.

Acharya, V., H. Almeida, F. Ippolito, and A. Perez, 2014. Credit lines as monitored liquidity insurance: Theory and evidence. *Journal of Financial Economics* 112, 287-319.

Adam, T., S. Dasgupta, and S. Titman, 2007, Financial constraints, competition, and hedging in industry equilibrium, *Journal of Finance* 62, 2445-2473.

Aghion, P. and J. Tirole, 1994, The management of innovation, *Quarterly Journal of Economics* 109, 1185-1209.

Ahern, K. and Harford, J., 2014, The Importance of Industry Links in Merger Waves, *Journal of Finance* 69, 527–576.

Allayannis, G., J. Weston, 2001, The use of foreign currency derivatives and firm market value, *Review of Financial Studies* 14, 243-276.

Almeida, H., M. Campello, I. Cunha, and M. S. Weisbach, 2014, Corporate Liquidity Management: A Conceptual Framework and Survey, *Annual Review of Financial Economics* 6, 135-162.

Altman, E. I., 1968, Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance* 23, 589–609.

Andrade, G. and S. N. Kaplan, 1998, How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed, *Journal of Finance* 53, 1443–1493.

Angrist, J.D. and J. Pischke, 2009, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, Princeton, N.J.

Armour, H. and D. Teece, 1980, Vertical Integration and Technological Innovation, *Review of Economics and Statistics*, 62, 470-474.

Bessembinder, H., 1991, Forward Contracts and Firm Value: Investment Incentive and Contracting Effects, *Journal of Financial and Quantitative Analysis* 26, 519-532.

Bodnar, G., G. Hayt, R. Marston, 1998, 1998 Wharton Survey of Financial Risk Management by US Non-financial Firms, *Financial Management* 27, 70-91

Bolton, P., H. Chen, and N. Wang, 2011, A Unified Theory of Tobin's q, Corporate Investment, Financing, and Risk Management, *Journal of Finance* 66, 1545–1578.

Bonaimé, A., K. Hankins, and J. Harford, 2014, Financial Flexibility, Risk Management, and Payout Choice, *Review of Financial Studies* 27, 1074-1101.

Brown, G.W. and Toft, K. B., 2002, How Firms Should Hedge, *Review of Financial Studies* 15, 1283-1324.

Burkart, M. and T. Ellingsen, 2004, In-Kind Finance: A Theory of Trade Credit, *American Economic Review* 94, 569-590.

Campello, M., Lin, C., Ma, Y. and Zou, H., 2011, The Real and Financial Implications of Corporate Hedging, *Journal of Finance* 66, 1615–1647.

Chava, S. and A. Purananadam, 2011, The Effect of Banking Crisis on Bank-dependent Borrowers, *Journal of Financial Economics* 99, 116-136.

Coase, R., 1937, The nature of the firm, *Economica*, 4, 386-405.

Cornaggia, J., 2013, Does Risk Management Matter? Evidence from the U.S. Agricultural Industry, *Journal of Financial Economics* 109, 419-440.

Costello, A., 2013, Mitigating incentive contracts in inter-firm relationships: Evidence from long-term supply contracts, *Journal of Accounting and Economics*, 56, 19-39.

Cunat, V., 2007, Trade credit: suppliers as debt collectors and insurance providers, *Review of Financial Studie*s 20, 491-527.

DeMarzo, P. and D. Duffie, 1995, Corporate Incentives for Hedging and Hedge Accounting, *Review of Financial Studies*, 8, 743-771.

Disatnik, D., R. Duchin, and B. Schmidt, 2014, Cash Flow Hedging and Liquidity Choices, *Review of Finance* 18, 715-748.

Dolde, W., 1993, The Trajectory of Corporate Financial Risk Management, *Journal of Applied Corporate Finance* 6, 33-41.

Emm, E., G. Gay, and C. Lin, 2007, Choices and best practice in corporate risk management disclosure, *Journal of Applied Corporate Finance* 19, 82-93.

Fee, C. E., C. Hadlock, and S. Thomas, 2006, Corporate Equity Ownership and the Governance of Product Market Relationships, *Journal of Finance,* 61, 1217-1252.

Fehle, F., and S. Tsyplakov, 2005, Dynamic risk management: Theory and evidence, *Journal of Financial Economics* 78, 3-47.

Froot, K., D. Scharfstein, J. Stein, 1993, Risk management: coordinating corporate investments and financing policies, *Journal of Finance* 5, 1629-1658.

Froot, K. and J. Stein, 1998, Risk management, capital budgeting, and capital structure policy for financial institutions: An integrated approach, *Journal of Financial Economics* 47, 55-82.

Gamba, A. and A. Triantis, 2014, Corporate Risk Management: Integrating Liquidity, Hedging, and Operating Policies, *Management Science* 60, 246-264

Garcia-Appendini, E., Montoriol-Garriga, J., 2013. Firms as liquidity providers: Evidence from the 2007-2008 financial crisis. *Journal of Financial Economics* 109, 272-291.

Garfinkel, J., and K. Hankins. 2011, The Role of Risk Management in Mergers and Merger Waves, *Journal of Financial Economics* 101, 515-532.

Graham, J., 1996, Debt and the Marginal Tax Rate, *Journal of Financial Economics* 41, 41-73.

Graham, J. and D. Rogers, 2002, Do firms hedge in response to tax incentives, *Journal of Finance* 57, 815-839.

Graham, J. and C. Smith, 1999, Tax incentives to hedge, *Journal of Finance* 54, 2241-2262.

Guay, W. and S. Kothari, 2003, How much do firms hedge with derivatives?, *Journal of Financial Economics* 70, 423-461.

Hankins, K., 2011, How do financial firms manage risk? Unraveling the interaction of financial and operational hedging, *Management Science* 57, 2197-2212.

Haushalter, D., S. Klasa, and W. Maxwell, 2007, The influence of product market dynamics on the firm's cash holdings and hedging behavior, *Journal of Financial Economics* 84, 797-825.

Hirshleifer, D., 1988, Risk, Futures Pricing, and the Organization of Production in Commodity Markets, *Journal of Political Economy* 96, 1206-1220.

Jorion, P., 1991, The pricing of exchange rate risk in the stock market, *Journal of Financial and Quantitiative Analysis* 26, 363-376.

Nance, D., C. Smith Jr., and C. Smithson, 1993, On the determinants of corporate hedging, *Journal of Finance* 48, 267-284.

Opler, T. and S. Titman, 1994, Financial distress and corporate performance, *Journal of Finance* 49, 1015-1040

Pérez-Gonzalez, F. and H. Yun, 2013, Risk management and firm value: Evidence from weather derivatives, *Journal of Finance* 68, 2143-2176.

Petersen, M. and R. Rajan, 1997, Trade credit: theories and evidence, *Review of Financial Studies* 10, 661-691.

Petersen, M. and S. Thiagarajan, 2000, Risk measurement and hedging: with and without derivatives, *Financial Management*, 29, 5-30.

Purnanandam, A., 2008, Financial distress and corporate risk management: Theory and evidence, *Journal of Financial Economics* 87, 706-739.

Rampini, A., and S. Viswanathan, 2010, Collateral, Risk Management, and the Distribution of Debt Capacity, *Journal of Finance* 65, 2293–2322.

Rampini, A., A. Sufi, and S. Viswanathan, 2014, Dynamic risk management, *Journal of Financial Economics* 111, 271–296.

Rauh, J. D., 2009, Risk Shifting versus Risk Management: Investment Policy in Corporate Pension Plans, *Review of Financial Studies* 22, 2688-2733.

Scinta, C., 2006, Steel Co Execs Aren't Excited By Idea Of Steel Futures, *Dow Jones Newservice*, June 20, 2006.

Smith, C. and R. Stulz, 1985, The Determinants of Firms' Hedging Policies, *Journal of Financial and Quantitative Analysis*, 28, 391-405.

Stulz, R., 1990, Managerial discretion and financing policies, *Journal of Financial Economics* 26, 3-27.

Sufi, A., 2009, Bank lines of credit in corporate finance: an empirical analysis, *Review of Financial Studies* 22, 1057-1088.

Williamson, O., 1985, *The Economic Institutions of Capitalism*. New York Free Press.

Wilner, B., 2000. The exploitation of relationships in financial distress: the case of trade credit. *Journal of Finance* 55, 153-178.

Appendix A. Description of Data Collection

If a firm uses the text "purchase obligation" in its footnote, but reports $0 for the aggregate dollar amounts of the contracts, we code *Purchase Obligation* equal to zero. Using this definition, roughly 20.8% of all Compustat firm-year observations are for firms which have entered into purchase contracts with their suppliers. The raw data containing the dollar values of the aggregate purchase obligations have several potential problems. One problem is that in addition to columns for years *t*+1 to *t*+6, the footnote line item also includes a "Total" column; sometimes this occurs before year *t*+1 and sometimes after *t*+6. We are able to automatically remove the "Total" column through programming. A related problem exists for the data I collect on contract length. Although many firms report the dollar amount of purchase obligations for years *t*+1, *t*+2, *t*+3, *t*+4, *t*+5, *t*+6 and onward, some firms group years *t*+2 and *t*+3 together, years *t*+4 and *t*+5 together, etc. For these firms, the estimate for contract length will be systematically too short. We are unable to solve this problem programmatically, although firms are unlikely to systematically differ in reporting based on the hedging propensity. The third problem is that firms use different scales (millions, thousands, etc) when reporting footnote tables depending on firm size. We use a combination of automated and manual techniques to identify the scale a firm is using. First, we automatically search the contractual obligations footnote for common text used to report scale (e.g., "in millions", "in 000s", etc). Second, we manually examine the time-series of the amount of each firm's supplier purchase obligations and compare the scale in consecutive years to ensure consistency. Lastly, we manually examine firms which have annual purchase obligations that are higher than current year cost of goods sold to ensure that the scale is correct and adjust the scale if necessary. The resulting unique database identifies the existence of a firm's contractual purchase obligations to its suppliers as well as estimates of the lengths and amounts of these obligations.

Appendix B

List of search terms used to identify commodity derivative users

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hedge fuel
fuel hedge
fuel call option
commodity derivative
commodity contract
commodity forward
commodity future
commodity hedge
commodity hedging
commodity option
commodity swap
hedges of commodity price
uses derivative financial instruments to manage the price risk
uses financial instruments to manage the price risk
uses derivative financial instruments to manage price risk
uses derivatives to manage the price risk
uses derivatives to manage price risk
forward contracts for certain commodities
forward contracts for commodities
derivatives to mitigate commodity price risk
futures to mitigate commodity price risk
options to mitigate commodity price risk
swaps to mitigate commodity price risk
corn future
cattle future
commodity price swap

Appendix C: List of Industries with Traded Futures

111110	SOYBEANS
111120	OILSEEDS
111140	WHEAT
111150	CORN
111160	RICE
111920	COTTON
111930	SUGARCANE
111991	SUGAR BEETS
112110	CATTLE
112210	SWINE
112410	SHEEP AND WOOL
211111	CRUDE PETROLEUM AND NATURAL GAS
211112	LIQUID NATURAL GAS
212112	COAL
212113	ANTHRACITE COAL
212221	GOLD ORES
212222	SILVER ORES
212231	LEAD AND ZINC ORES
212234	COPPER AND NICKEL ORES
311222	SOYBEAN OIL
311223	OTHER OILSEED
311225	MARGARINE
311310	SUGAR
311512	CREAMERY BUTTER
311611	MEAT PRODUCTS (EXCEPT POULTRY)
311920	COFFEE AND TEA
311942	SPICES AND EXTRACTS
324110	PETROLEUM REFINERY PRODUCTS
325212	SYNTHETIC RUBBER
331312	PRIMARY ALUMINUM
331314	SECONDARY ALUMINUM
331315	ALUMINUM SHEETS
331411	PRIMARY COPPER
331419	PRIMARY METALS (EXCEPT COPPER AND ALUMINUM)

Figure 1

Parallel Trends Analysis

Figure 1 presents the time series analysis of firms using commodity derivatives. The graph is centered on the 2008 introduction of steel futures and reports the years from t-2 to t+2. The blue line plots the percentage of commodity derivative users among firms with high steel exposure and the red line plots the percentage of commodity derivative users among firms with low steel exposure.

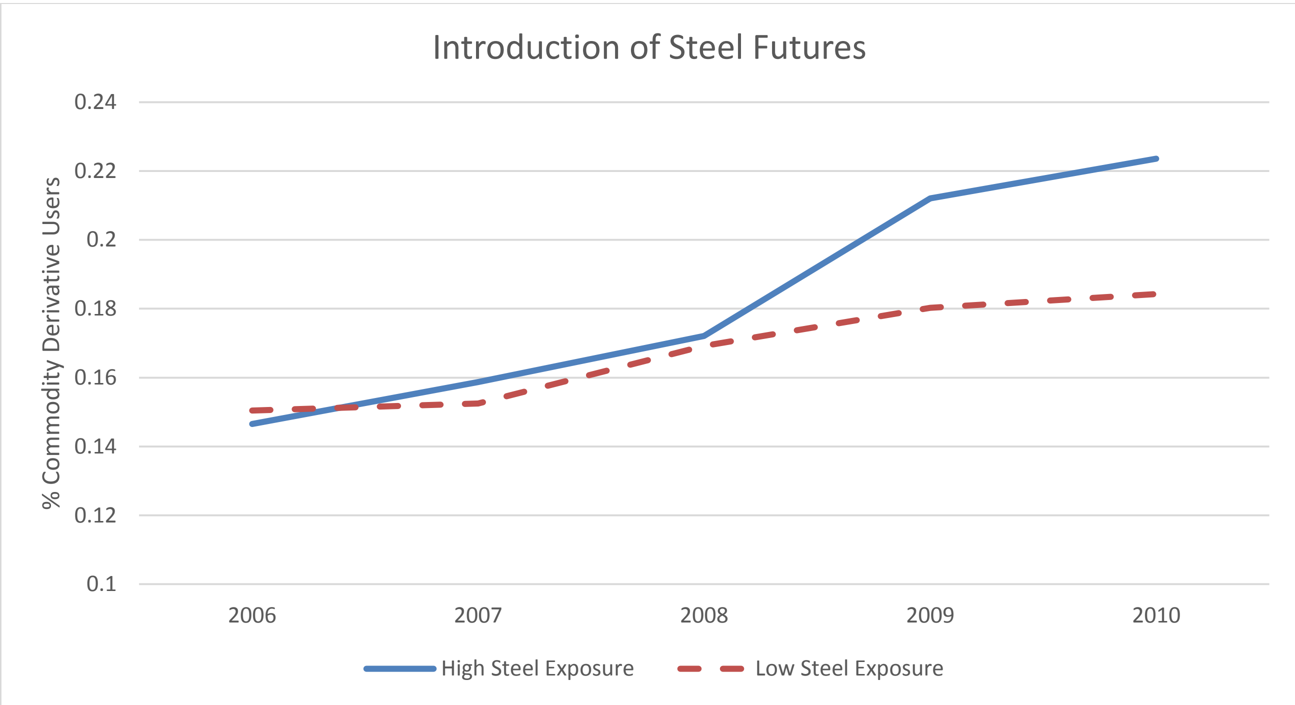

Table 1
Summary statistics

The tables presents summary statistics using all nonfinancial Compustat firms from 2003-2010. *Commodity Hedger* is equal to one if a firm reports using commodity derivatives, zero otherwise. *Purchase Obligation* is equal to one if the firm reports purchase obligations in its 10-K filing and zero otherwise. *% Input Traded* is equal to the percentage of input which is traded on an active futures exchange. *% Input Steel* is equal to the percentage of a firm's input accounted for by steel. *Ln_Assets* is the natural logarithm of the firm's book assets. *Market Lev* is the book value of debt divided by the sum of the market value of equity and the book value of debt. *Cash* is cash holdings divided by total assets and *Inventory* is total inventory divided by COGS. *Sales Growth* is equal to the sales growth between t-1 and t, and *Sales Volatility* is equal to the standard deviation of the sales/total assets ratio from t-2 to t. *Non-Debt Tax Shield* is equal to the sum of depreciation and amortization expenses divided by total assets. *Supplier R&D* is the sales weighted average of all supplier industry RD/Assets. *R&D Intensity* is the firm's own RD/Assets. *Relative Bargaining Power* is the weighted average supplier industry HHI divided by the customer industry HHI (based on two-digit NAICS codes). *Trade Credit* is AP/Total Assets. *CAPEX* is equal to capital expenditures/total assets. *Marg Tax Rate* is a firm's pre-interest marginal tax rate, from Graham (1996). *Tax Convexity* is the tax convexity measure calculated using the coefficients in Graham and Smith (1999).

Variable	Mean	Min	Median	Max	N
Commodity Hedger	0.156	0.000	0.000	1.000	29640
Purchase Obligation	0.208	0.000	0.000	1.000	29640
% of Input Traded	0.039	0.000	0.009	0.627	29640
% of Input Steel	0.014	0.000	0.001	0.169	29640
Ln_Assets	5.630	0.346	5.640	10.670	29640
Market Lev	0.211	0.000	0.124	0.954	29531
Cash	0.161	0.000	0.092	0.866	28945
Inventory	0.174	0.000	0.088	1.566	29640
Sales Growth	0.132	-1.000	0.146	1.077	29044
Sales Volatility	0.440	0.002	0.292	2.969	28945
NonDebt Tax Shields	0.044	0.000	0.034	0.252	29474
Supplier R&D	0.015	0.004	0.015	0.029	29640
R&D Intensity	0.073	0.000	0.003	1.126	29640
Relative Bargaining Power	1.676	0.102	1.670	9.548	29640
Trade Credit	0.108	0.001	0.056	1.048	29579
CAPEX	0.049	0.000	0.028	0.355	29092
Marg Tax Rate	0.256	0.000	0.349	0.395	13684
Tax Convexity	0.633	-0.012	0.009	27.901	28310

Table 2

Summary statistics - By contract status

The tables presents summary statistics using all nonfinancial Compustat firms from 2003-2010. *Commodity Hedger* is equal to one if a firm reports using commodity derivatives, zero otherwise. *Purchase Obligation* is equal to one if the firm reports purchase obligations in its 10-K filing and zero otherwise. *% Input Traded* is equal to the percentage of input which is traded on an active futures exchange. *% Input Steel* is equal to the percentage of a firm's input accounted for by steel. *Ln_Assets* is the natural logarithm of the firm's book assets. *Market Lev* is the book value of debt divided by the sum of the market value of equity and the book value of debt. *Cash* is cash holdings divided by total assets and *Inventory* is total inventory divided by COGS. *Sales Growth* is equal to the sales growth between t-1 and t, and *Sales Volatility* is equal to the standard deviation of the sales/total assets ratio from t-2 to t. *Non-Debt Tax Shield* is equal to the sum of depreciation and amortization expenses divided by total assets. *Supplier R&D* is the sales weighted average of all supplier industry RD/Assets. *R&D Intensity* is the firm's own RD/Assets. *Trade Credit* is AP/Total Assets. *Relative Bargaining Power* is the weighted average supplier industry HHI divided by the customer industry HHI. *CAPEX* is equal to capital expenditures/total assets. *Marg Tax Rate* is a firm's pre-interest marginal tax rate, from Graham (1996). *Tax Convexity* is the tax convexity measure calculated using the coefficients in Graham and Smith (1999).

Variable	Commodity Hedger only	Purchase Obligation only	Both	Neither
Commodity Hedger	1.000	0.000	1.000	0.000
Purchase Obligation	0.000	1.000	1.000	0.000
% of Input Traded	0.090	0.030	0.089	0.029
% of Input Steel	0.014	0.016	0.021	0.012
Ln_Assets	6.861	6.246	8.002	5.124
Market Lev	0.314	0.181	0.285	0.196
Cash	0.084	0.163	0.075	0.179
Inventory	0.126	0.204	0.163	0.175
Sales Growth	0.171	0.131	0.142	0.125
Sales Volatility	0.391	0.415	0.337	0.460
NonDebt Tax Shields	0.051	0.043	0.044	0.043
Supplier R&D	1.349	1.633	1.588	1.538
R&D Intensity	0.020	0.066	0.015	0.093
Relative Bargaining Power	1.640	1.724	1.782	1.664
Trade Credit	0.098	0.081	0.081	0.118
CAPEX	0.085	0.046	0.062	0.042
Marg Tax Rate	0.281	0.277	0.313	0.239
Tax Convexity	0.390	0.195	0.037	0.824
Max N (sum = 29,640)	3504	5024	1131	19981

Table 3
Substitution of purchase obligations and financial hedging

This table presents the marginal effects from probit and instrumental variable probit regressions using nonfinancial Compustat firms from 2003-2010. The dependent variable in all specifications equals one if a firm uses commodity derivatives and zero otherwise. *Purchase Obligation* is equal to one if the firm reports purchase obligations in its 10-K filing and zero otherwise (*PO User*). Other variables are as described in Table 2. *t*-Statistics are presented in parenthesis and are calculated from robust standard errors clustered by firm. All models include year indicator variables.

	Financial Hedging				Purchase Obligation		
	Probit	Probit	IV Probit	IV Probit	Probit	IV Probit	IV Probit
PO User	-0.093**	-0.044	-1.464***	-1.274**			
	(-2.346)	(-1.084)	(-3.598)	(-2.502)			
Derivative User					-0.092*	-0.578***	-0.746***
					(-1.910)	(-2.666)	(-2.776)
% Input Traded	3.296***	3.146***	2.542***	2.536***			
	(15.821)	(14.637)	(5.484)	(4.508)			
Size	0.198***	0.161***	0.211***	0.260***	0.163***	0.182***	0.198***
	(20.483)	(15.254)	(19.798)	(15.401)	(16.458)	(14.903)	(11.183)
Leverage		1.444***	1.037***	1.229***	-0.526**	-0.310	-0.325
		(6.920)	(3.472)	(2.725)	(-2.518)	(-1.362)	(-1.007)
Lev. Squared		-1.340***	-1.094***	-1.491***	0.166	-0.024	-0.134
		(-5.528)	(-3.823)	(-3.319)	(0.646)	(-0.091)	(-0.358)
Cash		-0.803***	-0.665***	-0.341	0.031	-0.011	0.021
		(-5.452)	(-3.926)	(-1.365)	(0.302)	(-0.109)	(0.124)
Inventory		-0.400***	-0.277**	-0.115	0.148**	0.113*	0.197*
		(-4.718)	(-2.357)	(-0.689)	(2.221)	(1.677)	(1.899)
Sales Growth		0.541***	0.422***	0.244***	-0.007	0.040	0.016
		(9.482)	(5.419)	(3.013)	(-0.141)	(0.776)	(0.247)
Sales Volatility		-0.028	-0.001	-0.091	0.057*	0.053*	0.034
		(-0.698)	(-0.032)	(-1.405)	(1.927)	(1.798)	(0.719)
R&D		-0.810***	-0.612**	-2.295***	-0.044	-0.045	-0.390*
		(-3.194)	(-2.396)	(-3.008)	(-0.348)	(-0.361)	(-1.722)
Trade Credit		0.334***	0.107	0.927***	-0.351***	-0.331***	-0.029
		(2.771)	(0.865)	(3.005)	(-2.948)	(-2.815)	(-0.104)
Supplier R&D					0.176***	0.162***	0.153***
					(5.780)	(5.217)	(3.477)
Contract Index					0.037	0.036	0.007
					(1.562)	(1.544)	(0.209)
Rel Barg Power					0.045*	0.039	0.117***
					(1.882)	(1.630)	(3.381)
Non-debt Tax Shields				4.464***			2.232***
				(5.474)			(2.971)
Marg Tax Rate				-0.225			0.038
				(-1.206)			(0.225)
Tax Convexity				0.013			-0.009
				(1.114)			(-0.733)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	29,640	28,308	25,834	12,938	25,834	25,834	12,938
Adjusted R2	0.140	0.181			0.064		

Table 4
Natural experiment: Introduction of steel futures

The table presents multivariate regression estimates using nonfinancial Compustat firms from 2003-2010. Panel A presents the marginal effects from a probit model predicting financial hedging. Panel B presents least squares estimates from a model predicting the change in purchase obligation use from t-1 to t. *Futures Available* is an indicator equal to one if the year is after 2008, zero otherwise. *Steel Exposure* is equal to one if steel is greater than the sample mean steel exposure, zero otherwise. *High Steel Exposure* is equal to one if steel is greater than the 90^{th} % for steel exposure, zero otherwise. The interaction term captures the change in risk management by firms with a steel exposure after the introduction of steel futures. Other variables are as described in Table 2. *t*-Statistics are presented in parenthesis and are calculated from robust standard errors clustered by firm. All models include year indicator variables.

	Panel A: Financial Hedging			
Steel Futures Available (post-2008)	0.020	-0.045	0.041	-0.011
	(0.643)	(-0.881)	(1.325)	(-0.216)
Steel Exposure	0.093*	0.018		
	(1.728)	(0.252)		
High Steel Exposure			0.165**	0.070
			(2.545)	(0.854)
Futures Available*Steel Exposure	0.179***	0.269***		
	(3.027)	(3.386)		
Futures Available*High Steel Exposure			0.126*	0.193**
			(1.734)	(2.099)
% Input Traded (non-steel)	3.178***	3.325***	3.180***	3.335***
	(14.230)	(10.868)	(14.228)	(10.882)
Size	0.159***	0.229***	0.159***	0.230***
	(15.120)	(13.905)	(15.075)	(13.892)
Leverage	1.458***	1.744***	1.450***	1.742***
	(6.974)	(5.426)	(6.942)	(5.436)
Leverage Squared	-1.332***	-1.873***	-1.336***	-1.881***
	(-5.492)	(-5.009)	(-5.512)	(-5.031)
Cash	-0.796***	-0.423	-0.792***	-0.421
	(-5.378)	(-1.556)	(-5.355)	(-1.552)
Inventory	-0.450***	-0.309**	-0.431***	-0.299**
	(-5.172)	(-2.067)	(-4.959)	(-1.997)
Sales Growth	0.459***	0.278***	0.471***	0.288***
	(9.803)	(4.234)	(10.009)	(4.375)
Sales Volatility	-0.022	-0.118*	-0.022	-0.115*
	(-0.548)	(-1.694)	(-0.546)	(-1.654)
R&D	-0.803***	-3.064***	-0.793***	-3.022***
	(-3.142)	(-3.700)	(-3.126)	(-3.681)
Trade Credit	0.326***	0.945***	0.320***	0.922***
	(2.692)	(3.103)	(2.643)	(3.024)
Non-debt Tax Shields		4.537***		4.544***
		(5.571)		(5.589)
Marginal Tax Rate		-0.383*		-0.390*
		(-1.917)		(-1.955)
Tax Convexity		0.023*		0.024*
		(1.905)		(1.933)
Year Dummies	Yes	Yes	Yes	Yes
# Obs	28,308	13,174	28,308	13,174
Adjusted R2	0.181	0.226	0.182	0.225

Table 4 (continued)

	Panel B: Change in Purchase Obligations			
Steel Futures Available (post-2008)	-0.072	-1.456	-0.210	-1.826
	(-0.071)	(-0.796)	(-0.214)	(-1.025)
Steel Exposure	2.388	3.186		
	(1.614)	(1.421)		
High Steel Exposure			3.082	3.382
			(1.328)	(1.051)
Futures Available*Steel Exposure	-3.281**	-4.281**		
	(-2.233)	(-1.985)		
Futures Available*High Steel Exposure			-4.682**	-5.075*
			(-2.124)	(-1.692)
Size	0.987***	1.294***	0.975***	1.284***
	(5.321)	(3.941)	(5.232)	(3.906)
Leverage	-2.604	-0.936	-2.683	-1.227
	(-0.554)	(-0.111)	(-0.571)	(-0.145)
Leverage Squared	2.005	0.134	1.932	0.225
	(0.371)	(0.015)	(0.357)	(0.026)
Cash	1.711	4.131	1.708	4.042
	(0.856)	(0.826)	(0.856)	(0.809)
Inventory	0.903	3.714	1.141	4.010
	(0.626)	(1.187)	(0.796)	(1.278)
Sales Growth	-1.257	-0.483	-1.279	-0.514
	(-0.768)	(-0.201)	(-0.791)	(-0.216)
Sales Volatility	0.535	1.400	0.515	1.352
	(0.882)	(0.935)	(0.837)	(0.894)
R&D	0.871	1.873	0.810	1.681
	(0.776)	(0.587)	(0.708)	(0.523)
Supplier R&D	1.155*	0.969	1.210*	1.136
	(1.796)	(0.884)	(1.752)	(0.977)
Trade Credit	1.034	3.178	0.905	3.015
	(0.749)	(0.635)	(0.650)	(0.602)
Contracting Index	0.764**	0.856	0.752**	0.849
	(1.983)	(1.396)	(2.000)	(1.407)
Rel Barg Power	-0.324	-0.327	-0.317	-0.327
	(-1.156)	(-0.796)	(-1.096)	(-0.779)
Non-debt Tax Shields		-5.256		-4.765
		(-0.493)		(-0.449)
Marginal Tax Rate		-3.065		-3.142
		(-0.709)		(-0.728)
Tax Convexity		-0.015		-0.015
		(-0.205)		(-0.203)
Year Dummies	Yes	Yes	Yes	Yes
# Obs	25,834	12,938	25,834	12,938
Adjusted R2	0.003	0.002	0.003	0.002

Table 5

Placebo Test: Placebo Steel Firms and Placebo Shock

The table presents placebo tests based on the Steel shock in Table 4. For Panel A, we identify industries with no steel exposure (2-digit SIC codes 8, 9, 21, 31, 59, 81) and examine the reaction of firms in these industries (labeled 'Placebo Steel Exposure') to the introduction of steel futures. For Panel B, we run the same experiment as that in Table 4 but the test uses the two years subsequent to the introduction of steel futures as the shock years (2006, 2007), labeled 'Placebo Futures Available'. Table firm control variables are included in the regressions but omitted in the table for brevity. We report pseudo-R2 for the probit estimates and Adjusted R2 for OLS estimates. All models include year indicator variables.

Panel A: Placebo Firms

	Probit	OLS
	Financial Hedging	*Change in PO*
Steel Futures Available (post- 2008)	0.07	-2.526
	(-1.637)	(-1.419)
Placebo Steel Exposure	-0.517**	0.579
	(-2.012)	(-0.190)
Placebo Exposure* Futures Avail.	-0.479	0.101
	(-0.751)	(-0.040)
Year Dummies	Yes	Yes
Firm Control Variables	Yes	Yes
# Obs	13,174	12,938
R2	0.226	0.002

Panel B: Placebo Years

	Probit	OLS
	Financial Hedging	*Change in PO*
Placebo Futures Available (2006-2007)	-0.058	1.869
	(-1.198)	(1.066)
Steel Exposure	0.101	2.756
	(1.492)	(1.483)
Steel Exposure * Placebo Availability	-0.054	-2.401
	(-0.840)	(-0.940)
Year Dummies	Yes	Yes
Firm Control Variables	Yes	Yes
# Obs	13,174	12,938
R2	0.225	0.002

Table 6
Changing risk management decisions

This table presents summary statistics on changes in risk management as the firm financial condition deteriorates. For each type of firm event, such as entering distress, a t-test compares firm quarters with this event to all other observations. *Entering 'Grey' Distress* equals one for a firm-year observation when the Altman Z score drops below 2.99. *Entering Distress* equals one when the Altman Z score drops below 1.81. *Entering Fin (not Econ) Distress* equals one when the firm enters distress but has a positive gross margin. *Stop Derivatives Use* equals one when firms cease to use commodity hedging. *New Contract* equals one when the firm starts to report purchase obligations.

	Firm Event			No Event				
	Obs	Mean	Std Err	Obs	Mean	Std Err	Diff	P Value
Entering 'Grey' Distress								
Stop Derivatives Use	711	0.028	0.006	28,929	0.017	0.001	0.011	0.017**
New Contract	711	0.046	0.008	28,929	0.034	0.001	0.012	0.039**
Enter Fin (not Econ) Distress								
Stop Derivatives Use	906	0.021	0.005	28,734	0.018	0.001	0.003	0.225
New Contract	906	0.047	0.007	28,734	0.034	0.001	0.013	0.015**
Enter Distress								
Stop Derivatives Use	1,114	0.022	0.004	28,526	0.018	0.001	0.004	0.162
New Contract	1,114	0.043	0.006	28,526	0.034	0.001	0.009	0.054*
Stop Derivatives Use								
New Contract	525	0.059	0.010	29,115	0.034	0.001	0.025	0.001***

Table 7
Distress

The table presents probit and OLS with firm fixed effect regressions results using nonfinancial Compustat firms from 2003-2010. The marginal effects are reported for the probit models. *New Contract* is equal to one if a firm begins reporting a purchase obligation in t, zero otherwise. *Entering 'Grey' Distress* equals one for a firm-year observation when the Altman Z score drops below 2.99. *Entering Distress* equals one when the Altman Z score drops below 1.81. *Entering Fin (not Econ) Distress* equals one when the firm enters distress but has a positive gross margin. *Distress* equals one for firm year observations with an Altman Z score less than 1.81. *Entering Econ Distress* equals one when the firm enters distress and has a negative gross margin. Firm control variables are the same as Table 3 but lagged one year. *t*-Statistics are presented in parenthesis and are calculated from robust standard errors clustered by firm. All models include year indicator variables.

Panel A: New Contract

	Probit				OLS, FE			
Enter Grey	0.055				0.003			
	(0.635)				(0.333)			
Enter Fin Distress		0.183**				0.022***		
		(2.368)				(2.581)		
Enter Distress			0.125*	0.218*			0.016**	0.033**
			(1.717)	(1.833)			(1.998)	(2.413)
Firm Controls $_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Tax Controls $_{t-1}$	No	No	No	Yes	No	No	No	Yes
# Obs	21,841	21,841	21,841	10,431	21,841	21,841	21,841	10,431
Adjusted R2	0.054	0.055	0.055	0.070	-0.293	-0.292	-0.292	-0.271

Panel B: New Contract

	Probit			OLS, FE		
Distress	-0.065			0.003		
	(-1.287)			(0.513)		
Enter Econ Distress		-0.262	0.244		-0.015	0.029
		(-1.264)	(0.740)		(-0.817)	(0.698)
Firm Controls $_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	Yes	Yes	Yes
Tax Controls $_{t-1}$	No	No	Yes	No	No	Yes
# Obs	21,841	21,841	10,431	21,841	21,841	10,431
Adjusted R2	0.055	0.055	0.070	-0.293	-0.293	-0.272

Table 8
Distress - An exogenous shock

The table presents probit and OLS with firm fixed effect regressions results using nonfinancial Compustat firms from 2003-2010. The marginal effects are reported for the probit models. *New Contract* is equal to one if a firm begins reporting a purchase obligation in t, zero otherwise. *Lead Lender Shock* equals one if the lead arranger on the firm's line of credit failed in the prior year, zero otherwise. Firm control variables are the same as Table 3 but lagged one year. *t*-Statistics are presented in parenthesis and are calculated from robust standard errors clustered by firm. All models include year indicator variables.

	New Contract			
	Probit		OLS, FE	
Lead Lender Shock	0.379*	0.478*	0.088**	0.098**
	(1.650)	(1.687)	(2.471)	(2.077)
Firm Control $_{t-1}$	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes
Tax Controls $_{t-1}$	No	Yes	No	Yes
# Obs	21,841	10,431	21,841	10,431
Adjusted R2	0.055	0.070	-0.292	-0.271

Table 9
Distress – The role of trade credit

This table presents the marginal effects from probit regressions using nonfinancial Compustat firms from 2003-2010. Panel A excludes firms with a high prior trade credit relationship where *Trade Credit* is AP/Total Assets and *High Trade Credit* is equal to one if the *Trade Credit* is higher than the industry-year median. Panel B excludes firms with a large change in trade credit. *High Δ Trade Credit* is equal to one if the change in *Trade Credit* is higher than the median change. *Entering Distress* equals one when the Altman Z score drops below 1.81. *Entering Fin (not Econ) Distress* equals one when the firm enters distress but has a positive gross margin. Other variables are the same as Table 3 but are lagged one year. *t*-Statistics are presented in parenthesis and are calculated from robust standard errors clustered by firm. All models include year indicator variables.

	Panel A: New Contract			
	Exclude High Trade Credit $_{t-1}$			
Enter Fin (not Econ) Distress	0.379***		0.335**	
	(3.734)		(2.120)	
Enter Distress		0.287***		0.322**
		(3.015)		(2.132)
Firm Control$_{t-1}$	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Tax Controls $_{t-1}$	No	No	Yes	Yes
# Obs	11,144	11,144	5,371	5,371
Adjusted R2	0.047	0.046	0.063	0.063

	Panel B: New Contract			
	Exclude High Δ Trade Credit $_{t-1}$			
Enter Fin (not Econ) Distress	0.225**		0.491***	
	(2.039)		(3.155)	
Enter Distress		0.184*		0.515***
		(1.764)		(3.511)
Firm Control $_{t-1}$	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Tax Controls $_{t-1}$	No	No	Yes	Yes
# Obs	10,914	10,914	5,263	5,263
Adjusted R2	0.066	0.066	0.086	0.087