Do Firms Hedge During Distress?

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Abstract:
Recent empirical studies find that firms are less likely to use financial derivatives as they approach distress, even though theory predicts risk management is more valuable in these situations. We revisit this literature by expanding the definition of hedging to include purchase obligations (POs) - non-cancelable forward contracts with suppliers. Firms rely on POs during distress, often switching from derivatives to these contracts. Firms also initiate POs in response to liquidity shocks. Moreover, compared to hedging with derivatives, hedging with POs enables higher investment levels during times of financial distress. Firms adjust – but do not cease - hedging near distress and this mitigates underinvestment.

1. Introduction

How do firms manage risk and do risk management decisions depend on a firm's financial condition? Expected distress costs should 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 has 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. Consistent with this intuition, firms appear to stop using financial derivatives as they approach distress (Purnanandam, 2008; Rampini, Sufi, and Viswanathan, 2014). 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 the ability to hedge 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 are generally less explored in the academic literature. By expanding the definition of hedging beyond exchange-traded derivatives to include these forward contracts, we document that firms continue to hedge as they approach distress, often switching from financial derivatives to purchase obligations. Our evidence therefore supports a more holistic view of risk management, similar in spirit to Bolton, Chen, and Wang (2011) and Almeida, Campello, Cunha, and Weisbach (2014) which connect derivatives hedging to broader liquidity management. Moreover, we show that PO usage enables firms to maintain higher investment levels in distress, consistent with theoretical predictions in Froot *et al* (1993).

There are numerous reasons why PO contracts may be 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., Garcia-Appendini and Montoriol-Garriga, 2013). Even if firms in distress are barred from traditional derivative markets due to collateral constraints, their suppliers may still be willing to write forward contracts. Suppliers also 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). If the customer is likely to continue its operations, the expected value of its long-term cash flows to the supplier may offset any 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 to customers during distress.

Our results confirm that firms increase purchase obligation usage as their financial condition worsens. A potential concern with these results is that the standard proxies for distress (such as Z-scores) may capture economic rather than financial distress. In our baseline results, we distinguish between financial and economic distress using operating margins. Financial distress leads firms to stop using derivatives and to initiate the use of purchase obligations, while firms entering economic distress do not show increased propensities to use purchase obligations. In addition, we also consider the impact of a likely exogenous shock to financial constraint. Specifically, we use the failure of a firm's line of credit lead arranger as a shock to a firm's financial condition (Sufi, 2009, Chava and Purnanandam, 2011). Firms experiencing this shock

increase their usage of purchase obligations, relative to firms that do not suffer this financial shock. This evidence supports the hypothesis that firms adjust their hedging choices as their financial condition deteriorates and that suppliers play a role in the risk management policies of financially distressed firms.

Next, we study the effect of existing purchase obligations on investment during times of distress. We start by comparing the investment behavior of firms that hedge with purchase obligations (PO hedgers) with firms that hedge with derivatives (futures hedgers) – a control group of firms which are on average larger and financially stronger (Almeida, Hankins, and Williams, 2017). We find that PO hedgers invest relatively more than futures hedgers during distress events. Although a firm's hedging decision is endogenous, limiting the sample to active hedgers and making financial hedgers the control group minimizes the potential bias. All of these firms actively manage input cost volatility and the control group should have greater financial flexibility. Further, since our hypothesis that distress leads to an increased reliance on forward contracts with suppliers corresponds with evidence from the trade credit literature, we ensure that changing trade credit relationships do not drive our results.

We employ two additional approaches to address endogeneity concerns. First, we consider a specification in which we use the failure of a firm's line of credit lead arranger as a shock to a firm's financial condition to better distinguish between financial and economic distress. Next, we instrument for the presence of PO hedging (relative to futures hedging) using supplier industry characteristics. With each approach, we document higher capital expenditures for PO hedgers relative to futures hedgers following distress.

We therefore uncover evidence that supports the prediction in Froot et al (1993) that hedging during distress may alleviate underinvestment. It also is consistent with Petersen and

Rajan (1997), which suggests that suppliers will assist customers in financial distress but not in economic distress. In highlighting the importance of purchase obligations to firms in distress, our paper contributes to the literatures on the impact of financial distress (Opler and Titman, 1994; Andrade and Kaplan, 2002; Campello, *et al.*, 2011), the interaction between product markets and corporate hedging (Adam, Dasgupta, and Titman, 2007), and how constrained firms manage risk (Fehle and Tsyplakov, 2005; Rampini and Viswanathan, 2010).

This paper is organized as follows. Section 2 describes our hand-collected data on purchase obligations and derivatives use as well as the rest of the panel data used in the analysis. Section 3 documents changing risk management choices as firms enter distress. Although this conclusion is consistent with evidence from the trade credit literature on the importance of suppliers to firms in distress (Petersen and Rajan, 1997), it contradicts the implication that distressed firms stop hedging (Rampini, Sufi, and Viswanathan, 2014). In Section 4, we document that distressed firms with purchase obligations maintain higher investment levels – consistent with Bessembinder (1991) and Nance, Smith, and Smithson (1993). By including purchase obligations, we gain a broader picture of how distressed firms operate and a richer understanding of product market relationships. This has important implications for agency conflicts in distressed firms (e.g., Stulz, 1990, Purnanandam 2008). Section 5 concludes.

2. Data

2.1. Purchase obligations, commodity derivatives, and investment

Our variable of interest is a firm's use of purchase obligations. However, we limit our control group to financial hedgers to avoid the concern that firms with purchase obligations are financially stronger or more sophisticated at risk management than the average firm. *PO_Hedge*

is an indicator variable which equals one if the firm uses a purchase obligation (*PO Contract*) and zero if the firm uses commodity derivatives (*Commodity Contract*). *PO Contract* is an indicator variable that equals one if the firm reports using a purchase obligation, and zero otherwise. A purchase obligation contractually obligates the customer to purchase a specific quantity at a predefined price from a supplier, thereby resembling a forward contract. All firms are required to report these contracts in 10-K filings since December 15, 2003.[1] 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. We also use collect the total dollar amount of POs committed to over the next five years to create a continuous variable. We scale the sum of PO commitments by cost of goods sold in the prior year to create *PO/COGS*.

Commodity Contract is an indicator variable equal to one if the firm reports using commodity derivatives in its 10-K filings, and zero otherwise. We follow the methodology in Almeida, Hankins, and Williams (2017) and use 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) and Almeida, Hankins and Williams (2017), who note that a large percentage of a firm's risks are unhedgeable with traditional derivatives.

This paper examines both the form of hedging as firms approach distress as well as the impact of hedging on investment during 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 CAPEX not total assets and our goal is to interpret the effect of the numerator.

[1] One exception is for small businesses with revenues and a public float less than $25 million.

2.2. Financial Distress and Shocks

Although our broad focus is on whether firms adjust risk management in distress, we recognize that the form of distress may matter. Suppliers may assist financially distressed but economically viable customers yet avoid more seriously economically distressed firms. We define corporate distress as an Altman's (1968) Z score less than 1.81 and entering distress is based on a change in that variable relative to the prior year. Following Andrade and Kaplan (1998), *Financial Distress* equals one if the firm has a positive operating margin but is in distress (as defined by Z-score less than 1.81) while *Econ Distress* equals one if the firm has a Z-score less than 1.81 and a negative operating margin.

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. 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).

2.3. Instruments and other control variables

We additionally control for *Ln(Total Assets)*, defined as the natural log of the firm's total book assets, *Sales*, defined as the firm's total revenues divided by total book assets, and *R&D Intensity*. Further, since trade credit may play a role in the supplier/customer purchasing relationship, especially during times of distress, we control for *AP* in our tests, defined as the firm's outstanding accounts payables divided by total assets. All variables are defined in the Appendix.

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 the instrument *Supplier Tangibility*, which relates to the choice between risk management tools but is not directly related to within firm changes in investment. Then, we use the interaction of the supplier tangibility instrument 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.

The intuition for our instrument is that *Supplier Tangibility* relates to supply contract settlement risk and the usefulness of purchase obligations as a hedge. We calculate each supplier industry's *Tangibility* following Almeida and Campello (2007) and then use two-digit NAICS codes to construct *Industry Tangibility* as the median industry measure. We then sales weight these industries using the 2002 Bureau of Economic Analysis' (BEA) benchmark Input-Output (IO) tables to calculate *Supplier Tangibility*. For each customer industry, we weight each six-digit supplier industry characteristic by the percentage of input they supply to the customer industry according to the "Use" table from the Input-Output tables.

$$Supplier\ Tangibility\ = \sum_{\substack{i=1 \\ i \neq j}}^{n} Industry\ Input\ Coefficient_{ij}\ \times Industry\ Tangibility_{i}$$

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*. We map this weighted-average supplier industry variable from the BEA IO Tables to each firm's two-digit NAICS industry in Compustat. In order to generate instruments for the potentially endogenous interaction term, we multiply *Supplier Tangibility* by *Financial Distress*.

3. Distress and POs

3.1. Cross-sectional variation by distress

In contrast to the early theoretical literature on corporate hedging (i.e., Froot, Scharfstein, and Stein (1993)), Rampini, Sufi, and Viswanathan (2014) document that collateral constraints bind and distressed firms are less likely to use financial derivatives. Noting that Almeida, Hankins, and Williams (2017) find that POs are an alternative hedging tool, we begin by revisiting this question in a univariate setting in Table 2.

Panel A summarizes the pre-distress risk management choices of firms in the year before a firm enters either economic or financial distress. Firms entering economic distress are less likely to use derivatives or purchase obligations than firms entering financial distress, consistent with the literature that argues that distress may limit hedging options. However, firms entering financial distress show hedging levels on par to the full sample as reported in Table 1.

Next, we consider time-series changes in our PO and derivatives variables. First, we create *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. We also generate *New PO Contract*, which equals one if the firm reports using a PO at time *t* and no PO at *t*-1, zero otherwise. We then estimate *t*-tests based on the form of distress. A firm "enters" one of these distress conditions when the variable equals zero at *t*-1 and one at time *t*.

In Panel B, we document that firms are significantly more likely to stop using financial derivatives upon entering distress than firms which are not. However, the change in hedging is limited to the population entering financial distress. Moreover, we document a significant higher PO initiation in the *Financial Distress* subsample. As financially distressed firms cease using financial hedging, we observe an increased reliance on forward contracts with suppliers. The same cannot be said for the *Econ Distress* subsample, consistent with suppliers being unwilling to support customers with poor economic prospects (Petersen and Rajan (1997)).

Since Panel B indicates that firms entering financial distress appear to switch between using financial derivatives and using purchase obligations, we test this intuition directly in Panel C. We observe that firms which stop using derivatives are more likely to initiate a new PO contract. This is true whether we compare them to the full population of firms or limit the analysis to firms using derivatives in the prior year.

3.2. Multivariate tests – hedging and distress

Table 3 presents multivariate evidence on the changing hedging behavior near distress. We regress *New PO Contract* and *Stop Derivatives Use* on our distress measures but we now control for firm-level characteristics as well as industry and year controls to absorb unobserved heterogeneity. Panel A shows that firms entering financial distress are more likely to initiate purchase obligations and stop derivatives use. Conversely, we document no change for firms entering economic distress, who already likely faced more limited hedging options. Further, we explore switching between derivatives and purchase obligations. Panel B documents that firms which stop derivatives use are more likely to initiate a purchase obligation contract, but only if the

firm has a positive operating margin in the prior year. Suppliers appear willing to support financially distressed customers when the customer has relatively stronger economic prospects.

Table 4 presents multivariate evidence on the changing hedging behavior near distress. We examine changes in the level of PO use across subsamples based expected costs of distress as identified in Opler and Titman (1994). Specifically, we split the sample based on whether the firm operates in an industry with an HHI above/below the industry median, whether the firm's revenues are above/below $100 million, and whether the R&D investment is high/low (defined as above the median for non-zero R&D firms). As discussed by Opler and Titman, these firms may face higher costs of distress. For example, smaller firms may have more difficulty accessing external capital markets, rivals in concentrated industries have larger expected gains to eliminating financial weaker competitors, and firms in high-R&D supply chains produce more specialized products and are more at risk of losing customers when distressed. We expect to see firms increasing POs more in response to distress when they are in these three subsamples. Models 1 and 2 present the splits on HHI, Models 3 and 4 show results split on revenues, and Models 5 and 6 contain the results for R&D. While firms facing higher distress costs should increase their level of risk management, the use of purchase obligations may be moderated by supplier incentives. Consistent with the cost of distress literature, we find that *Enter Fin Distress* increases purchase obligation levels for concentrated industries and firms with high R&D. Interestingly, the size results are more consistent with the trade credit literature where larger downstream firms are more important to a supplier. We document that only larger firms entering financial distress increase their use of purchase obligations, most likely reflecting the willingness of suppliers to write those forward contracts.

We also evaluate how firms respond to an exogenous distress shock in Table 5. As noted in Section 2, *LOC_Shock* equals one if the firm's lead arranger on a line of credit failed during the

prior year. We run this analysis on the full sample as well as limiting it to financially healthy firms ($Z > 3$) to preclude the concern that the firm contributed to the bank's failure. Across both samples, firms exposed to a LOC shock are more likely to initiate a new PO contract. This is robust to the inclusion of industry or firm fixed effects and all regressions include year dummies and firm-level control variables. Coupled with existing evidence that distressed firms lose the ability to hedge through financial markets (i.e, Rampini, Sufi, and Viswanathan (2014)), firms appear to attempt to replace the lost ability to hedge in financial markets via product-market contracts. Interestingly, we document little relationship between the LOC shock and financial hedging. To the extent that the liquidity shock of losing the lead arranger on one's line of credit is unrelated to the firm's collateral position, we view these results as consistent with Rampini, Sufi, and Viswanathan. Like the evidence on POs, this speaks to the importance of hedging in distress.

4. Hedging, Distress, and Investment

4.1. Hedging, distress, and underinvestment – OLS results.

So far, we have shown hedging activity changes – but does not cease – as firms approach distress or experience an exogenous shock. 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. As discussed earlier, we compare PO users to firms using financial hedging (*PO_Hedge)* to minimize the concern that using POs is correlated with financial stronger firms (where suppliers are willing to write contracts). Focusing on this variable – and specific treatment/control group – allows us to highlight how the investment outcome varies with distress depending on the type of hedging. In other words, conditional on the firm's decision to hedge input costs, we are interested in whether their specific hedging choice (POs or derivatives) differently

affect the ability to invest in distress. We regress *CAPEX* on *PO_Hedge*, interacted with our distress measures discussed in Section 2.2. Specifically, we estimate several versions of the following empirical model in Table 6:

$$CAPEX_{it} = f_t + k_t + \alpha_t + \beta_1 DistressMeasure_{i,t-1} + \beta_2 PO\_Hedge_{i,t-1} + \beta_3 DistressMeasure_{i,t-1} * PO\_Hedge_{i,t-1} + \sum_{i=4}^{n} B_i\, Control + e. \quad (1)$$

where *i*, and *t* index firm and time, respectively. f_t, k_t, and a_t represent firm, time, and industry-year interacted fixed effects, respectively. Models 1-2 have industry-year interacted fixed effects to observe any industry-year specific unobservable heterogeneity. In models 3-4, we use firm fixed effects to absorb time-invariant firm unobservables and add year dummy variables to capture any time trends. Lastly, models 5-6 include both firm fixed effects and industry-year interacted dummies in our most fully saturated model. *DistressMeasure* represents either *Fin Distress* or *Econ Distress* depending on the model in the early tables and then is extended to an exogenous shock to financial constraint in later tables.

As expected both *Fin Distress* and *Econ Distress* both have significantly negative coefficients. This implies that both forms of distress lead to lower subsequent investment for firms hedging with derivatives (*PO_Hedge* = 0). As predicted by Froot, Scharfstein, and Stein (1993), the inability to hedge during distress leads to underinvestment. However, the result is more nuanced for PO users. The significantly positive interaction effects between *Fin Distress*PO_Hedge* indicates that firms using POs to hedge are less prone to the collateral-type problems affecting firms hedging via financial markets and this partially offsets the underinvestment problem in distress. We further note that *Econ Distress*PO_Hedge* generally is statistically insignificant, consistent with the argument that suppliers are only willing to assist

customers likely to survive as a going concern. The one significant coefficient on this interaction is in the model specification omitting firm fixed effects.

One potential 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 to distressed customers (e.g., Shenoy and Williams, 2017). Cunat (2007) and Garcia-Appendini and Monteriol-Garriga (2013) find that suppliers are liquidity providers during periods of financial constraint. The enhanced investment activity may therefore be the result of improved trade credit financing, and the PO usage would then be generated by a spurious correlation between increased trade credit activity and purchasing activity. Although we control for trade credit in our multivariate tests, we directly address this issue in our next set of tests.

In Table 7, we re-estimate our results in Table 6, but we omit firms that have experienced an increase in *AP* between *t*-1 and *t*. In other words, we eliminate firms with increases in trade credit in order to rule out any spurious effects driven by potential increases in trade credit discussed above. The results are largely consistent with those in Table 6. Interestingly, we again observe one specification where the coefficient on *Econ Distress*PO_Hedge* is significantly positive, perhaps suggesting that there may be times when POs enable higher investment even for economically distressed firms. However, this result is not robust to the inclusion of industry-year fixed effects and should be regarded with caution.

Broadly, the above results are consistent with the hypotheses that 1) firms that use commodity derivatives to hedge indeed face limitations when they are constrained, leading to an underinvestment problem, and 2) firms that use POs to hedge are able to partially offset this problem in financial distress. Next, we consider shocks to the firm's financial constraints as well as IV analyses.

4.3. Lead Lender Failures

We return to the line of credit shock and evaluate whether POs affect investment during an exogenous financial shock. Again, we compare PO users to derivative users. In Table 8, we regress *CAPEX* on *PO_Hedge * LOC_Shock*. Models 1, 3, and 5 are estimated on the entire sample. For Models 2, 4, and 6, we only include firms that are not distressed prior to the shock (Z > 3) both to ensure that we capture a true shock and reduce concerns about reverse causality, i.e. that financially constrained firms somehow cause the failure of their lead lenders. Models 1 and 2 include industry-year interacted fixed effects while Models 3-6 include firm fixed effects with either year or industry-year time controls. In five of the six specifications, we document significantly positive coefficients on *PO_Hedge * LOC Shock* – only losing significance in the financially healthy firms smaller subsample fully saturated with firm and industry-year interacted dummies. These results buttress the earlier evidence that hedging using purchase obligations enables firms to invest at higher levels following a financial shock than hedging with derivatives.

4.2. Instrumental Variables

Lastly, we explore the impact of hedging choice on investment during distress using an instrumental variable analysis. Since our interest is in the interaction of hedging and distress, we must instrument for both *PO_Hedge* and *PO_Hedge*Distress* (Models 1-3). We also include a set of tests (Models 4-6) where we instead use *PO_Dummy* and *PO_Dummy*Distress*, which allows us to utilize the entire sample. As discussed in Section 2.3, our primary instruments are *Supplier Tangibility and Supplier Tangibility*Distress*, which proxy for the settlement risk of purchase

obligation contracts (Almeida, Hankins, and Williams (2017)).[2] Note that we instrument for the interaction terms by using supplier tangibility interacted with the distress measure. Table 9 reports the coefficient estimates as well as the relevant test statistics related to over-identification, under-identification, and weak instrumental variables.

Our instrumental variable results in Table 9 confirm the evidence in earlier tables. The negative coefficient on the *Financial Distress* across both sets of models (Models 3 and 6) indicates a drop in investment related to financial condition while the interactions of *PO_Hedge* Financial Distress* and *PO_Dummy* Financial Distress* are consistently positive and statistically significant. That is, while investment drops around financial constraint, firms hedging with purchase obligations are better able to maintain their investment levels, relative to firms using futures and controlling for intertemporal heterogeneity in investment. Further, the test statistics in the baseline specifications indicate no reason to believe that the instruments are weak or invalid. We also note that in the first-stage models predicting the direct effect (i.e., PO_Hedge or PO_Dummy), the instrument Supplier Tangibility is significant (Models 1 and 4). In the first-stage models predicting the interaction terms *PO_Hedge* Financial Distress* and *PO_Dummy* Financial Distress,* the instrument *Supplier Tangibility*Financial Distress* is significant.

All of the multivariate analysis on the impact of PO during distress is consistent across Tables 6 - 9. Hedging with supply contracts appears to help firms alleviate the underinvestment problem for firms with financial (not economic) distress or those facing an exogenous shock. This buttresses earlier evidence that purchase obligations are a risk management tool (Almeida, Hankins, and Williams, 2017). Forward contracts with suppliers provide a useful hedge during times of distress, enabling higher investment levels than firms which hedge with derivatives.

[2] Note that our results are also robust to adding additional instruments, such as *% Input Traded*, which proxies for the availability of exchange-traded derivatives.

5. Conclusions

This paper reconsiders the question of how and whether firms hedge in distress. Although theory predicts that firms have stronger incentives to hedge as they approach distress (i.e., Froot et al, 1993), newer empirical evidence instead documents that such firms use less financial derivatives. To better consider the firm's full menu of hedging possibilities, we expand the definition of risk management to include purchase obligations. The trade credit literature highlights the important role of suppliers in assisting during times of financial distress. Consistent with this view, we find that firms entering financial distress are more likely to use POs than financial derivatives for hedging, even switching risk management from derivatives to supply contracts. Importantly, the ability to hedge using POs allows firms to minimize underinvestment during financial distress.

This paper highlights that firms continue to hedge in distress, but adjust their risk management choices. POs sidestep the collateral constraints associated with financial derivatives and appear to provide more flexibility for less-severely distressed firms. Although POs do not fully insulate firms from economic distress, risk management can affect investment levels for some firms.

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Appendix

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

Variable Name	Definition
Hedging Characteristics	
Purchase Obligation	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, zero if it uses commodity derivatives.
PO/COGS	Dollar value of PO commitments over next five years divided by cost of goods sold.
Distress Variables	
Z-score	Z-score from Altman (1968)
Financial Distress	Indicator variable that equals one if the firm has a Z-score less than 1.81 and it has a positive operating margin.
Econ Distress	Indicator variable that equals one if the firm has a Z-score less than 1.81 and it has a negative operating margin.
Firm Characteristics	
CAPEX	Capital expenditures at time t (CAPEX) scaled by total assets (AT) at time t-1
TotalAssets	Compustat variable AT.
Sales/Assets	Total sales scaled by total assets (REVT/AT)
AP	Accounts payables divided by total assets (AP/AT)
Supplier Characteristics	
% Input Traded	Percentage of the firm's input traded on futures markets, using the BEA tables and commodity derivative definitions from Almeida, Hankins, and Williams (2017)
Supplier Z-score	Weighted-average supplier industry Z-score, using the BEA tables.
Supplier Differentiated Goods	Weighted-average percentage of suppliers producing differentiated goods, using the BEA tables and the differenated goods definitions in Giannetti, Burkart, and Ellingsen (2011) and Rauch (1999).
Supplier Tangibility	Weighted-average percentage of suppliers' tangibility ratios, using the BEA tables and the tangibility definition from Almeida and and Campello (2007).
Supplier Market Leverage	Weighted-average supplier industry market leverage, using the BEA tables.

Table 1 – Summary Statistics

This table reports summary statistics for the key variables in the paper. All variables are defined in the Appendix.

Variable Name	Mean	Median	25th Pct	75th Pct	Std	N
Hedging Characteristics						
Purchase Obligation	0.23	0.00	0.00	1.00	0.42	50,534
Derivative User	0.19	0.00	0.00	0.00	0.39	50,534
PO_Hedge	0.64	1.00	0.00	1.00	0.48	15,117
Distress Variables						
Z-score	35.43	3.18	1.03	7.94	1230.25	39,781
Financial Distress	0.02	0.00	0.00	0.00	0.13	38,030
Econ Distress	0.02	0.00	0.00	0.00	0.13	38,030
Firm Characteristics						
CAPEX	0.05	0.02	0.01	0.06	0.08	45,720
Ln(TotalAssets)	5.96	6.08	4.32	7.62	2.43	45,993
Sales/Assets	0.85	0.67	0.26	1.18	0.81	45,956
AP	0.15	0.06	0.03	0.12	0.31	45,810
Supplier Characteristics						
% Input Traded	0.03	0.01	0.00	0.03	0.06	46,497
Supplier Z-score	3.50	3.50	3.15	3.90	0.51	50,295
Supplier Differentiated Goods	0.24	0.21	0.12	0.35	0.16	50,534
Supplier Tangibility	0.25	0.25	0.24	0.27	0.03	41,269
Supplier Market Leverage	0.31	0.31	0.28	0.34	0.05	50,295

Table 2 – Cross-sectional Differences in Hedging

This table presents cross-sectional differences hedging behavior for firms entering either economic or financial distress. Panel A documents differences before entering distress between the two groups. Panel B documents changes in hedging at the time of entering distress. Panel C documents switching between derivatives and purchase obligations. All variables are defined in the Appendix.

Panel A

	Entering Econ Distress			Entering Fin Distress				
	N	Mean	St Dev	N	Mean	St Dev	diff	Pr(T < t)
Commodity Hedger $_{t-1}$	998	0.144	0.352	920	0.272	0.445	0.127	0.000
PO Contract $_{t-1}$	998	0.138	0.345	920	0.234	0.423	0.095	0.000
PO/Total Assets $_{t-1}$	728	0.018	0.092	794	0.025	0.125	-0.004	0.107

Panel B

	Enter Distress			Not Entering Distress				
	N	Mean	St Dev	N	Mean	St Dev	diff	Pr(T < t)
Stop Derivatives Use								
Enter Fin Distress	920	0.032	0.175	48,651	0.018	0.132	-0.014	0.001
Enter Econ Distress	998	0.018	0.133	48,573	0.018	0.133	0.000	0.486
New PO Contract								
Enter Fin Distress	920	0.047	0.211	48,651	0.032	0.176	-0.015	0.006
Enter Econ Distress	998	0.031	0.174	48,573	0.032	0.177	0.001	0.585

Panel C

	Stop Derivatives Use			Not Stopping				
	N	Mean	St Dev	N	Mean	St Dev	diff	Pr(T < t)
New PO Contract								
Full Sample	923	0.046	0.209	49,611	0.032	0.175	-0.014	0.009
Derivatives User at t-1	923	0.046	0.209	6,675	0.036	0.187	-0.009	0.079

Table 3 – Distress and Hedging Choices

This table reports multivariate logit regressions that predict changes in risk management. Panel A documents binary changes in hedging at the time of entering distress (*New PO Contract*, *Stop Derivatives Use*). Panel B documents that switching from derivatives to purchase obligations is conditional on financial health. *Stop Derivatives* equals one of the firm ceases using financial derivatives. Firm controls include lagged Ln(Total Assets), Sales, R&D Intensity, and Accounts Payable. 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

	New PO Contract		Stop Derivatives Use	
Enter Fin Distress	0.331*		0.420*	
	(0.161)		(0.197)	
Enter Econ Distress		-0.021		0.154
		(0.190)		(0.258)
N	44874	44874	44729	44729
Firm Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes

Panel B

	New PO Contract					
	Positive Operating Margin $_{t-1}$			Negative Operating Margin $_{t-1}$		
Stop Deriv $_{t}$	0.306+	0.191		-0.252	-0.364	
	(0.170)	(0.173)		(0.520)	(0.525)	
Stop Deriv $_{t-1, t, t+1}$			0.219+			0.069
			(0.117)			(0.311)
Stop Deriv $_{t, t+1}$			0.255+			0.148
			(0.136)			(0.349)
N	31407	31135	31135	9370	9071	9071
Firm Controls	No	Yes	Yes	No	Yes	Yes
Industry Dummies	No	Yes	Yes	No	Yes	Yes
Year Dummies	No	No	Yes	No	No	Yes

Table 4 – Increased Use of POs

This table reports multivariate regressions that predict the continuous PO variable, *PO/COGS* where COGS is measured in the prior year. Following Opler and Titman (1994), we split the sample by median industry concentration (HHI), revenues above/below $100 million, and high/low R&D firms. Firm controls include lagged *Ln(Total Assets)*, *Sales*, *Accounts Payable*, and *R&D Intensity*. 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.

	PO/COGS$_{t-1}$					
	Industry Concentration		Sales		R&D	
	Above Med	Below Median	> $100m	< $100m	High	Low
Enter Fin Distress $_{t-1}$	0.055+	-0.022	0.037+	-0.080	0.189*	0.017
	(0.031)	(0.031)	(0.022)	(0.085)	(0.081)	(0.022)
Ln (Total Assets) $_{t-1}$	-0.015	-0.060***	-0.046***	-0.048	-0.097**	-0.035**
	(0.017)	(0.015)	(0.012)	(0.034)	(0.037)	(0.012)
Sales $_{t-1}$	-0.069**	-0.064**	-0.084***	-0.05	-0.248**	-0.065***
	(0.023)	(0.025)	(0.018)	(0.039)	(0.078)	(0.016)
AP $_{t-1}$	0.167	-0.179	0.105	-0.142	-0.627	-0.02
	(0.198)	(0.135)	(0.146)	(0.206)	(0.646)	(0.114)
R&D Intensity $_{t-1}$	0.017	-0.263*	-0.127	-0.075	0.142	-0.099
	(0.101)	(0.112)	(0.164)	(0.106)	(0.253)	(0.078)
N	4741	4745	8062	1424	1050	8436
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 – Exogenous Distress and Hedging

This table reports multivariate logit regressions that predict *New PO Contract* and *Stop Derivatives*. *LOC Shock* represents an exogenous financial shock - the failure to the firm's lead arranger on its credit line. To avoid concerns that the firm contributed to the bank's failure, we rerun all analysis with only financially health firms (Z>3). All models also contain control variables, along with firm, year, and industry 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.

	New Contract				Stop Derivatives			
	All		Z > 3		All		Z > 3	
LOC Shock $_{t-1}$	0.447**	0.536***	0.566**	0.757***	-0.171	-0.373	-0.104	-0.351
	(0.137)	(0.160)	(0.175)	(0.214)	(0.266)	(0.285)	(0.364)	(0.389)
Ln (Total Assets) $_{t-1}$	0.125***	0.152*	0.109***	0.135	0.106***	0.058	0.086***	0.118
	(0.011)	(0.073)	(0.014)	(0.093)	(0.015)	(0.094)	(0.022)	(0.142)
Sales $_{t-1}$	0.047	0.053	0.026	-0.009	0.058	0.036	0.079	0.088
	(0.041)	(0.117)	(0.048)	(0.151)	(0.050)	(0.134)	(0.062)	(0.205)
AP $_{t-1}$	-0.825**	0.266	-0.721*	0.001	-0.065	0.155	-0.333	0.81
	(0.302)	(0.465)	(0.339)	(1.009)	(0.181)	(0.410)	(0.328)	(1.406)
R&D Intensity $_{t-1}$	0.113	-0.195	0.228	-0.102	0.111	1.077	0.22	1.729+
	(0.190)	(0.462)	(0.239)	(0.597)	(0.344)	(0.660)	(0.522)	(1.041)
N	45773	11396	27954	7185	45628	6463	27672	3268
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes

Table 6 – Distress, Hedging, and Investment

This table reports multivariate regressions that predict *CAPEX* using *PO_Hedge* and a variety of distress measures. *PO_Hedge* equals one if the firms uses purchase obligations and zero if the firm exclusively uses derivatives. All models also contain control variables, along with a variety of firm, year, and/or 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.

	CapEx $_t$ / Assets $_{t-1}$					
PO_Hedge $_{t-1}$	-0.008**	-0.007**	-0.003	0.001	-0.002	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
*PO_Hedge*FinDistr* $_{t-1}$	0.009*		0.018***		0.012***	
	(0.004)		(0.003)		(0.003)	
*PO_Hedge*EconDistr* $_{t-1}$		0.013+		0.008		-0.002
		(0.008)		(0.006)		(0.006)
Fin Distress $_{t-1}$	-0.013***		-0.035***		-0.028***	
	(0.004)		(0.003)		(0.003)	
Econ Distress $_{t-1}$		-0.025***		-0.030***		-0.020***
		(0.007)		(0.004)		(0.004)
Total Assets $_{t-1}$	-0.002***	-0.003***	-0.024***	-0.026***	-0.022***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Sales $_{t-1}$	-0.007***	-0.007***	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
AP $_{t-1}$	-0.013***	-0.007+	0.008	0.011	0.008	0.011
	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)	(0.007)
R&D Intensity $_{t-1}$	-0.031***	-0.028***	-0.021+	-0.018	-0.017	-0.013
	(0.006)	(0.006)	(0.011)	(0.011)	(0.011)	(0.011)
N	14978	14978	14978	14978	14978	14978
Firm FE	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	No	No
Industry -Year FE	Yes	Yes	No	No	Yes	Yes

Table 7 – Distress, Hedging, and Investment –Robust to trade credit

This table reports multivariate regressions that predict *CAPEX* using *PO_Hedge* and a variety of distress measures. We omit all firms that experienced an increase in *AP*. *PO_Hedge* equals one if the firms uses purchase obligations and zero if the firm exclusively uses derivatives. All models also contain control variables, along with a variety of firm, year, and/or 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.

	CapEx $_t$ / Assets $_{t-1}$					
PO_Hedge $_{t-1}$	-0.008***	-0.006**	-0.003	0.001	-0.001	0.003
	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
*PO_Hedge*FinDistr* $_{t-1}$	0.009+		0.016**		0.011+	
	(0.005)		(0.006)		(0.006)	
*PO_Hedge*EconDistr* $_{t-1}$		0.010		0.027**		0.005
		(0.011)		(0.010)		(0.011)
Fin Distress $_{t-1}$	-0.013**		-0.030***		-0.026***	
	(0.004)		(0.005)		(0.005)	
Econ Distress $_{t-1}$		-0.016		-0.058***		-0.039***
		(0.010)		(0.008)		(0.008)
Total Assets $_{t-1}$	-0.003***	-0.003***	-0.026***	-0.027***	-0.021***	-0.023***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Sales $_{t-1}$	-0.011***	-0.011***	-0.005	-0.006+	-0.004	-0.005
	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
AP $_{t-1}$	0.003	0.007	0.035+	0.057**	0.040*	0.058**
	(0.007)	(0.007)	(0.018)	(0.018)	(0.019)	(0.019)
R&D Intensity $_{t-1}$	-0.039***	-0.037***	-0.028	-0.02	-0.018	-0.01
	(0.007)	(0.007)	(0.019)	(0.019)	(0.020)	(0.020)
N	7345	7345	7345	7345	7345	7345
Firm FE	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	No	No
Industry -Year FE	Yes	Yes	No	No	Yes	Yes

Table 8 – Exogenous Distress and Investment

This table reports multivariate regressions that predict *CAPEX* using *PO_Hedge* and *LOC Shock*. *LOC Shock* represents a failure to the firm's lead arranger on its credit line. All models also contain control variables, along with firm, year, 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.

	CapEx $_{t}$ / Assets $_{t-1}$					
	All	Z > 3	All	Z > 3	All	Z > 3
PO_Hedge $_{t-1}$	-0.006*	-0.006*	0.000	0.002	0.001	0.005
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
*PO_Hedge * LOC Shock* $_{t-1}$	0.015*	0.018+	0.021***	0.018*	0.010+	0.000
	(0.006)	(0.010)	(0.006)	(0.008)	(0.006)	(0.009)
LOC Shock $_{t-1}$	-0.012*	-0.015*	-0.011*	-0.006	-0.005	0.009
	(0.005)	(0.007)	(0.005)	(0.007)	(0.005)	(0.008)
Ln (Total Assets) $_{t-1}$	-0.002***	-0.003***	-0.026***	-0.016***	-0.023***	-0.017***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Sales $_{t-1}$	-0.006**	-0.007**	0.000	0.010*	-0.001	0.010**
	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)
AP $_{t-1}$	-0.013***	-0.011	0.008	-0.031	0.009	-0.053*
	(0.004)	(0.011)	(0.011)	(0.027)	(0.011)	(0.026)
R&D Intensity $_{t-1}$	-0.030***	-0.042***	-0.024*	-0.01	-0.019+	-0.013
	(0.006)	(0.009)	(0.010)	(0.012)	(0.010)	(0.011)
N	14978	9037	14978	9037	14978	9037
Firm FE	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	No	No
Industry -Year FE	Yes	Yes	No	No	Yes	Yes

Table 9 – IV Estimates

This table reports multivariate instrumental variables (IV) estimates that predict *CAPEX* using instrumented *PO_Hedge* and *PO_Hedge*Distress*. We instrument using lagged *Supplier Tangibility* and *Supplier Tangibility*Distress*. All models also contain control variables, along with a variety of firm and 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. All models include firm and year fixed effects.

	PO_Hedge $_{t-1}$ 1st Stage	*PO_Hedge * Dist* $_{t-1}$ 1st Stage	*CapEx* $_t$ / *Assets* $_{t-1}$ 2nd Stage	*PO_Hedge* $_{t-1}$ 1st Stage	*PO_Hedge * Dist* $_{t-1}$ 1st Stage	*CapEx* $_t$ / *Assets* $_{t-1}$ 2nd Stage
PO_Hedge $_{t-1}$			0.037+			
			(0.022)			
*PO_Hedge * Dist* $_{t-1}$			0.063***			
			(0.017)			
PO Dummy $_{t-1}$						-0.086***
						(0.015)
*PO_Dummy * Dist* $_{t-1}$						0.211***
						(0.044)
Supplier Tangibility $_{t-1}$	-1.189***	0.352***		-1.294***	-0.182***	
	(0.141)	(0.075)		(0.085)	(0.035)	
*SupTang*FinDistress* $_{t-1}$	-0.226	-3.102***		0.101	-0.917***	
	(0.254)	(0.272)		(0.184)	(0.183)	
Financial Distress $_{t-1}$	0.046	1.334***	-0.059***	-0.015	0.448***	-0.061***
	(0.066)	(0.072)	(0.010)	(0.047)	(0.047)	(0.010)
Total Assets $_{t-1}$	0.025***	0.003	-0.027***	0.064***	0.004*	-0.010***
	(0.007)	(0.004)	(0.003)	(0.004)	(0.002)	(0.001)
Sales $_{t-1}$	-0.012	-0.012*	-0.002	-0.002	-0.008***	0.004**
	(0.009)	(0.005)	(0.003)	(0.005)	(0.002)	(0.001)

(continued)

Table 9 (continued)

AP $_{t-1}$	-0.007	0.010	0.012	0.041***	0.004	0.005
	(0.015)	(0.014)	(0.009)	(0.008)	(0.003)	(0.004)
R&D Intensity $_{t-1}$	0.083**	-0.005	-0.029**	0.060***	0.011**	-0.003
	(0.028)	(0.018)	(0.009)	(0.016)	(0.004)	(0.004)
N	13986	13986	13986	39785	39785	39785
Firm FE	Yes		Yes	Yes		Yes
Year FE	No		Yes	No		Yes
First Stage F Stat	42.75	68.64		125.61	30.27	
First Stage F Stat P Value	0.000	0.000		0.000	0.000	
Underidentification P Value			0.000			0.000
Weak Identification F statistic			42.493			25.946
Stock Yogo 10% Threshold			7.03			7.03