Do Firms Hedge During Distress?

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Collateral constraints can restrict financial hedging as firms approach distress. By expanding the definition of hedging to include purchase obligations (POs), non-cancelable forward contracts with suppliers, we present novel evidence that distressed firms do not cease risk management but rather initiate alternative hedging activity. This contributes to the growing evidence contradicting theories of risk-shifting near distress. Moreover, hedging with purchase obligations enables higher investment levels and lower credit spreads compared to hedging with derivatives.

We thank Asaf Bernstein, Matt Billett, Scott Cederburg, Yingmei Cheng, Shan Ge, Erik Gilje, Huseyin Gulen, Jayant Kale, Gaurav Kankanhalli, Omesh Kini, Sandy Klasa, Katie Moon, Amiyatosh Purnanandam, Adriano Rampini, Jérôme Taillard, Dmitriy Muravyev, participants at the Cavalcade Conference, ITAM Conference, Toronto Rotman Risk Management and Financial Innovation Conference, FSU SunTrust Conference, RCFS Bahamas Conference, and seminar participants at ESCP-Paris, the Stockholm School of Economics, University of Arizona, Université Lille, University of Colorado at Boulder, University of Missouri, University of Nebraska, University of Nevada at Las Vegas, Southern Methodist University, Florida International University, Cal Poly, and the University of South Florida. We also gratefully acknowledge financial support from the National Center for the Middle Market at The Ohio State University, and the Eller Research Grant program from the University of Arizona.

Do risk management decisions depend on a firm's financial condition and do these hedging choices affect investment? Expected distress costs theoretically increase the value of risk management (Smith and Stulz, 1985; Rauh, 2009), so firms should have stronger incentives to hedge when closer to financial distress. Yet, in practice, financial constraints can affect a firm's ability to hedge in a variety of ways. Prior work highlights that derivatives require collateral, lines of credit often have debt covenants, and cash carries a liquidity premium (Acharya *et al.*, 2014; Rampini, Sufi, and Viswanathan, 2014). Thus, risk management options may be limited precisely when a firm's hedging need is largest and recent empirical evidence documents that firms stop using financial derivatives as they become constrained (Rampini, *et al.*, 2014) or are in extreme distress (Purnanandam, 2008). Using a unique hand-collected panel of forward contracts with suppliers, this paper revisits whether firms cease hedging as their financial condition worsens and evaluates whether risk management affects a firm's ability to invest during times of distress.

Purchase obligations - non-cancelable supply contracts - are a widely used hedging tool (Almeida, Hankins, and Williams, 2017) but often ignored in the academic literature[1]. By expanding the definition of hedging beyond financial derivatives to include these forward contracts, we document that firms do not stop hedging as they approach distress. Rather, firms initiate purchase obligations (forward contracts) when collateral constraints may preclude the use of futures and the shift to this alternative hedging tool varies with the expected cost of distress, consistent with Smith and Stulz (1985). While purchase obligations are bilateral contracts, there is no evidence that these contracts are initiated by the firm's suppliers. Moreover, we show that PO usage enables firms to maintain higher investment levels in distress, consistent with the theoretical

[1] Moon and Phillips (2021) is a notable exception which explores the use of purchase obligations in outsourcing. The paper documents a negative association between the use of POs and leverage but does not examine how changes in financial condition affect supply contracts.

predictions in Bessembinder (1991) and Froot, Scharfstein, and Stein (1993). Hedging with purchase obligations also reduces credit spreads during distress relative to derivatives hedging, consistent with hedging improving access to credit (Campello et al., 2011) but also providing unique evidence on the cost of futures contracts for constrained firms.

Why are PO contracts available when alternative risk management options, such as derivatives, are not? The trade credit literature finds that suppliers are better positioned than financial institutions to provide liquidity during downturns (e.g., Wilner, 2000; Garcia-Appendini and Montoriol-Garriga, 2013). Even if distressed firms are barred from traditional derivative markets due to collateral constraints, their suppliers still may be willing to write forward contracts. Suppliers have an additional incentive to assist customers during temporary negative shocks because the supplier's value is a function of customers' future cash flows (Petersen and Rajan, 1997; Yang, Birge, and Parker, 2015). If the customer is likely to continue its operations, the expected value of its long-term cash flows to the supplier may offset any temporary increased risk associated with financial distress. 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 relatively shorter horizons (generally 1-3 years). This flexibility makes POs advantageous during distress.

Following up on these arguments, we build a simple theoretical framework to understand the choice between derivatives and POs when firms face collateral constraints. The model captures the flexibility associated with PO contracts by assuming that firms can pledge more future income to suppliers than to financial institutions. This additional source of pledgeability creates an advantage for POs relative to a derivatives contract when a firm's financial position is weaker. In particular, we study how a firms' existing hedging strategy affects the ability to invest when its financial position weakens. POs can be collateralized using the additional pledgeable income that the supplier can extract from the firm, allowing the PO-reliant firm to increase investment in bad states of the world relative to a firm relying on futures. Nevertheless, POs do not always dominate futures as firms are likely to pay a premium to hedge using POs depending on the terms that they can negotiate with their suppliers. (A key difference between forwards and futures is that forwards are negotiated.) If this premium is large enough, firms will choose to hedge using futures despite pledgeability constraints. In addition, stronger financial health reduces the underinvestment cost of hedging with futures. Thus, the model illustrates how POs enable both hedging and investment for constrained firms yet are a second best option relative to derivatives for financially healthier firms. Further, it highlights how the cost of underinvestment magnifies the preference for hedging with purchase obligations.

Our empirical results confirm that firms initiate purchase obligations and cease using financial derivatives as their financial condition worsens. We start with two distinct proxies for financial distress: one derived from Altman (1968) Z scores and a second one from Bharath and Shumway (2008). We also consider the impact of a likely exogenous shock to financial constraints. Building on Sufi (2009), which highlights the importance of lines of credit for financial flexibility, we use the failure of a firm's line of credit lead arranger as a shock to a firm's financial condition. Firms experiencing each of these discrete events are more likely to initiate new purchase obligations. This conclusion is consistent with evidence from the trade credit literature on the importance of suppliers to firms in distress (Cunat, 2007).

Our model also highlights conditions where hedging becomes more important as a firm's financial condition worsens. As in Smith and Stulz (1985), the value of hedging increases when expected costs of financial distress are high. Thus, theory predicts that the hedging decision should vary accordingly. We explore this implication empirically with three proxies for the expected cost of distress derived from growth opportunities (Opler and Titman, 1994), aggregate risk (Acharya, et al., 2014), and industry concentration (Purnanandam, 2008). Such firms are significantly more likely to initiate PO contracts as their financial condition worsens.

To augment the evidence on the role of expected distress costs, we also consider an exogenous shock to investment payoffs and thus the cost of underinvestment. We examine state-level tax cuts (Asker, Farre Mensa, and Ljungqvist, 2015) and document that firms initiate purchase obligations in response to tax cuts. Importantly, this result is driven by financially weaker firms. If the purchase obligations were simply due to increased investment following the tax cut and not hedging, the response wouldn't be limited to this subset of firms. These results support the implication that constrained firms favor PO usage as a hedge in a manner that varies with the expected cost of distress.

One might even wonder if distressed firms should hedge at all. The seminal Jensen and Meckling (1976) argues that, all else equal, shareholders in a levered firm should prefer to increase risk. However, more recent work questions whether the relationship is that straightforward. Theoretical models in Morellec and Smith (2007), Purnanandam (2008), and Chod (2017) illustrate continued incentives to hedge in the presence of risky debt. Empirically, the literature has documented both precautionary corporate behavior near distress (Rauh, 2009; Acharya, Davydenko, and Strebulaev, 2012; Gilje, 2016) as well as the specific use of financial derivatives by highly levered firms (Gilje and Taillard, 2017) and firms nearing financial distress (Giambona and Wang, 2020). Thus, it is not obvious that risk-shifting incentives dominate. Most closely related to this paper, Purnanandam (2008) explains how financially distressed firms have an incentive to hedge but that it dissipates with extreme leverage or insolvency. Likewise, this paper examines the risk management decisions of financially distressed firms but not cases of severe economic distress. Our proxies for distress – by design – capture modestly, not extremely, distressed firms.[2]

Another concern is whether the purchase obligation is initiated by the supplier. The trade credit literature illustrates how market power and hold-up concerns affect supplier-customer contracting (Dass, et. al, 2015; Fabbri and Klapper, 2016). If financial distress exacerbates suppliers' concern with relationship-specific investments or shifts the relative negotiating power, it could be possible that supplier demand - not corporate hedging - explains the change in PO use near distress. The supplier demand channel predicts that PO initiations by distressed firms should vary with supplier power. Exploiting this insight, we provide evidence suggesting that our results are not driven by supplier demand.

Next, we study the effect of purchase obligations on investment during times of distress by comparing the investment behavior of firms hedging with POs exclusively relative to firms using commodity derivatives.[3] Although a firm's hedging decision is endogenous, limiting the sample to active hedgers and making derivative users the control group minimizes the potential bias. Both the treated and control groups actively manage input cost volatility and the control group firms are larger and financially stronger on average. Consistent with POs relaxing a collateral constraint, firms with purchase obligations maintain higher investment levels than those using derivatives when experiencing distress. Moreover, PO firms maintain higher investment relative to derivative users following an exogenous shock to financial constraints - the failure of a firm's line of credit

[2] Recognizing variation in the degree of distress is not limited to the hedging literature (Petersen and Rajan, 1997; Andrade and Kaplan, 2002; Phillips and Sertsios, 2013).
[3] Our results are robust to shifting firms which use both forwards and futures from the control to the treated category. Those results are presented in Appendix C3.

lead arranger. This extends Howell (2020) which finds that the availability of alternative hedging options has real effects for more constrained asphalt-paving firms.

While there is no perfect identification strategy to completely rule out the hypothesis that latent variables explain both PO usage (even relative to futures) and investment upon distress, we present additional tests which lend support to a causal interpretation. Since purchase obligations may be used to mitigate hold-up issues rather than for hedging, we identify situations in which POs are unlikely to be a hedge. First, as POs are bilateral contracts between customers and suppliers, they are less likely to be effective hedges in the presence of higher settlement risk (Vuillemey, 2020). Second, we examine the introduction of steel futures. For firms with exposure to steel, the use of POs for hedging drops dramatically when futures become available. The remaining POs are associated with higher relationship specific investment, suggesting those contracts are due to contracting, not hedging (Almeida, et al., 2017). Empirically, we document that POs have no effect on investment upon distress when POs are unlikely to be hedging tools (higher settlement risk or exchange-traded future available). Only when POs are expected to be a hedge do they affect investment for distressed firms.

Further analysis explores alternative channels. One concern is that purchase obligations might be a forward-looking indication of growth prospects and therefore future investment. The paper presents a battery of robustness checks to address this. With each approach, PO hedgers maintain higher investment relative to derivative hedgers as their financial condition worsens. Additionally, we confirm that changes in trade credit financing don’t explain our results.

Our final test examines the impact of hedging choice on credit spreads. After confirming that hedging reduces spreads for distressed firms, we present unique evidence that distressed firms using purchase obligations often have lower credit spreads than those hedging with derivatives.

This evidence corresponds both with the hypothesis that purchase obligations can be a valuable hedging tool as well as relax funding constraints relative to futures.

We therefore uncover novel evidence which both supports the Froot *et al.* (1993) prediction that hedging may alleviate underinvestment during distress and extends the literature on the value of risk management (Perez-Gonzalez and Yun, 2013; Gilje and Taillard, 2017). The goal of this paper is distinct from Almeida, et al. (2017), which documented the hedging benefits of supply contracts and provided cross-sectional evidence that collateral constraints affect the use of derivatives - lending support to Rampini and Viswanathan (2010). This paper focuses exclusively on the risk management decisions of financially distressed firms. We present the first evidence that distressed firms initiate new hedging contracts as well as document that the choice between forwards and futures affects both investment and credit spreads. In highlighting the importance of purchase obligations to distressed firms, our paper contributes to the literatures on the impact of financial distress (Opler and Titman, 1994; Andrade and Kaplan, 2002), the interaction between the industry dynamics and corporate hedging (Adam, Dasgupta, and Titman, 2007; Garfinkel and Hankins, 2011), and how constrained firms manage risk (Petersen and Rajan, 1997, Rampini and Viswanathan, 2010). Further, the results extend recent industry-specific studies which find no evidence of risk shifting by distressed firms (Rauh, 2009; Gilje, 2016; Doshi, Kumar, and Yerramilli, 2018; Giambona and Wang, 2020) by documenting sustained investment by a broad sample of non-financial firms experiencing distress.

1. Theory of Risk Management Alternatives and Effects on Investment

We develop a simple theoretical framework to understand the determinants of a firm's choice between hedging through purchase obligations or futures contracts, focusing on the role of financial health. We also examine the model's implications for investment conditional on financial distress. Appendix A presents this model.

The firm can use POs or futures to manage its exposure to positions such as variation in input prices (e.g., hedgeable shocks) in the model. In addition, the firm is exposed to a shock that cannot be hedged with futures or POs (non-hedgeable shock). The modeling of this shock follows Holmstrom and Tirole (1998). The firm either holds cash or uses a bank credit line to manage this liquidity shock. It also can use cash to manage the hedgeable exposure, but this strategy will typically be inefficient if futures are available because cash consumes more pledgeable income (collateral) than futures.

The firm's hedging policy is potentially affected by collateral constraints as in Rampini and Viswanathan (2010). Following Holmstrom and Tirole, the collateral constraint is a quantity constraint on the firm's pledgeable income. Limited pledgeable income creates a motivation for hedging, as a negative shock to cash flow arising from the hedgeable position may cause inefficient liquidation of the firm's investment. In addition, limited pledgeability affects the firm's choice of which tool it uses for hedging. The futures position requires the firm to post collateral initially (at the time the position is opened), whereas the PO (forward) contract can be settled *ex-post*.[4] Because of this wedge, hedging through POs can increase the firm's pledgeable income and relaxes financial constraints. However, unlike exchange traded derivatives, POs are the product of a bargaining game between customers and suppliers. Some firms will have more or less ability to

[4] The *ex-post* settlement of purchase obligations can arise from the supplier's greater ability to extract pledgeable income from the buyer. In the model, we capture this situation by assuming that the firm can pledge more income to the counterparty of the forward contract (e.g., the supplier) than to other external financiers. The trade credit literature relies on a similar rationale to motivate the positive response of trade credit to negative financial shocks (Petersen and Rajan, 1997; Cunat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013).

negotiate favorable terms with their suppliers and this may affect the cost of using POs. We capture this situation by assuming that the firm must pay a premium to hedge using POs.[5]

One of our goals is to examine the model's implication for investment conditional on financial distress. In particular, we study how the firms' existing hedging strategy affects the ability to invest when its financial position weakens. To do so, we depart from Almeida, et al. (2017) by assuming that the firm can choose the fraction of the required future investment that it decides to finance in the bad state of the world. The "bad state" in the model is the one in which both the non-hedgeable and the hedgeable shock materialize, requiring the firm to use its liquidity and hedging positions to help finance the required investment. While the firm would like to finance the entire investment, it may be constrained in its ability to do so and may have to scale down.

Because the futures position must be collateralized with the firm's pledgeable income, it may become optimal for the firm to reduce its futures position in order to save pledgeable income (as in Rampini and Viswanathan, 2010). An imperfect hedging position will then limit the firm's ability to finance its investment in the bad state of the world. In contrast, the PO can be collateralized using the additional pledgeable income that the supplier can extract from the firm, allowing the PO-reliant firm to increase investment in the bad state of the world relative to a firm relying on futures. Notice that this result does not mean that POs always dominate futures. The premium associated with the PO contract may be high if the firm's supplier has significant bargaining power, and thus a firm may still choose to use futures despite imperfect hedging arising from limited pledgeability.[6]

[5] Unconstrained firms switch from POs to futures as a hedging tool when futures contracts become available (Almeida, et al., 2017), consistent with the average customer viewing POs as a relatively more expensive hedging mechanism.
[6] Notice also that a high PO premium does not necessarily tighten the pledgeability constraint because the firm can pledge more income when using the PO contract.

In addition, the stronger is a firm's financial health, the more it can hedge when using the futures contract. Thus, financial health reduces the effective cost of hedging with futures. The effective cost of hedging using futures also depends on the expected losses of not being able to finance investments in the bad state of the world. When these losses are low, futures become more attractive relative to POs (which provide greater insurance against underinvestment in bad states).

Two specific implications for distressed firms are derived from the model:

1. Firms are more likely to choose POs over futures if their financial position is weak in a manner which varies with the expected costs of financial distress or underinvestment. Using the futures contract exposes such firms to significant underinvestment risk in bad states of the world while POs relax collateral constraints.

2. Conditional on financial deterioration, firms hedging with POs have a greater ability to finance their investments (e.g., in financial distress).

Both implications are unique and original to this paper.[7] Firms do not stop hedging as they approach distress but rather the form of hedging changes. When hedging with derivatives is costly due to collateral constraints, firms write new forward contracts with their suppliers. This insight expands our understanding of how firms manage risk and is consistent with theory by Smith and Stulz (1985) and Froot, Scharfstein, and Stein (1993). Expected costs of distress affect risk management decisions and the form of hedging has real effects when firms enter distress. Using forwards instead of futures relaxes collateral constraints and mitigates underinvestment during distress.

We also consider the possibility that the firm may borrow from the supplier to mitigate the cash flow impact of the hedgeable shock. That is, conditional on being in the bad state of the world,

[7] Unlike Almeida, et al., 2017 and Moon and Phillips (2021), this paper focuses exclusively on the risk management decisions of distressed firms and presents evidence that these choices affect investment and credit spreads.

the firm can use the additional pledgeable income that the supplier can capture to raise additional financing (e.g., trade credit financing). The model then shows that the PO is a more efficient way to use the additional pledgeable income that contracting with the supplier can provide, relative to trade credit. The key advantage of the PO relative to trade credit is that the firm can use POs to transfer cash *across* states. For example, suppose the firm uses the PO to insure against the increase in the price of an input. If the price of the input goes down rather than up, the firm will make an additional payment to the supplier (the difference between the guaranteed and the market price). This additional payment compensates the supplier for the better terms it can provide in the bad state (when the price goes up). Thus, purchase obligations are likely to relax financing constraints more than trade credit financing, despite the fact that both rely on the same source of pledgeability.

2. Data

2.1. Purchase Obligations, Commodity Derivatives, and Investment

Our variable of interest is a firm's use of purchase obligations. A purchase obligation contractually obligates the customer to purchase a specific quantity at a predefined price from a supplier, thereby resembling a forward contract.[8] All firms are required to report these contracts in 10-K filings since December 15, 2003.[9] Thus, the sample consists of all Compustat firm-years with a year-end between 12/15/2003–12/31/2015 and an available 10-K filing on the SEC's EDGAR site. *PO User* is an indicator variable that equals one if the firm reports using a purchase obligation, and zero otherwise. *Derivative User* is an indicator variable equal to one if the firm reports using commodity derivatives in its 10-K filings, and zero otherwise. We use a combination

[8] While purchase obligations resemble forward contracts, it is important to note that they are not covered by Dodd-Frank regulation of OTC derivatives.
[9] One exception is for small businesses with revenues and a public float less than $25 million.

of automated Perl scripting and hand collection to collect these two variables. We note in the summary statistics in Table 1 that PO users represent 23% of the population whereas commodity derivative users represent 19%. These data are consistent with Guay and Kothari (2003), which notes that a large percentage of a firm's risks are unhedgeable with traditional derivatives.

To avoid the concern that firms with purchase obligations are financially stronger or more sophisticated with risk management than the average firm, we often limit our control group to financial hedgers. Table 1 presents the summary statistics for the entire sample as well as separately for firms using forwards and futures. This paper examines both the form of hedging as well as the impact of hedging on investment near distress. We measure investment as *CAPEX*, defined as $CAPEX_t/Total\ Assets_{t-1}$. We use lagged assets as the denominator to isolate changes in investment not total assets and our goal is to interpret the effect on the numerator.

2.2. Control Variables

In the regressions, we also control for *Ln(Assets)*, defined as the natural log of the firm's total book assets, *Book Leverage*, defined as current liabilities plus long term debt scaled by total assets, *COGS/Sales*, defined as the firm's cost of goods sold scaled by total revenues, *Tangibility* calculated following Almeida and Campello (2007), *M/B*, defined as market value divided by the book value of assets, *Accounts Payable*, scaled by total assets, and *R&D Intensity*, also scaled by total assets. Table 1 presents the summary statistics for the control variables for the full sample and separately for PO users as well as derivative users. Compared to derivative users, firms using purchase obligations tend to be smaller, have lower investment levels, lower M/B levels, lower Accounts Payable, and higher R&D. Complete variable definitions are presented in Appendix B.

2.3. Financial Distress and Line of Credit Shock

To capture financial deterioration, we employ three distinct approaches. First, following Andrade and Kaplan (1998), *Financial Distress* equals one if the firm has a positive operating margin but is in distress (as defined as Altman's (1968) Z-score less than 1.81) and *EnterFinDistress* is a change in that variable relative to the prior year. We focus on financial distress because suppliers may assist financially distressed but economically viable customers while avoiding more seriously economically distressed firms - as documented in the trade credit literature (Kolay, Lemmon, and Tashjian, 2016). Next, we calculate the annual maximum distance to default following Bharath and Shumway (2008) to generate a second measure of financial deterioration. While there is no established distress threshold for this approach, we identify financial deterioration with *EDF Jump,* which equals one if the default probability increases by 5% from the prior year.

In addition to these first two measures, which are similar to Campello, et al. (2011), we also use the failure of a firm's line of credit lead arranger as a shock to a firm's financial constraints. Sufi (2009) argues that the lack of a credit line is a good proxy variable for a financially constrained firm and Chava and Purnanandam (2011) also use bank shocks to proxy for constraint. Risk management preferences should respond to a liquidity shock if financial health is relevant for the choice between forwards and futures. We begin by identifying firms that have a line of credit using Perl script. We use search terms identical to those in Sufi (2009). After identifying firms with credit lines, we identify their lead arrangers using DealScan. *LOC_Shock* equals one if the firm's lead arranger on a line of credit failed during the prior year. DealScan reports a range of relationship titles. We define lenders classified as lead arranger, mandated arranger, coordinating arranger, bookrunner, and senior managing agent as primary lending relationships and we categorize these as lead arrangers. Bank failures are identified from FDIC data and major investment bank failures during 2008. We also update our data to represent bank mergers and subsidiary names using the data from Schwert (2018).

2.4 Expected Distress Cost Proxies and Tax Shock

To test the model's implications that the decision to hedge with POs should vary with expected distress costs, we present three proxies for the expected cost of distress or underinvestment. First, following Opler and Titman (1993), we focus on research and development spending. *High R&D* equals one if R&D is above the annual median for firms with non-zero R&D. Next, we capture the role of aggregate risk (Chen, 2010) with *High VIX* which equals one if VIX is in the top quartile of the distribution. Lastly, Purnanandam (2008) argues that industry concentration can proxy for financial distress costs. *Low Herf* equals one if the firm's 2 digit NAICS industry Herfindahl index is below the sample median. In addition, we Asker, Farre Mensa, and Ljungqvist (2015) state level tax cuts as an exogenous shock to the cost of underinvestment. *Large Tax Cut* indicates an observation where the tax cut is greater than 1% and this represents a shock to the cost of underinvestment.

3. Distress and POs

It is well-established that collateral constraints can lead firms to stop using derivatives as their financial condition deteriorates (Rampini, Sufi, and Viswanathan, 2014). However, the use of forward contracts by distressed firms has been overlooked in the literature. Are firms changing, but not stopping, their hedging as they become constrained?

3.1. Hedging Decisions near Distress

To examine whether financial condition leads firms to adjust their risk management choices, we generate two variables: *New PO*, which equals one if the firm reports using a PO at time *t* and no PO at *t*-1, zero otherwise, and *Stop Derivatives Use*, which equals one if the firm reported using commodity derivatives at *t*-1 and does not report the derivatives at *t*, zero otherwise Then we estimate several versions of the following empirical model:

$$Hedging\ Change_{it} = k_t + \beta_1 DistressEvent_{i,t-1} + \sum_i^n \beta_i\ Control_{i,t-1} + e. \quad (1)$$

where *i* and *t* index firm and time, respectively, and k_t represents industry-year fixed effects. *DistressEvent* represents one of three changes in the firm's financial situation: *EnterFinDistress, EDF Jump*, or *LOC Shock*. As both the dependent variables (*New PO*, *Stop Derivatives Use*) and the distress events are within firm changes, we control for time-invariant firm heterogeneity by firm differencing the firm control variables, *Ln(Assets)*, *Book Leverage*. *COGS/Sales*, *Tangibility*, *M/B, Accounts Payable*, and *R&D Intensity*. As our focus is on financial distress, we present the main tables without *Book Leverage* and *M/B* in the Appendix C1 Panel A to address potential multicollinearity concerns. All results are robust to omitting these control variables. Our results also are robust to alternative estimation methods, including OLS with firm fixed effects and logit with firm fixed effects, and these results are presented in Appendix C1 Panel B.

Table 2 shows that corporate distress events, *EnterFinDistress* and *EDF Jump,* associate with initiating a PO contract. We confirm this relationship using the exogenous shock to financial flexibility, *LOC_Shock*. To preclude the concern that the firm contributed to the bank's failure, we run this analysis on the full panel as well as limiting it to financially healthy firms (Altman Z score above the sample median). In both samples, firms exposed to a LOC shock are more likely to initiate a new PO contract. Another interesting contribution of the LOC shock evidence is that it highlights that constrained firms hedge with purchase obligations in a setting free of asset substitution concerns. The latter four columns of Table 2 confirm existing evidence that firms stop using financial derivatives due to collateral constraints starting to bind near distress. Both *EnterFinDistress* and *EDF Jump* associate with *Stop Derivatives Use* while *LOC Shock* has no impact on financial hedging as would be expected given the firm collateral is unaffected by the shock. Further, we document that firms respond on the extensive, not intensive, margin of purchase obligation use in Appendix C1 Panel C. There is no increase in the level of purchase obligation use in response to distress on average or within the subsample of firms with preexisting PO contracts.

There is a concern that the bankruptcy code could affect firms' risk management choices. As a firm weakens and counterparties become increasingly concerned with settlement risk, safer contracts may be preferable. If POs have seniority to derivatives in bankruptcy, that might explain the patterns documented in Table 2. However, derivatives have an implicit senior status to nearly all other claimants in the event of default (Bolton and Oehmke, 2015). While the treatment of purchase obligations by bankruptcy courts has varied with court rulings (Almeida, et al., 2017), POs are never senior to derivatives. Thus, bankruptcy law cannot explain the increased preference for POs and decrease in derivatives hedging near distress.

3.2. Expected Distress Costs

While Table 2 presents evidence that entering distress leads firms to adjust their risk management decisions, distress costs should intensify the preference for hedging with purchase obligations. To explore this, we first extend the baseline model to test whether the likelihood of a new purchase obligation varies with expected distress costs:

$$New\ PO_{it} = k_t + \beta_1 DistressEvent_{i,t-1} + \beta_2 DistressCostProxy_{i,t-1} + \beta_3 DistressEvent_{i,t-1} * DistressCostProxy_{i,t-1} + \sum_i^n \beta_i\, Control_{i,t-1} + e. \quad (2)$$

where i and t index firm and time, respectively, k_t represent industry-year fixed effects, and *DistressCostProxy* represents *High R&D*, *High VIX*, or *Low Herf*. For succinctness, the three measures of distress (*EnterFinDistress*, *EDF Jump*, and *LOC Shock*) are aggregated into one measure, *Any Distress Event,* which equals one if any of the three measures equals one. Again, as the dependent variable is a within-firm change, we control for time-invariant firm heterogeneity by firm differencing the firm control variables.

In addition, we explore an exogenous shock to investment opportunities to provide additional variation in expected distress costs. Reducing underinvestment is a fundamental benefit of risk management (Froot, Scharfstein, and Stein, 1993). Building off Asker et al. (2015) and using HQ locations from SEC filings, we identify firms headquartered in a state with a corporate tax rate decrease. We examine the likelihood of a new purchase obligation for firms with a *Large Tax Cut* shock and note that the statistical significance of these tests are robust to the thresholds suggested by Heath, et al., (2021).

Table 3 Panel A shows that PO initiations near distress is concentrated in firms with higher growth opportunities (*High R&D*), higher aggregate risk (*High VIX*), or higher industry competition (*Low Herf*). That is, firms with higher expected distress costs initiate forward contracts as they become more constrained. (While Table 3 uses the aggregated *Any Distress Event* measure, Appendix C2 reports the individual distress proxies separately.) In Panel B, the *Large Tax Cut* shock associates with *New PO*. That is, firms exposed to such a positive investment opportunity shock are more likely to initiate PO contracts. Clearly, this could be due to new supply contracts related to the changing return on investment. However, we connect this evidence to our model by splitting on financial health. The results are driven by firms with below the median Z score or those near an *EDF Jump*. A tax cut does not lead financially healthier firms to initiate POs. Rather, consistent with PO providing a hedging benefit, only financially weaker firms respond to a shock to expected underinvestment costs by initiating purchase obligations.

3.3. Do Suppliers Initiate Purchase Obligations?

Thus far, the evidence suggests that firms initiate purchase obligations in response to financial deterioration or a shock to financial flexibility in a manner which varies with expected distress costs. Yet these contracts are the outcome of a supplier-customer negotiation and a concern remains that the contracts could be initiated by the supplier. If suppliers' preference for or ability to require a supply contract increases with a customer's financial distress, then the observed new contracts may not be due to risk management. We investigate the supplier channel by focusing on two components of the consumer-supplier relationship. Since relationship specific investments (RSI) both affect the need for contracting as uncertainty increases (Williamson, 1979) as well as the magnitude of potential supply chain spillovers from financial distress (Titman and Wessels, 1998), suppliers of specialized products may have greater interest in establishing supply contracts with financial deteriorating customers. In addition, bargaining power affects customer-supplier interactions (Cunat, 2007) and the financial deterioration of the downstream firm may affect that balance. Specifically, more powerful suppliers could use a customer's weakened financial position to their advantage and demand purchase obligations.

To examine whether new POs appear to be supplier initiated, we create proxies for supplier RSI and negotiating power as well as evaluate a firm's overall dependency on suppliers. First, we focus on relationship specific investments. Giannetti, Burkart, and Ellingsen (2011) argue that differentiated goods are more specialized and difficult to resell and both the trade credit and capital structure literatures recognize that firms with higher RSI are more exposed to customer distress (Dass, et al., 2014; Hertzel, et al., 2008). While individual suppliers are unknown for our broad panel, we use the Bureau of Economic Analysis' (BEA) Input-Output tables to create a supplier composite, identifying all six-digit upstream industries as well as the percentage of input supplied to each customer industry. We follow the framework of Giannetti, Burkart, and Ellingsen (2011) and define industries that produce differentiated goods at the 2-digit level (based on products with heterogeneous pricing). We then calculate a sales-weighted average across all supplier industries to estimate the percentage of a firm's upstream industries that produce differentiated products. We estimate the following formula, where *Diff Goods* takes a value of one for each differentiated goods industry:

$$Supplier\ Differentiated\ Goods\ = \sum_{\substack{i=1 \\ i\neq j}}^{n} Industry\ Input\ Coefficient_{ij}\ \times Diff\ Goods_i$$

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, and the *Industry Input Coefficient* is the percentage of industry *j*'s input which comes from industry *i*.

In addition to *Supplier Differentiated Goods*, we create two additional variables to test supplier demand concerns. To proxy for supplier negotiating power building, we build on Rhodes-Kropf and Robinson (2008) which argues that a firm's market to book captures its relative bargaining power. Again, using the BEA Input-Output tables to create a supplier composite, we calculate *Supplier M/B* using the same approach to capture the upstream industry bargaining power. We also employ the Fresard, Hoberg, and Phillips (2020) measure of vertical integration where a higher score implies that a firm is vertically integrated. A more integrated firms is assumed to be less exposed to supplier demands (Williamson, 1979).

Table 4 presents the evidence on supplier demand and purchase obligation initiations near distress. First, *Supplier Differentiated Goods*, *Supplier M/B*, and *Vertical Integration* are added as a control variables in columns 1, 3, and 5, respectively. Then, observations with *High Supplier Differentiated Good*s and *High Supplier M/B* (both defined as above 75%) are excluded in columns 2 and 4, respectively. In column 6, we restrict the sample to the most vertically integrated firms (above 75%). Regardless of the proxies or specification, there is no evidence that supplier demand is generating the observed relationship of new supply contracts for distressed firms. Neither controlling for high supplier market power nor excluding firms facing the most concentrated supplier industries has a material effect on the inference. Further, we document PO initiations even within the subsample of most vertically integrated firms, providing additional support that supplier demand does not explain the results.

4. Hedging, Distress, and Investment

4.1. Mitigating Underinvestment – Forwards versus Futures

So far, we have shown that risk management changes – but does not cease – when firms enter distress or experience an exogenous liquidity shock and highlighted the role of expected distress costs in hedging with forwards. We now explore the implications for investment policy. As POs are the result of contracting between two firms, we do not have exogenous variation in their availability but take multiple distinct approaches to address this issue. Our primary identification strategy is to compare exclusive PO users to firms using financial hedging – limiting the sample to firms which hedge and restricting the control group to financially stronger firms. In addition, we will rule out alternative hypotheses, present multiple validation tests including a natural experiment, and document the real effects of using POs.

Table 5 presents summary statistics for the treated and control groups across a variety of financial flexibility metrics (size, investment, tangibility, line of credit, COGS, and operating margins). Our variable of interest, *PO_Hedge*, equals one if the firm uses POs exclusively (no futures) and zero if the firm uses financial hedging.[10] Comparing the treated and control groups in the year prior to distress (*EDF Jump*, *EnterFinDistress*, or *LOC Shock*), firms using purchase obligations are similar or weaker than firms using derivatives across many dimensions.

Focusing on the *PO_Hedge* variable allows us to highlight how the investment outcome varies with distress depending on the type of hedging - not the decision to hedge. Conditional on hedging, we are interested in whether the choice between futures and forwards affects the ability to invest in distress. That is, for firms in similar financial condition (entering financial distress, experiencing a material jump to the likelihood of default, or having a line of credit shock), the empirical specification evaluates the impact of hedging decisions. Table 5 shows, all else equal, firms using derivatives appear to have greater financial flexibility (more likely to have a line of credit, higher operating margins, etc.). Thus, the control group should be more able to maintain investment when distressed.[11]

To evaluate how POs affect investment, we use multiple distress measures. In addition to *EDF Jump*, *EnterFinDistress*, and *LOC Shock*, we also examine *FinDistress* (equals one for firms in financial distress but not limited to the specific time of entering). Froot, Scharfstein, and Stein (1993) note, "all the theories rely on the basic observation that, without hedging, firms may be

[10] For robustness, Appendix C3 replicates Tables 5 and 6 with an alternative measure, *PO_Hedge2*, which equals one if the firm uses any purchase obligations and is zero if it uses derivatives exclusively.
[11] Table 5 documents that PO users have lower *CapEx* prior to distress than derivative users. We present evidence in Table 9 and Appendix D that the differences in pre-distress investment do not drive our results.

forced to underinvest in some states of the world because it is costly or impossible to raise external finance." So while the first part of the paper documents firms initiating POs as their financial condition deteriorates, we now aim to answer the broader question of how risk management mitigates underinvestment during periods of distress. Specifically, we estimate several versions of the following empirical model:

$$CAPEX_{it} = f_t + k_t + \beta_1 DistressMeasure_{i,t-1} + \beta_2 PO\_Hedge_{i,t-1} + \beta_3 DistressMeasure_{i,t-1} * PO\_Hedge_{i,t-1} + \sum_i^n \beta_i Control_{i,t-1} + e. \quad (3)$$

where *i* and *t* index firm and time, respectively, and f_t and k_t represent firm and industry-year fixed effects, respectively.[12]

Table 6 first shows that each distress variable, *EDF Jump*, *EnterFinDistress*, *FinDistress* and *LOC Shock,* has negative and statistically significant coefficients. Any form of distress leads to lower subsequent investment for firms hedging with derivatives (the control group). However, the result is more nuanced for PO users. The interaction coefficients are uniformly positive across both *PO_Hedge* definitions and all four distress measures, mostly offsetting the negative impact of distress on investment. Compared to financial derivatives, the multivariate evidence suggests that POs may have benefits for distressed firms. We confirm these results using an instrumental variables approach which is presented in Appendix E. Broadly, the results are consistent with the hypotheses that 1) firms hedging with derivatives indeed face limitations when they are constrained, potentially leading to an underinvestment problem, and 2) firms that use POs to hedge are able to partially relax this constraint.

[12] We switch to firm fixed effects since the dependent variable is no longer a change in hedging activity. Also, Appendix C4 presents the results using *PO_Hedge* measured at t-2, the period prior to distress which allows us to evaluate whether pre-existing hedging choices associate with higher investment during distress.

4.2. Underinvestment – Cross-Sectional Evidence on PO Hedges

Given the difficulty of perfectly addressing endogeneity, we expand our evidence on the role of hedging choice on investment during distress by presenting two cross-sectional robustness tests. Purchase obligations may be written to address hedging as well as contracting or hold-up purposes and there is no reason to believe that supplier contracts not intended for hedging would have risk management benefits.[13] Our expectation is that only POs intended as hedges will enable higher *CapEx* as a firm's financial condition deteriorates. Tables 7 and 8 present these results which contribute to the evidence that POs associate with higher investment during distress due to their hedging benefits and not omitted variables.

Purchase obligations are less attractive for hedging when suppliers are riskier and the contracts face higher settlement risk. Therefore, we build off Almeida and Campello (2007) and create *Supplier Tangibility*. We calculate each supplier industry's *Tangibility* and then use two-digit NAICS codes to construct *Industry Tangibility* as the median industry measure. We then sales weight these industries as above using the 6-digit BEA IO tables to calculate *Supplier Tangibility*. Table 7 presents the investment regressions split by *Supplier Tangibility* (relative to the industry year median). With *Low Supplier Tangibility¸* hedging with PO would be less effective given the higher settlement risk and those contracts are more likely to serve purposes other than risk management. Across all four distress measures, *PO_Hedge* mitigates underinvestment for firms with *High Supplier Tangibility*. However, the coefficients are much reduced in terms of magnitude and significance with *Low Supplier Tangibility*. These results provide additional support to the assertion that it is the hedging benefit of purchase obligations that impacts investment levels.

[13] As settlement risk and the availability of derivatives affect whether firms hedge with POs (Almeida, et al., 2017), features of the supply industry and the derivatives markets can identify which POs are more likely hedging tools.

The introduction of steel futures in December 2008 provides an alternative validation strategy. Before 2008, steel-exposed firms had to rely on POs for hedging. However, examining a two-year event window before and after 2008, AHW (2017) shows that steel-exposed firms switched from POs to exchange-traded futures (due to lower settlement risk and bargaining costs). This natural experiment provides a framework to examine the hedging benefits of POs for mitigating underinvestment during distress. POs are more likely to be hedges and should support investment during distress before 2008. In Table 8, we split the sample of steel-exposed firms into two periods.[14] *No Steel Futures* captures pre-2008 and *Futures Available* is post-2008. For the "No Steel Futures" period, we find a significantly positive effect on investment for PO firms in distress (*EDF Jump*, *EnterFinDistress,* and *FinDistress*)[15]. When futures are available and purchase obligations are less likely a hedge, the interaction coefficient is near zero and not significant. This is consistent with the earlier placebo tests. When purchase obligations aren't designed to provide hedging, they have no impact on investment for distressed firms. This points to the importance of the hedging element of the PO contract. Tables 6, 7, and 8 all support the hypothesis that hedging with purchase obligations relaxes a collateral constraint for constrained firms.

4.3 Investigating Alternative Channels

Our model explains how purchase obligation use enhances the pledgeability of assets during distress, enabling higher levels of investment. One concern is that there may be omitted variables correlated with purchase obligations. While Table 5 indicates that PO's ability to mitigate underinvestment is not driven by observable pre-event differences in financial flexibility between

[14] A firm is defined as having steel exposure if steel exceeds more than 1% of firm inputs using the BEA IO tables.
[15] *LOC Shock* is omitted as approximately half of the bank failures occur in the financial crisis which overlaps with the introduction of steel futures.

the control and treatment group, we present three additional pieces of evidence to strengthen the argument that differences in financial health do not explain the investment behavior of PO and derivative users. First, Table 6 shows that none of the baseline *PO_Hedge* coefficient estimates are related to future investment in the absence of being in distress. Second, while Moon and Phillips (2021) document POs are not correlated with current sales growth, there is an association with firm growth. We explore whether the results are driven by differences in the sales growth trajectories of PO and derivative firms. We calculate the future sales growth ($\Delta Sales/TA_{t,t+1}$) and exclude all observations above the annual median. (Appendix C5 documents that the results are robust to alternative measures of higher future sales: Two Year and Industry-Year Adjusted.) While splitting the sample obviously decreases the sample, the results are remarkably consistent. The first four columns for Table 9 show PO users are more able than financial hedgers to maintain investment when distressed even within the subsample of firms with declining future sales. Therefore, the role of PO use in investment is not spuriously driven by higher sales growth.

Lastly, since Table 5 showed derivative hedgers had higher *CapEx* prior to distress, we want to preclude observed changes in investment being driven by pre-event differences. The last four columns of Table 9 present the investment results for the subsample of firms with pre-distress *CapEx* above the sample median. While the interaction coefficient on the smallest treated sample (*EnterFinDistress*) is diminished, the results otherwise remain consistent.[16] Purchase obligations relative to derivatives appear to mitigate underinvestment for distressed firms and there is no evidence that this is driven by differences in sales growth or prior investment levels.

Another possible concern is that there may be a spurious correlation between PO behavior and trade credit activity. For example, suppliers are known to issue more downstream trade credit

[16] Further, in Appendix D, we confirm the baseline results using a propensity score matched control group. Even with the reduced sample size, the coefficient on *PO_Hedge*EDF Jump* is positive and statistically significant.

to distressed customers (Shenoy and Williams, 2017) and provide liquidity during periods of financial constraint (Cunat, 2007). The enhanced investment activity therefore may be the result of improved trade credit financing, not the PO usage. Although we control for trade credit in our multivariate tests, we directly address this issue by considering accounts payable as the dependent variable in Table 10. We omit lagged *Accounts Payable* in these tests to avoid the dynamic panel bias (Flannery and Hankins, 2013). Examining the interaction coefficients across the four distress measures, only one exhibits a marginally positive coefficient. This suggests that increased trade credit is not the channel leading firms with purchase obligations to maintain higher investment levels relative to firms using derivatives.

4.4 Evidence on Credit Spreads

Campello, Lin, Ma, and Zou (2011) documents that hedging mitigates the negative impact of distress on credit spreads. Since we argue that it is the hedging component of purchase obligations that enables higher levels of investment during distress, our last test uses Dealscan data to examine the impact of purchase obligations on credit spreads. While this data greatly limits the sample size and power of the tests, Table 11 presents the full sample as well as the subsample of financially weaker firms (relative to the sample median EDF) and documents three interesting pieces of evidence.

First, relative to firms hedging with more constraining financial derivatives, firms using purchase obligations have lower credit spreads in distress. For the full sample, the interaction of *PO_Hedge* with the distress proxies is consistently negative but statistically significant and larger in magnitude for firms entering or in financial distress as defined by Z score thresholds. It is not surprising for the interaction coefficient not to be significant for *EDF Jump* and *LOC Shock*. A firm can experience a significant change in the estimated distance to default without necessarily raising the risk to bondholders. Likewise, *LOC Shock*, by design, is unrelated to firm fundamentals and may not increase the credit spread for an otherwise healthy firm. However, Columns 5 – 8 focus on the financially weaker firms. Here, the interaction coefficients are statistically significant for all but the *LOC Shock*.

Table 11 also confirms that spreads respond to changes in financial condition for financially weaker firms (Leland, 1994). The two distress proxies which capture a change in a firm's financial condition are *EDF Jump* and *EnterFinDistress*. For both variables, the baseline coefficient is positive and generally statistically significant. Like the interaction coefficient results, *EDF Jump* associates with changing credit spread only when the sample is limited to financially weaker firms.

A final important point of Table 11 is the positive (though not often statistically significant) coefficient on the baseline *PO_Hedge* measure. Given the firm fixed effects, the baseline variable estimate only captures the effect of switching. Switching to POs does not decrease credit spreads for the average firm. If anything, PO firms may face higher spreads than derivative users. This fits with the argument for our primary identification strategy and Table 5 evidence that firms using purchase obligations are, on average, financially weaker than those using derivatives. In sum, despite the small sample, the table is consistent with purchase obligations providing distressed firms a hedging benefit relative to derivatives.

5. Conclusions

This paper revisits the question of whether firms hedge near distress. Countering recent empirical evidence that firms appear to reduce risk management near distress, we expand the definition of risk management to include purchase obligations and find results in line with theoretical predictions of Froot *et al.* (1993). Firms entering distress do not cease hedging but rather gravitate towards purchase obligations. We also document that expected liquidation costs play an important role in hedging decisions of distressed firms.

This paper provides novel evidence that purchase obligations enable constrained firms to minimize underinvestment. We are the first to highlight that the specific form of hedging can impact investment. While negotiated pricing and settlement risk make purchase obligations suboptimal to an exchange traded contract for a financially healthy firm, POs relax the collateral constraints of financial derivatives and provide more flexibility for constrained firms. In turn, the use of forward contracts with suppliers appears to enable higher investment relative to hedging with derivatives for firms in financial distress. A causal interpretation is supported by a variety of robustness tests and the credit spread evidence.

Further, these results emphasize the importance of suppliers in times of distress. Examining when firms initiate purchase obligations expands our understanding of how firms respond to potential underinvestment and speaks to the broader topic of risk shifting near distress. In sum, taking a broader view of risk management activities offers insight into the operations of distressed firms.

References

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.

Acharya, V., S. A. Davydenko, and I. A. Strebulaev, 2012, Cash holdings and credit risk, *Review of Financial Studies* 25, 3572-3609.

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

Almeida, H., and M. Campello, 2007, Financial constraints, asset tangibility, and corporate investment, *Review of Financial Studies* 20, 1429-1460.

Almeida, H., M. Campello, I. Cunha, and M. Weisbach, 2014, Corporate liquidity management: A conceptual framework and survey, *Annual Review of Financial Economics* 6, 135-162.

Almeida, H., K. W. Hankins, and R. Williams, 2017, Risk management with supply contracts, *Review of Financial Studies* 30, 4179–4215.

Asker, J., J. Farre-Mensa, and A. Ljungqvist, 2015, Corporate investment and stock market listing: A puzzle?, *Review of Financial Studies* 28, 342–390.

Altman, E. I., 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *Journal of Finance* 23, 589–609.

Andrade, G., and S. Kaplan, 1998, How costly is financial (not economic) distress? Evidence from highly leveraged transactions that became distressed, *Journal of Finance* 53, 1443-1493.

Bessembinder, H., 1991, Forward contracts and firm value: Investment incentive and contracting effects, *Journal of Financial and Quantitative Analysis* 26, 519-532.

Bolton, P., and M. Oehmke, 2015. Should derivatives be privileged in bankruptcy? *Journal of Finance* 70, 2353-2394.

Campello, M., C. Lin, Y. Ma, and H. Zou, 2011, The real and financial implications of corporate hedging, *Journal of Finance* 66, 1615-1647.

Chava, S. and A. Purnanandam, 2011, The effect of banking crisis on bank-dependent borrowers, *Journal of Financial Economics* 99, 116-135.

Chen, H, 2010, Macroeconomic conditions and the puzzles of credit spreads and capital structure, *Journal of Finance* 65, 2171-2212

Chod, J., 2017, Inventory, risk shifting, and trade credit, *Management Science* 63, 3208-3225.

Costello, A., 2013, Mitigating incentive conflicts 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 Studies* 20, 491-527.

Dass, N., J. Kale, and V. Nanda, 2015, Trade credit, relationship-specific investment, and product market power, *Review of Finance* 19, 1867–1923.

Dotshi, H., P. Kumar, and V. Yerramilli, 2018, Uncertainty, capital investment, and risk management, *Management Science* 64, 5461-5959.

Fabbri, D. and L. F. Klapper, 2016, Bargaining power and trade credit, *Journal of Corporate Finance* 41, 66-80.

Flannery, M. and K. W. Hankins, 2013, Estimating dynamic panel models in corporate finance, *Journal of Corporate Finance* 19, 1-19.

Fresard, L., G. Hoberg, and G. Phillips, 2020, Innovation activities and integration through vertical acquisitions, *Review of Financial Studies* 33 2937-2976.

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

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. W. Hankins, 2011, The role of risk management in mergers and waves, *Journal of Financial Economics* 101, 515–532.

Giambona, E., and Y. Wang, 2020, Derivatives supply and corporate hedging: Evidence from the Safe Harbor Reform of 2005, *Review of Financial Studies* 33, 5015-5050.

Giannetti, M., M. Burkart, and T. Ellingsen, 2011, What you sell is what you lend? Explaining trade credit contracts, *Review of Financial Studies* 24, 1261-1298.

Gilje, E., 2016, Do firms engage in risk shifting? Empirical evidence, *Review of Financial Studies* 29, 2925-2954.

Gilje, E., and J. Taillard, 2017, Does hedging affect firm value? Evidence from a natural experiment, *Review of Financial Studies* 30, 4083-4132.

Grieser, William D. and Charles J. Hadlock, 2019, Panel-data estimation in finance: Testable assumptions and parameter (In)Consistency, *Journal of Financial and Quantitative Analysis* 54, 1-29.

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

Heath, D., M. Ringgenberg, M. Samadi, and I. Werner, 2021, Reusing natural experiments, Working paper.

Holmstrom, B. and J. Tirole, 1998, Private and public supply of liquidity, *Journal of Political Economy* 106, 1-40.

Howell, S., 2020, Firm type variation in the cost of risk management, *Journal of Corporate Finance* 64.

Kolay, M., M. Lemmon, and E. Tashjian, 2016, Spreading the misery: Sources of bankruptcy spillover in the supply chain, *Journal of Financial and Quantitative Methods* 51, 1955-1990.

Leland, H., 1994, Corporate debt value, bond covenants, and optimal capital structure, *Journal of Finance* 49, 1213-1252.

Moon, K., and G. Phillips, 2021, Outsourcing through purchase contracts and firm capital structure, *Management Science* 67, 363–387.

Morellec, E. and C. Smith, 2007, Agency conflicts and risk management, *Review of Finance* 11, 1-23.

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

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

Phillips, G. and G. Sertsios, 2013. How do firm financial conditions affect product quality and pricing?, *Management Science* 59, 1764-1782.

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

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

Rampini, A. and S. Viswanathan, 2010, Collateral, risk management, and the distribution of debt capacity, *Journal of Finance* 65, 2293-2322.

Rauh, J., 2009, Risk shifting versus risk management: Investment policy in corporate pension Plans, *Review of Financial Studies* 22, 2687–2733.

Schwert, M., 2018, Bank capital and lending relationships, *Journal of Finance* 73, 787-830.

Shenoy, J. and R. Williams, 2017, Trade credit and the joint effects of supplier and customer financial characteristics, *Journal of Financial Intermediation*, 29, 68-80.

Smith, C. and R. Stulz, 1985, The determinants of firms' hedging policies, *Journal of Financial and Quantitative Analysis*, 28, 391-405.

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

Titman, S. and R. Wessels, 1988, The determinants of capital structure, *Journal of Finance* 43, 1-40

Vuillemey, G., 2020, The value of central clearing, *Journal of Finance* 75, 2021-2053.

Williamson, O. 1979, Transaction-cost economics: The governance of contractual relations, *Journal of Law and Economics* 22, 233-261.

Yang, S.A., J. R. Birge, and R.P. Parker, 2015, The supply chain effects of bankruptcy, *Management Science* 61, 2320-2338.

Table 1 – Summary Statistics

This table reports summary statistics for the key variables in the paper. *PO User* is a variable that equals 1 if a firm reports using purchase obligations in its 10-K filing, 0 otherwise. *Derivative User* is a variable that equals 1 if the firm reports using commodity derivatives in its 10K filings, 0 otherwise. All other variables are defined in Appendix B.

	All			PO User			Derivative User		
	Obs	Mean	St. Dev.	Obs	Mean	St. Dev.	Obs	Mean	St. Dev.
PO User	50,534	0.232	0.422	11,740	1.000	0.000	9,353	0.284	0.451
Derivative User	50,534	0.185	0.388	11,740	0.226	0.418	9,353	1.000	0.000
Ln Total Assets	50,534	5.963	2.432	11,740	7.083	2.077	9,353	7.272	2.653
Book Leverage	50,343	0.320	0.747	11,697	0.242	0.297	9,324	0.403	0.770
COGS/Sales	48,833	1.251	4.659	11,617	0.869	2.955	9,066	0.882	2.590
Tangibility	50,325	0.252	0.164	11,700	0.270	0.147	9,311	0.319	0.156
M/B	50,534	2.595	9.466	11,740	1.484	2.447	9,353	2.621	11.291
Accounts Payable	50,328	0.164	0.351	11,706	0.102	0.171	9,261	0.158	0.363
R&D Intensity	50,534	0.071	0.180	11,740	0.050	0.116	9,353	0.023	0.111
CapEx	49,881	0.044	0.062	11,673	0.047	0.054	9,294	0.071	0.087
EDF Jump	46,627	0.175	0.380	8,329	0.122	0.327	6,767	0.156	0.363
Enter Financial Distress	50,534	0.018	0.134	11,740	0.020	0.141	9,353	0.028	0.164
LOC Shock	50,534	0.015	0.120	9,085	0.019	0.135	9,353	0.031	0.174

Table 2 – Changing Risk Management around Distress Events

This table presents multivariate evidence on how risk management decisions near distress vary with the expected cost of distress. *New PO* equals one if the firm reports using a PO at time *t* and no PO at *t*-1, zero otherwise. *Stop Deriv. Use* equals one if the firm reported using commodity derivatives at t-1 and does not report the derivatives at t, zero otherwise. There are three distress events *(EnterFinDistress*, *EDF Jump, and LOC Shock.*) Control variables are first-differenced. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	New PO				*Stop Derivatives Use*			
	All	All	All	Z > 3	All	All	All	Z > 3
EnterFinDistress	0.013*				0.010*			
	(0.006)				(0.005)			
EDF Jump		0.007*				0.005+		
		(0.003)				(0.003)		
LOC Shock			0.084***	0.104***			0.003	0.009
			(0.007)	(0.010)			(0.006)	(0.007)
Ln (Total Assets)	0.010**	0.002	0.012***	0.009+	0.006*	0.005	0.006*	0.006+
	(0.003)	(0.005)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.004)
Book Leverage	0.002	0.023*	0.001	0.012	0.003	0.009	0.003	0.002
	(0.004)	(0.011)	(0.004)	(0.009)	(0.003)	(0.009)	(0.003)	(0.007)
COGS/Sales	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangibility	0.037*	0.024	0.035+	0.043+	-0.005	-0.025	-0.005	0.021
	(0.018)	(0.029)	(0.018)	(0.025)	(0.015)	(0.024)	(0.015)	(0.019)
M/B	0.000	-0.001	0.000	0.000	0.000	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Accounts Payable	-0.002	0.004	0.000	0.001	0.004	0.024	0.004	-0.004
	(0.009)	(0.034)	(0.009)	(0.019)	(0.008)	(0.029)	(0.008)	(0.014)
R&D Intensity	-0.004	-0.027	-0.004	-0.001	0.010	0.021	0.01	0.008
	(0.013)	(0.023)	(0.013)	(0.019)	(0.010)	(0.020)	(0.010)	(0.014)
N	35,593	24,298	35,593	21,829	35,593	24,298	35,593	21,829
Firm FD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3 –PO Initiations and Expected Distress Costs

This table presents multivariate evidence on how PO initiations vary with the expected cost of distress. *New PO* equals one if the firm reports using a PO at time *t* and no PO at *t*-1, zero otherwise. Panel A presents three proxies for the expected cost of distress (*High R&D*, *HighVIX*, *LowHerf*) while Panel B presents an exogenous shock to underinvestment (*Large Tax Cut*). Control variables are first-differenced effects but suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

Panel A: Cross-sectional Variation

	New PO		
Any Distress Event	0.014***	0.005	0.001
	(0.003)	(0.004)	(0.004)
*High R&D * Distress Event*	0.030***		
	(0.007)		
*High VIX * Distress Event*		0.036***	
		(0.006)	
*Low Herf * Distress Event*			0.039***
			(0.006)
High R&D	0.010***		
	(0.003)		
High VIX		-0.001	
		(0.003)	
Low Herf			0.011***
			(0.003)
N	35,593	35,593	35,593
Firm FD	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes

Panel B: Exogenous Investment Opportunity

	New PO				
	All	Median Z Score		Near EDF Jump $_{t-1, t, t+1}$	
		Below	Above	Yes	No
Large Tax Cut	0.032***	0.038***	0.022*	0.081***	0.011
	(0.007)	(0.009)	(0.011)	(0.013)	(0.011)
N	35,593	18,999	16,593	7,891	16,407
Firm FD	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes

Table 4 – PO Initiations and Supplier Demand

This table presents multivariate evidence on whether PO initiations near distress vary with supplier characteristics. *New PO* equals one if the firm reports using a PO at time *t* and no PO at *t*-1, zero otherwise. *Any Distress Event* equals one if any distress event *(EnterFinDistress*, *EDF Jump, LOC Shock*) equals one. Columns 1, 3, and 5 include a control for supply chain features (*Supplier Differentiated Goods, Supplier M/B*, and *Vertical Integration)*. The other columns drop firms in the top quartile of *Supplier Differentiated Goods* and *Supplier M/B* or keep only the top quartile of vertically integrated firms. Control variables are first-differenced. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	New PO					
	All	Drop High Supp DiffGoods	All	Drop High Supp M/B	All	Only High Vert Int
Any Distress Event	0.020***	0.018***	0.019***	0.031***	0.019***	0.036***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)
Supp. Diff Goods	0.017					
	(0.014)					
Supplier M/B			-0.036***			
			(0.006)			
Vert. Integration					0.218	
					(0.287)	
Ln (Total Assets)	0.010**	0.009*	0.009+	0.005	0.005	-0.012
	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.010)
Book Leverage	0.001	0.001	0.005	0.002	0.006	-0.011
	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)	(0.022)
COGS/Sales	0.000	0.001	0.000	0.001+	0.000	0.002
	(0.000)	(0.000)	0.000	0.000	(0.000)	(0.003)
Tangibility	0.034+	0.03	0.023	0.044+	0.028	-0.099+
	(0.018)	(0.021)	(0.025)	(0.026)	(0.026)	(0.053)
M/B	0.000	0.000	0.000	0.000	-0.001+	-0.001
	(0.000)	(0.000)	0.000	0.000	(0.001)	(0.003)
Accounts Payable	-0.001	-0.002	-0.010	-0.013	-0.016	-0.056
	(0.009)	(0.011)	(0.014)	(0.013)	(0.029)	(0.070)
R&D Intensity	-0.005	0.01	-0.011	0.002	-0.019	-0.171*
	(0.013)	(0.017)	(0.016)	(0.018)	(0.018)	(0.080)
N	35,593	26,884	22,752	19,200	28,045	8,452
Firm FD	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 – Pre-Distress Summary Statistics

This table presents summary statistics for treated and control firms the year before experiencing a distress event (*EDF Jump, EnterFinDistress, LOC Shock*). *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. (Appendix C3 presents these results using an alternative definition identifying those firms using any purchase obligations.)

	PO_Hedge = 1		*PO_Hedge* = 0			
	Obs	Mean	Obs	Mean	Diff	P-value
One Year Before EDF Jump						
Ln (Total Assets)	795	6.930	1,156	7.751	0.821	0.000
CapEx	789	0.057	1,152	0.111	-0.054	0.000
Tangibility	788	0.301	1,149	0.367	-0.066	0.000
LOC	795	0.752	1,156	0.798	-0.046	0.016
COGS/TA	794	0.581	1,156	0.603	-0.022	0.431
Ln(OperMargin)	722	0.110	1,088	0.138	-0.028	0.066
One Year Before Enter Fin Distress						
Ln (Total Assets)	155	7.437	250	7.553	0.116	0.519
CapEx	155	0.060	249	0.134	-0.073	0.000
Tangibility	155	0.273	246	0.378	-0.105	0.000
LOC	155	0.858	250	0.868	-0.010	0.777
COGS/TA	155	0.406	250	0.402	0.005	0.911
Ln(OperMargin)	154	0.204	246	0.239	-0.035	0.051
One Year Before LOC Shock						
Ln (Total Assets)	118	7.688	220	8.515	-0.827	0.000
CapEx	118	0.059	219	0.099	-0.041	0.000
Tangibility	116	0.302	218	0.376	-0.074	0.000
LOC	118	0.932	220	0.927	0.005	0.867
COGS/TA	118	0.732	220	0.762	-0.030	0.711
Ln(OperMargin)	118	0.156	220	0.138	0.018	0.453

Table 6 – Distress, Hedging, and Investment

This table examines how hedging choices affect investment (*CapEx*) during distress using OLS with firm and industry-year effects. There are four distress indicators – *EDF Jump*, *EnterFinDistress*, *FinDistress*, and *LOC Shock*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets$_{t-1}$			
*PO_Hedge*EDF Jump*	0.027***			
	(0.003)			
*PO_Hedge*EnterFinDistr*		0.010+		
		(0.005)		
*PO_Hedge*FinDistress*			0.019***	
			(0.004)	
*PO_Hedge*LOC Shock*				0.021***
				(0.006)
EDF Jump	-0.034***			
	(0.002)			
EnterFinDistress		-0.018***		
		(0.003)		
FinDistress			-0.027***	
			(0.002)	
LOC Shock				-0.026***
				(0.004)
PO_Hedge	-0.002	0.001	-0.002	0.001
	(0.003)	(0.002)	(0.003)	(0.002)
Ln (Total Assets)	-0.019***	-0.020***	-0.020***	-0.021***
	(0.002)	(0.002)	(0.002)	(0.002)
Book Leverage	-0.052***	-0.039***	-0.035***	-0.040***
	(0.006)	(0.003)	(0.004)	(0.003)
COGS/Sales	-0.001*	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Tangibility	-0.029*	-0.018	-0.016	-0.019+
	(0.014)	(0.011)	(0.011)	(0.011)
Market/Book	0.014***	0.002***	0.002***	0.002***
	(0.001)	0.000	0.000	0.000
Accounts Payable	0.089***	0.047***	0.044***	0.048***
	(0.022)	(0.010)	(0.010)	(0.010)
R&D Intensity	-0.038+	-0.008	-0.01	-0.007
	(0.021)	(0.013)	(0.013)	(0.013)
N	9,811	13,686	13,686	13,686
Firm FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes

Table 7 – Hedging and Investment Validation #1: Supplier Tangibility

This table examines how hedging choices affect investment (*CapEx*) during distress, splitting the sample on *Supplier Tangibility* (at the industry year median). There are four distress indicators – *EDF Jump*, *EnterFinDistress*, *FinDistress*, and *LOC Shock*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. Regressions include both firm and industry-year fixed effects and control variables are suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets $_{t-1}$							
	High Supplier Tangibility				Low Supplier Tangibility			
*PO_Hedge*EDF Jump*	0.039***				0.009*			
	(0.005)				(0.004)			
*PO_Hedge*EnterFinDistress*		0.017+				-0.008		
		(0.010)				(0.009)		
*PO_Hedge*FinDistress*			0.026***				0.012*	
			(0.006)				(0.005)	
*PO_Hedge*LOC Shock*				0.031**				0.007
				(0.010)				(0.007)
EDF Jump	-0.042***				-0.017***			
	(0.003)				(0.003)			
EnterFinDistress		-0.015**				-0.006		
		(0.006)				(0.006)		
FinDistress			-0.031***				-0.018***	
			(0.003)				(0.004)	
LOC Shock				-0.033***				-0.011*
				(0.005)				(0.005)
PO_Hedge	-0.005	0.000	-0.006	-0.001	0.000	0.001	-0.001	0.001
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
N	5,400	7,012	7,465	7,465	3,913	5,191	5,578	5,578
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8– Hedging and Investment Validation #2: Steel Futures Natural Experiment

This table examines how hedging choices affect investment (*CapEx*) around a natural experiment. Focusing on firms with exposure to steel, the sample is split on *Steel Futuures Availability*. There are three distress indicators – *EDF Jump*, *EnterFinDistress*, and *FinDistress*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. Regressions include both firm and industry-year fixed effects and control variables are suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets$_{t-1}$					
	No Steel Futures			Steel Futures		
*PO_Hedge*EDF Jump*	0.043*			-0.003		
	(0.020)			(0.004)		
*PO_Hedge*EnterFinDistress*		0.041			-0.003	
		(0.025)			(0.016)	
*PO_Hedge*FinDistress*			0.036*			-0.001
			(0.018)			(0.008)
EDF Jump	-0.044***			-0.006*		
	(0.012)			(0.003)		
EnterFinDistress		-0.018			-0.008	
		(0.011)			(0.012)	
FinDistress			-0.043***			-0.01
			(0.010)			(0.006)
PO_Hedge	-0.008	-0.008	-0.008	0.002	0.002	0.001
	(0.013)	(0.010)	(0.010)	(0.003)	(0.005)	(0.005)
N	932	1,463	1,501	1,505	1,874	2,100
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes

Table 9 – Alternative Channels: Sales Growth or Prior Investment

This table examines how hedging choices affect investment (*CapEx*) during distress. The first four columns exclude firms with higher future sales (change in sales from t to t+1 is above the median). The second four columns exclude firms with below the median prior investment. There are four distress indicators – *EDF Jump*, *EnterFinDistress*, *FinDistress*, and *LOC Shock*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. Regressions include both firm and industry-year fixed effects and control variables are suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets $_{t-1}$							
	Exclude Higher Future Sales				Exclude Low Investment Firms			
*PO_Hedge*EDF Jump*	0.038***				0.041***			
	(0.006)				(0.006)			
*PO_Hedge*EnterFinDistress*		0.032*				0.009		
		(0.013)				(0.009)		
*PO_Hedge*FinDistress*			0.028***				0.021**	
			(0.007)				(0.007)	
*PO_Hedge*LOC Shock*				0.020*				0.030**
				(0.009)				(0.010)
EDF Jump	-0.041***				-0.053***			
	(0.004)				(0.004)			
EnterFinDistress		-0.030***				-0.019***		
		(0.007)				(0.005)		
FinDistress			-0.032***				-0.030***	
			(0.004)				(0.004)	
LOC Shock				-0.020***				-0.031***
				(0.006)				(0.005)
PO_Hedge	0.000	0.002	-0.005	0.000	0.001	0.003	-0.001	0.002
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
N	3,619	4,608	5,003	5,003	5,136	7,024	7,024	7,024
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 10 – Accounts Payable Channel

This table examines whether hedging choices affect accounts payable in distress. There are four distress indicators – *EDF Jump*, *EnterFinDistress*, *FinDistress*, and *LOC Shock*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. Regressions include both firm and industry-year fixed effects. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Accounts Payable $_t$*/Total Assets* $_{t-1}$			
*PO_Hedge*EDF Jump*	0.008*			
	(0.003)			
*PO_Hedge*EnterFinDistress*		0.002		
		(0.007)		
*PO_Hedge*FinDistress*			-0.012**	
			(0.004)	
*PO_Hedge*LOC Shock*				-0.001
				(0.007)
EDF Jump	-0.008***			
	(0.002)			
EnterFinDistress		-0.002		
		(0.004)		
FinDistress			-0.013***	
			(0.003)	
LOC Shock				-0.012**
				(0.004)
PO_Hedge	-0.005+	0.000	0.002	0.000
	(0.003)	(0.003)	(0.003)	(0.003)
Ln (Total Assets)	-0.045***	-0.040***	-0.044***	-0.045***
	(0.002)	(0.002)	(0.002)	(0.002)
Book Leverage	-0.023***	0.003	0.040***	0.036***
	(0.006)	(0.004)	(0.004)	(0.004)
COGS/Sales	-0.001	0.000	-0.001*	-0.001*
	(0.001)	(0.000)	(0.000)	(0.000)
Tangibility	0.060***	0.116***	0.117***	0.115***
	(0.014)	(0.012)	(0.013)	(0.013)
M/B	0.003**	0.003***	0.002***	0.002***
	(0.001)	(0.000)	(0.000)	(0.000)
R&D Intensity	-0.005	0.094***	0.057***	0.060***
	(0.022)	(0.014)	(0.015)	(0.015)
N	9,856	12,847	13,740	13,740
Firm FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes

Table 11 – Credit Spreads

This table examines whether hedging choices affect credit spreads during distress. There are four distress indicators – *EDF Jump*, *EnterFinDistress*, *FinDistress,* and *LOC Shock*. *PO_Hedge* equals one if the firm uses purchase obligations exclusively and equals zero if the firm uses any derivatives. The first four columns examine the full sample while the later four columns limited the sample to financially weaker firms (relative to median EDF). Regressions include both firm and industry-year fixed effects and control variables are suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Average Spread							
	All				Financially Weaker			
*PO_Hedge*EDF Jump*	-6.827				-19.426*			
	(7.450)				(9.226)			
*PO_Hedge*EnterFinDistress*		-41.427**				-62.483***		
		(13.982)				(15.975)		
*PO_Hedge*FinDistress*			-17.072*				-30.816**	
			(8.228)				(9.908)	
*PO_Hedge*LOC Shock*				-2.606				-6.070
				(10.643)				(15.972)
EDF Jump	0.375				10.855+			
	(4.925)				(6.017)			
EnterFinDistress		17.874**				22.422**		
		(6.913)				(7.763)		
FinDistress			1.152				8.112	
			(4.606)				(5.731)	
LOC Shock				4.162				5.725
				(5.536)				(7.521)
PO_Hedge	9.82	8.850+	9.375*	7.502	9.079	11.371	16.691*	9.457
	(6.236)	(5.222)	(4.774)	(4.662)	(12.085)	(8.144)	(7.726)	(7.472)
N	977	1,167	1,293	1,293	489	670	741	741
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix A

We use a simple liquidity management model along the lines of Holmström and Tirole (1998). Start with an initial (date-0) investment = I, which is fixed. The firm also starts with net worth A > 0. The investment produces a payoff R at the final date (date 2). At date-1, the firm has to make an additional (random) investment to continue the project. If this investment is not made, the project is liquidated and produces zero. With probability λ, the required investment is ρ, and it is zero in the other state. We assume that $\rho < R$ (so that continuation is efficient in state λ), and that $R > I + \lambda \rho$ (so the project is positive NPV). Everyone is risk-neutral, and the discount rate is 1 for simplicity.

The main friction is that the firm faces a limited pledgeability constraint. As in Holmstrom and Tirole, limited pledgeability arises from a moral hazard problem. In order to produce the payoff R, the manager must retain an amount equal to $R^b < R$. If the manager's share of the payoff is less than R^b, the manager misbehaves and chooses an (inefficient) action that reduces the overall payoff but produces private benefits for the manager. Thus, pledgeable income is equal to $\rho_0 = R - R^b$.

We assume that $\rho_0 < \rho$. This assumption means that the manager cannot generate sufficient pledgeable income to pay for the random investment in case it happens and must hold liquidity (see Almeida, Campello, Cunha and Weisbach (2014) for further discussion). We assume that the firm holds cash to manage the exposure to the random investment. The minimum amount of cash that the firm must hold is:

$$C^* = \rho - \rho_0 \qquad (1)$$

Following Holmström and Tirole (1998), we assume that there is a liquidity premium q associated with cash holdings (the firm pays a price q > 1 for cash at the initial date 0). Given this, the firm will be able to continue in state λ if:

$$A + \rho_0 > I + \lambda\rho + (q - 1) C^* \qquad (2)$$

We assume that this condition holds (that is, the firm has sufficient pledgeable income to fund I, λρ and the date-0 liquidity premium). The associated payoff is:

$$U^* = R - I - \lambda \rho - (q - 1) C^* \qquad (3)$$

which we assume to be greater than zero (the project is still positive NPV after accounting for the liquidity premium).

In addition to the shock in state λ, the firm is exposed to a (zero mean) additional shock which is modeled as in Almeida, Hankins and Williams (2017). With probability x = 0.5, there is a shortfall equal to −μ, and with probability (1 − x) = 0.5 the firm gains μ. The key difference between this shock and the previous one is that the exposure associated with x can be hedged, either with an operational hedge or derivatives. For example, we can assume that the variation in the required investment ρ is not contractible (it is firm-specific and due to the firm's own performance) while the exposure μ is due to variation in input prices. State x is a state in which input prices are high.

How does the exposure associated with x affect the firm? Notice that eliminating the exposure in state 1 − λ is irrelevant. It reduces the variance of cash flows but has no effect on investment policy or the firm's payoff. On the other hand, in state λ, the firm has an incentive to eliminate this exposure because it will cause inefficient liquidation. If the firm holds cash equal to C^* and input prices go up (state x), then the firm will face a shortfall equal to −μ and will not have sufficient pledgeable income to continue.

Next, we assume that the firm can choose the fraction of the required investment $\rho + \mu$ that it decides to pay in the bad state λx (partial liquidation). One possible interpretation is that the firm reduces its demand for inputs and thus needs to scale down if both shocks ρ and μ happen. We denote this fraction by θ, so that the firm invests $\theta(\rho + \mu)$. We assume that if $\theta < 1$ there is a linear effect on both the payoff of the investment and pledgeable income. The total payoff goes to θR, and pledgeable income goes to $\theta\rho_0$.

Hedging with futures

The firm can hedge the risk associated with x by opening a futures position. The firm commits to making a payment, which we denote by $f \leq \mu$, if the shock does not happen in exchange for receiving a payment equal to f if the shock does happen. For each f, and given the optimal cash holding of C^*, the firm's budget constraint in state $\lambda(1 - x)$ is:

$$\rho_0 + C^* - f = \rho - \mu. \qquad (4)$$

The firm always continues in this state since $C^* = \rho - \rho_0$ is sufficient to cover the shortfall in pledgeable income. In state λx, there can be partial continuation and thus the budget constraint is:

$$\theta\rho_0 + C^* + f = \theta(\rho + \mu). \qquad (5)$$

The firm's hedging position f is a function of the fraction that the firm chooses to continue:

$$f(\theta) = \theta\mu - (1 - \theta) C^* = \theta\mu - (1 - \theta)(\rho - \rho_0) \qquad (6)$$

In particular, if $\theta = 1$ (no liquidation), we must have full hedging ($f = \mu$). Partial liquidation allows the firm to reduce its hedging position to $f(\theta) < \mu$.

The main friction associated with futures comes from the margin account that the firm needs to open with the futures exchange. We assume that the required amount is given by ζf, with $\zeta < 1$. The margin account will then be equivalent to an increase in cash holdings (it needs to be in place at date-0). Assuming that the exchange pays an interest rate on the margin account which is equivalent to what the firm earns on liquid assets, the margin account will create a liquidity premium equal to (q - 1)ζf. Thus, when using futures the firm will achieve the following payoff:

$$U_f(\theta) = (1-\lambda)R + (\lambda/2)(R - \rho) + (\lambda\theta/2)(R - \rho) - (q - 1)(C^* + \zeta f(\theta)) - I =$$

$$= R - I - \lambda\rho - (\lambda(1 - \theta)/2)(R - \rho) - (q - 1)(C^* + \zeta f(\theta)) \quad (7)$$

In this expression the term (λ(1-θ)/2)(R – ρ) is the cost of liquidating the project (which happens with probability λ(1-θ)/2), and (q – 1) ζf(θ) is the cost of the margin position. We assume that partial liquidation of the project reduces the payoff function $U_f(\theta)$, that is:

$$\frac{\partial U_f(\theta)}{\partial\theta} = \frac{\lambda}{2}(R - \rho) - (q - 1)\zeta(\mu + \rho - \rho_0) > 0 \quad (8)$$

If this assumption does not hold, the futures position is too costly implying that the optimal θ is zero. Assumption (8) rules out this trivial case.

The futures position f(θ) is feasible when:

$$A + \rho_0 + (\lambda(1 - \theta)/2)(\rho - \rho_0) \geq I + \lambda\rho + (q - 1)(C^* + \zeta f(\theta)) \quad (9)$$

In this expression, notice that partial liquidation θ < 1 relaxes the feasibility constraint. Thus, given the assumption in (8), the optimal solution with futures hedging is to pick the highest possible θ that satisfies equation (9).

Result 1: Under futures hedging, the optimal θ is equal to min (θ*, 1), where θ* is defined as:

$$A + \rho_0 + (\lambda(1 - \theta^*)/2)(\rho - \rho_0) \geq I + \lambda\rho + (q - 1)(C^* + \zeta f(\theta^*)) \quad (10)$$

Notice that θ* is an weakly increasing function of A and ρ_0. The associated futures position is:

$$f(\theta^*) = \theta^*\mu - (1 - \theta^*)(\rho - \rho_0) \quad (11)$$

And the payoff is given by Equation (7) evaluated at θ*.

Hedging with purchase obligations

Next, we model hedging using non-cancelable supply contracts (purchase obligations or POs). If one assumes that the exposure μ is due to variation in input prices then hedging with POs is equivalent to contracting on date-0 on a fixed price that does not depends on the specific realization of input prices. This position can be interpreted as a position in a forward contract. The firm commits to making a payment of $F \leq \mu$ to the supplier if input prices decrease, and receives a payment equal to F if input prices increase.

Given that the variation in input prices is zero mean, the actuarially fair date-0 price would be zero. However, given that the supplier may have some bargaining power, the price is likely to be positive (and increasing with the supplier's bargaining power). Thus, the ex-ante price for a forward position of F is $kF > 0$.

The key advantage of a forward contract with a supplier is that it can relax financing constraints. As is standard in the trade credit literature, the supplier may be in a position to extract more pledgeable income from buyers relative to external investors due to the value of the trading relationship, better monitoring technology or additional information about the customer. We capture this idea by assuming that pledgeable income goes up to $\rho'_0 > \rho_0$ for contracts that have the supplier as a counterparty. Other than a purchase obligation, customers and supplier can use trade credit to mitigate the variation in input prices.

We assume throughout that the increase in pledgeable income is sufficient to pay the premium in the forward contract. That is, $k\,\mu \leq \rho'_0 - \rho_0$. We also assume that hedging with the supply contract increases the firm's payoff, which requires that $\frac{\lambda}{2}(R - \rho) > k\,\mu$.

Under these assumptions the feasibility constraint for a forward contract is the same as in the case with no hedging (equation (2) above). Thus, with the forward contract partial liquidation is never optimal ($\theta_F = 1$). In particular, the firm always chooses a forward position equal to $F^* =$

μ (full hedging). The firm's ex-ante payoff is however reduced by the magnitude of the forward premium:

$$U_F = R - I - \lambda \rho - (q - 1) C^* - k\mu \qquad (12)$$

In addition, notice that we are assuming that cash holdings are constant at C* in both cases (hedging with futures or forwards). There can be meaningful interactions between hedging and optimal cash holdings in both cases. In particular, the firm may be able to use the additional pledgeable income $\rho'_0 - \rho_0$ to reduce cash holdings. In that case the financing advantage of purchase obligations may increase. We abstract from this possibility for now.

Before analyzing the trade-off between forwards and futures, consider the possibility that the firm may borrow from the supplier to mitigate the negative shock μ. That is, conditional on being in the bad state λx the firm can use the additional pledgeable income $\rho'_0 - \rho_0$ to raise funding to pay for the outflow μ. That possibility, which would capture trade credit financing, requires the firm to have sufficient pledgeable income to pay for μ. That is, it requires that $\rho'_0 - \rho_0 \geq \mu$. In addition, as in the discussion above it is likely that the supplier will be in a position to charge a premium for the trade credit financing. Denote this premium by k_μ. The feasibility constraint for trade credit is then that $\rho'_0 - \rho_0 \geq (1 + k_\mu)\mu$.

Notice that this feasibility constraint is very likely to be tighter than that for the purchase obligation ($\rho'_0 - \rho_0 \geq k\mu$). There is no reason why k_μ should be lower than the premium k that the firm pays for the forward contract. More importantly, the key advantage of the forward contract is that the firm can use it to transfer cash across states. In exchanging for receiving a transfer of cash equal to μ in the bad state λx, the firm makes an additional payment μ in the good state $\lambda(1\text{-}x)$. This transfer of cash across states cannot be replicated by trade credit financing since it is a "spot contract”. That is the main reason why the purchase obligation is likely to relax financing constraints by more than trade credit financing.

We summarize this discussion in the following result:

Result 2: Under forward (purchase obligation) hedging, if $k\,\mu \leq \rho'_0 - \rho_0$ and $\frac{\lambda}{2}(R - \rho) > k\,\mu$, the optimal continuation policy is $\theta = 1$ and the forward position is $F^* = \mu$ (full hedging). The associated payoff is given by U_F in equation (12). In addition, if $k < 1 + k_\mu$, the purchase obligation weakly dominates trade credit financing.

Given results 1 and 2 it is straightforward to compare the payoffs of the two options (futures and forwards) and derive implications. We have that:

$$U_F - U_f(\theta^*) = (\lambda(1 - \theta^*)/2)(R - \rho) + (q - 1)\,\zeta f(\theta^*) - k\mu \qquad (13)$$

Thus the analysis generates the following implications, which are summarized in result 3:

Result 3: The firm is more likely to choose forwards over futures if

- k is small;
- A and ρ_0 are small;
- $\lambda\,(R - \rho)$ is large;
- $(q - 1)\,\zeta$ is large.

The first result is obvious given that k captures the forward premium. The second result comes from the fact that increases in A, the original endowment, and ρ_0 relax the firm’s financing constraint and thus make futures hedging more appealing relative to forwards. The third result comes from the fact that using futures exposes the firm to liquidity risk when $\theta^* < 1$. Thus when the expected liquidation loss is high firms are more likely to choose forwards and this is increasing in R, the investment payoff. Finally, result 4 captures the fact that futures become less attractive if the required margin position is larger or costlier.

Finally, notice that the solution derived here has the property that $\theta^* \leq 1 = \theta_F$. Thus, firms that use the forward contract in equilibrium exhibit higher investment, conditional on the liquidity shock happening. This result is a direct consequence of the fact that purchase obligations relax financing constraints. If the cost of the purchase obligation is high (because suppliers have a lot of bargaining power for example), then some firms may find it optimal to use futures. Since futures contracts tighten financing constraints, firms that chooses futures may have to engage in partial hedging and invest less (e.g., liquidate more) in equilibrium to meet feasibility constraints.

Appendix B

This Appendix reports the definitions for the variables used in this study.

Variable Name	Definition
Hedging Characteristics	
PO User	Indicator variable that equals one if the firm reports using purchase obligations in its 10K, zero otherwise.
Derivative User	Indicator variable that equals one if the firm reports using commodity derivatives in its 10K, zero otherwise, using the list in Almeida, Hankins, and Williams (2017)
PO_Hedge	Indicator variable that equals one if the firm uses POs exclusively, zero if it uses commodity derivatives.
PO_Hedge, All	Indicator variable that equals one if the firm uses any POs, zero if it uses commodity derivatives exclusively.
Distress Variables	
EDF Jump	Indicator variable that equals one if the Bharath and Shumway's distance to default measure increases 5% over the prior year.
Fin Distress	Indicator variable that equals one if the firm has a Z-score less than 1.81 and it has a positive operating margin.
EnterFinDistress	Indicator variable that equals one if *FinDistress* moves from zero to one
LOC Shock	Indicator variable that equal one if the lead arranger on a firm's line of credit fails.
Firm Characteristics	
CAPEX	Capital expenditures (CAPX) scaled by total assets (AT)
Ln(TotalAssets)	The natural log of Compustat variable AT.
Book Leverage	Long term debt (DLTT) + debt in current liabilities (DLC) scaled by AT
COGS/Sales	Cost of goods sold scaled by total sales (COGS/REVT)
Tangibility	Almeida and Campello, 2007: (0.715*RECTR + 0.547*INVT + 0.535*PPENT)/AT
M/B	Market value of assets (AT + CSHO*PRCC_F - SEQ - TXDB)/ total assets (AT)
Accounts Payable	Accounts payables divided by total assets (AP/AT)
R&D Intensity	R&D (XRD) divided by total assets (AT)
Supplier Differentiated Goods	Combine Giannetti, Burkart, and Ellingsen (2011) classification of products as standardized or differentiated with BEA IO tables to calculate sales weighted proxy for proportion of upstream industries which produce differentiated products.
Supplier M/B	Combine M/B with BEA IO tables to calculate sales weighted proxy for supplier market power.
Vertical Integration	Firm level measure from Fresard, Hoberg, and Phillips (2020)

Appendix C1 – Distress Events and PO Initiations/Levels: Robustness

This table presents evidence that PO initiations are robust to the empirical specification and that distress affects the extensive not intensive margin. Panel A excludes *M/B* and *Book Leverage*. In Panel B, the first three columns estimate an OLS model with firm fixed effects and standard errors clustered at the firm level while the later three columns employ a logit with firm fixed effects. Panel C examine the level of purchase obligations. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

Panel A: Robust to Controls

	New PO		
EnterFinDistress	0.013*		
	(0.006)		
EDF Jump		0.009**	
		(0.003)	
LOC Shock			0.085***
			(0.007)
Ln (Total Assets)	0.011***	0.005	0.012***
	(0.003)	(0.005)	(0.003)
COGS/Sales	0.000	0.001	0.000
	(0.000)	(0.001)	(0.000)
Tangibility	0.036*	0.031	0.034+
	(0.018)	(0.029)	(0.018)
Accounts Payable	0.001	-0.004	0.002
	(0.008)	(0.034)	(0.008)
R&D Intensity	-0.004	-0.023	-0.004
	(0.013)	(0.023)	(0.013)
N	35,794	24,322	35,794
Firm FD	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes

Panel B: Robust to Specification

	New PO					
	Firm Fixed Effects, OLS			Firm Fixed Effects, Logit		
EnterFinDistress	0.014*			0.341+		
	(0.007)			(0.179)		
EDF Jump		0.009*			0.254*	
		(0.004)			(0.101)	
LOC Shock			0.085***			1.343***
			(0.007)			(0.135)
N	42,628	27,886	42,628	11,000	7,306	11,000
Industry*Year FE	Yes	Yes	Yes	No	No	No
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: PO Levels

	Purchase Obligations/Total Assets					
	All			Firms with Existing POs		
EnterFinDistress	-0.002			0.005		
	(0.002)			(0.008)		
EDF Jump		-0.002+			-0.003	
		(0.001)			(0.004)	
LOC Shock			-0.002			-0.005
			(0.003)			(0.008)
N	42,281	27,836	42,281	9,529	7,242	9,529
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes

Appendix C2 – Expected Distress Costs and PO Initiations: By Distress Measures

These tables replicate Table 3 with the disaggregated measures of distress.

	New PO								
EnterFinDist.	0.005			0.015*			0.001		
	(0.007)			(0.007)			(0.008)		
EDF Jump		0.006+			0.000			-0.003	
		(0.004)			(0.004)			(0.004)	
LOC Shock			0.068***			0.01			0.019
			(0.008)			(0.024)			(0.012)
*High R&D * Event*	0.047**			-0.009			0.027*		
	(0.017)			(0.014)			(0.012)		
*High VIX * Event*		0.009			0.015*			0.022***	
		(0.008)			(0.007)			(0.007)	
*Low Herf * Event*			0.047**			0.080**			0.090***
			(0.014)			(0.025)			(0.015)
High R&D	0.012***	0.010**	0.010***						
	(0.003)	(0.003)	(0.003)						
High VIX				0.009***	0.007*	0.001			
				(0.002)	(0.003)	(0.002)			
Low Herf							0.017***	0.022***	0.011***
							(0.003)	(0.004)	(0.003)
N	35,593	24,298	35,593	35,593	24,298	35,593	35,593	24,298	35,593
Firm FD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix C3 - Distress, Hedging, and Investment: Robust to *PO_Hedge* definition

These tables replicate Tables 5 (Panel A) and 6 (Panel B) using an alternative definition of *PO_Hedge*. *PO_Hedge2* equals one if the firms uses any purchase obligations and equals zero if the firm uses derivatives exclusively.

Panel A

	PO_Hedge2 = 1		*PO_Hedge2* = 0			
One Year Before EDF Jump						
Ln (Total Assets)	1,091	7.377	860	7.467	0.090	0.311
CapEx	1,084	0.066	857	0.118	-0.052	0.000
Tangibility	1,084	0.317	853	0.369	-0.051	0.000
LOC	1,091	0.754	860	0.812	-0.057	0.002
COGS/TA	1,090	0.599	860	0.587	0.012	0.663
Ln(OperMargin)	1,009	0.123	801	0.131	-0.008	0.619
One Year Before Entering Financial Distress						
Ln (Total Assets)	215	7.696	190	7.296	-0.400	0.023
CapEx	215	0.069	189	0.147	-0.078	0.000
Tangibility	214	0.301	187	0.380	-0.079	0.000
LOC	215	0.870	190	0.858	0.012	0.729
COGS/TA	215	0.422	190	0.383	0.039	0.358
Ln(OperMargin)	214	0.201	186	0.254	-0.053	0.002

Panel B

	Capital Expenditures $_t$ /Total Assets$_{t-1}$			
*PO_Hedge2*EDF Jump*	0.025*** (0.003)			
*PO_Hedge2*EnterFinDistr*		0.011* (0.005)		
*PO_Hedge2*FinDistress*			0.015*** (0.003)	
*PO_Hedge2*LOC Shock*				0.024*** (0.006)
EDF Jump	-0.037*** (0.003)			
EnterFinDistress		-0.021*** (0.004)		
FinDistress			-0.028*** (0.003)	
LOC Shock				-0.031*** (0.004)
N	9,811	13,686	13,686	13,686
Firm FE	Yes	Yes	Yes	Yes
Year*Industry FE	Yes	Yes	Yes	Yes
Firm Control Variables	Yes	Yes	Yes	Yes

Appendix C4– Distress, Hedging, and Investment: Robust to Lag *PO_Hedge*

This table examines how hedging choices affect investment during distress (replicating Table 6) but with *PO_Hedge* measured before distress. *PO_Hedge* equals one if the firm uses purchase obligations exclusively at t-2 and zero if the firm uses derivatives. Regressions include both firm and industry-year fixed effects. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets $_{t-1}$			
*PO_Hedge $_{t-2}$*EDF Jump*	0.026***			
	(0.004)			
*PO_Hedge $_{t-2}$*EnterFinDistress*		0.004		
		(0.006)		
*PO_Hedge $_{t-2}$*FinDistress*			0.018***	
			(0.004)	
*PO_Hedge $_{t-2}$*LOC Shock*				0.015*
				(0.006)
EDF Jump	-0.033***			
	(0.002)			
EnterFinDistress		-0.018***		
		(0.003)		
FinDistress			-0.030***	
			(0.003)	
LOC Shock				-0.024***
				(0.004)
PO_Hedge $_{t-2}$	-0.004	-0.001	-0.004	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Ln (Total Assets)	-0.021***	-0.021***	-0.021***	-0.021***
	(0.002)	(0.002)	(0.002)	(0.002)
Book Leverage	-0.053***	-0.041***	-0.036***	-0.041***
	(0.006)	(0.004)	(0.004)	(0.004)
COGS/Sales	-0.001	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Tangibility	-0.013	-0.013	-0.011	-0.015
	(0.016)	(0.013)	(0.013)	(0.013)
M/B	0.013***	0.003***	0.003***	0.003***
	(0.001)	0.000	0.000	0.000
Accounts Payable	0.103***	0.066***	0.059***	0.067***
	(0.025)	(0.011)	(0.011)	(0.011)
R&D Intensity	-0.058**	-0.003	-0.006	-0.003
	(0.021)	(0.014)	(0.014)	(0.014)
N	8,252	10,444	10,444	10,444
Firm FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes

Appendix C5 – Distress, Hedging, and Investment: Robust to Alternative Measures of Increasing Future Sales

This table provides evidence that increasing future sales do not drive the relationship between hedging and investment during distress (replicating Table 7) using alternative measures of increasing future sales. While Table 7 excluded firms with above the median change in sales from *t* to *t+1*, this table excludes firms with above the median change in sales from *t* to *t+2* (*Exclude Higher Two Year Future Sales*) and above the median industry-year adjusted change in sales from *t* to *t+1* (*Exclude Higher Ind-Adj Future Sales*). Regressions include both firm and industry-year fixed effects and control variables are suppressed for brevity. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	Capital Expenditures $_t$ /Total Assets $_{t-1}$							
	Exclude Higher Two Year Future Sales				Exclude Higher Ind-Yr Adj Future Sales			
*PO_Hedge*EDF Jump*	0.033***				0.034***			
	(0.007)				(0.006)			
*PO_Hedge*EnterFinDistress*		0.040**				0.029*		
		(0.014)				(0.012)		
*PO_Hedge*FinDistress*			0.026***				0.021**	
			(0.008)				(0.007)	
*PO_Hedge*LOC Shock*				0.020*				0.024**
				(0.009)				(0.009)
EDF Jump	-0.034***				-0.037***			
	(0.005)				(0.004)			
EnterFinDistress		-0.035***				-0.026***		
		(0.008)				(0.007)		
FinDistress			-0.029***				-0.031***	
			(0.005)				(0.004)	
LOC Shock				-0.020***				-0.022***
				(0.006)				(0.005)
PO_Hedge	0.002	0.001	-0.002	0.000	0.002	0.003	-0.001	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
N	3,100	3,888	4,259	4,259	3,617	4,660	5,041	5,041
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix D – Distress, Hedging, and Investment: Propensity Matched Samples

This table examines how hedging choices affect investment during distress but using propensity score matching to address pre-distress differences in investment levels. *PO_Hedge* equals one if the firm uses purchase obligations exclusively at t-2 and zero if the firm uses derivatives. *PO_Hedge2* equals one if the firms uses any purchase obligations and equals zero if the firm uses derivatives exclusively. Matching is done using Stata's *psmatch2* with no replacement using the more common *EDF Jump* distress event. Regressions include both firm and industry-year fixed effects. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

Panel A: Pre-Distress Capital Investment Match						
	N	Mean	N	Mean	Diff	P Value
	PO_Hedge = 1		*PO_Hedge* = 0			
Pre-Distress *CapEx*	857	0.080	857	0.112	0.032	0.000
	PO_Hedge2 = 1		*PO_Hedge2* = 0			
Pre-Distress *CapEx*	789	0.057	789	0.056	-0.001	0.733

Panel B: Distress, Hedging, and Investment with Matched Samples		
	Capital Expenditures $_t$/Total Assets$_{t-1}$	
*PO_Hedge*EDF Jump*	0.038*	
	(0.017)	
*PO_Hedge2*EDF Jump*		0.018+
		(0.009)
EDF Jump	-0.044**	-0.023***
	(0.013)	(0.007)
PO_Hedge	-0.034*	
	(0.016)	
PO_Hedge2		-0.007
		(0.011)
N	753	634
Firm FE	Yes	Yes
Industry*Year FE	Yes	Yes
Firm Controls	Yes	Yes

Appendix E – Instrumental Variable Analysis

We confirm that POs enable distressed firms to maintain higher investment using an instrumental variable analysis. For our instrumental variables (IV) tests, we require instruments correlated with both the choice of PO versus derivatives as well as the interaction of that variable with the distress variable. We use two instruments which relate to the choice between forwards and futures but are not directly related to within firm changes in investment. *Supplier Tangibility* captures contract settlement risk and is described in Section 4.2 while *% Input Traded* proxies for the availability of relevant derivatives and is described below. Then, we use the interaction of the instruments with the distress measure to instrument for the interaction. We present test statistics on the validity and strength of the instruments in the results section.

% Input Traded measures the availability of relevant derivatives for hedging. It is positively associated with the use of futures and negatively correlated with purchase obligations use (Almeida, et al., 2017). To construct this variable, we start with the November 2009 issue of *Futures* magazine to identify all six-digit Bureau of Economic Analysis' (BEA) Input-Output industries which are traded on a major financial exchange. *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, *% 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.

The instruments proxy for the availability and settlement risk of purchase obligation contracts. The validity of these instruments requires that they are not weak and satisfy the exclusion restriction. While the exclusion restriction cannot be tested directly, both instruments are a function of the derivatives market or the supplier industry, not the specific firm, and only fail the exclusion restriction if they are related to idiosyncratic firm-level investment changes.

Since our interest is in the interaction of hedging and distress, we must instrument for both *PO_Hedge* and *PO_Hedge*Distress*. Our instruments are *% Input Traded* and *Supplier Tangibility* as well as both variables interacted with the distress measure. This table below reports the coefficient estimates as well as the relevant test statistics related to first stage *F*-statistics, under-identification, and weak instrumental variables. The first system (columns 1-3) includes firm fixed effects and the second system (columns 4-6) includes both firm and year fixed effects. The test statistics in the baseline specification indicate no reason to believe that the instruments are weak or invalid with *F*-statistics of 27.39 and 46.69 for the first stage regressions predicting *PO_Hedge* and *PO_Hedge*FinDistress*, respectively. The inclusion of year dummies weakens the first stage *F*-statistic for one of the first stage regressions (*PO_Hedge*). The first stage *F*-statistics are 5.95 and 46.93 when year effects are included. While the lower *F* statistic could be concerning, it should be noted that the inclusion of year dummies has little impact on the coefficients of interest in terms of magnitude or statistical significance. Both specifications find a negative relationship between distress and investment that is offset for firms with purchase obligations. The evidence using an instrumental variables analysis continues to support the hypothesis that POs enhance the ability of firms to invest in distress.

Distress, Hedging, and Investment: IV Estimates

This table reports multivariate instrumental variables (IV) estimates that predict *CAPEX*. We instrument for *PO_Hedge* (the choice between PO and derivatives hedging) using *% Input Traded* and *Supplier Tangibility*, as well as the interaction between those variables with the distress measure for *PO_Hedge*FinDistress*. All models also contain control variables and firm fixed effects. Standard errors are clustered at the firm level and are robust to arbitrary heteroskedasticity. Standard errors are reported in parentheses and ***, **, *, and + represent statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

	IV without Year Dummies			IV with Year Dummies		
	First Stage		Second	First Stage		Second
	PO	***PO*Dist.***	***CapEx***	***PO***	***PO*Dist.***	***CapEx***
	(1)	(2)	(3)	(4)	(5)	(6)
% Input Traded	-0.194***	0.052***		-0.218***	0.049**	
	(0.000)	(0.009)		(0.000)	(0.015)	
Supplier Tang	-1.208***	0.322***		-0.344*	0.576***	
	(0.000)	(0.000)		(0.062)	(0.000)	
*%Trade*FinDist.*	0.134	-0.107		0.169	-0.095	
	(0.242)	(0.409)		(0.131)	(0.463)	
*SupTang*FinDist*	-0.213	-3.079***		-0.290	-3.109***	
	(0.405)	(0.000)		(0.255)	(0.000)	
Fin Distress	0.043	1.330***	-0.072***	0.054	1.335***	-0.059***
	(0.523)	(0.000)	(0.010)	(0.411)	(0.000)	(0.012)
*PO_Hedge*FinDist*			0.078***			0.066**
			(0.017)			(0.020)
PO_Hedge			-0.124***			0.129**
			(0.022)			(0.049)
Ln (Assets)	0.020***	0.001	0.016***	0.000	-0.005	0.019***
	(0.001)	(0.883)	(0.002)	(0.958)	(0.233)	(0.002)
M/B	0.001**	0.000	0.001***	0.001*	0.000	0.001**
	(0.038)	(0.428)	(0.000)	(0.099)	(0.349)	(0.000)
Sales	-0.0151*	-0.013***	0.013***	-0.012	-0.012**	0.018***
	(0.092)	(0.009)	(0.003)	(0.172)	(0.018)	(0.003)
AP	-0.013	0.010	0.012	-0.024	0.006	0.015
	(0.430)	(0.478)	(0.011)	(0.146)	(0.682)	(0.011)
R&D Intensity	0.060**	-0.008	0.025*	0.036	-0.014	0.025*
	(0.025)	(0.638)	(0.010)	(0.191)	(0.403)	(0.010)
N	13,987	13,987	13,987	13,987	13,987	13,987
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	No	No	No	Yes	Yes	Yes
First Stage F Stat	27.650	36.890		6.340	37.750	
First Stage P Value	0.000	0.000		0.000	0.000	
Underidentification			0.000			0.000
Weak Iden F Stat			27.683			6.206
StockYogo 10%Value			7.560			7.560