Financial and Non-Financial Risk Management: OSHA Penalties from Random Plant Inspections*

Marie-Aude Laguna

Université Paris-Dauphine

Ryan Williams

University of Arizona

Abstract

We examine whether firms balance financial and non-financial risks in their overall risk-management strategies. Specifically, we test the hypothesis that changes in the firm's perceived (non-financial) supply-chain risks affect subsequent leverage and hedging decisions. Suppliers decrease debt and increase hedging activity when a key customer receives an OSHA penalty from a random site inspection. Our empirical results are inconsistent with several sources of reverse causality. Overall, the evidence suggests that financial risk management is only one component of a firm's overall risk management strategy, and that firms attempt to offset shocks to one source of risk by adjusting others.

Preliminary, do not circulate.

* marie-aude.laguna@dauphine.fr (Laguna) and rwilliams@email.arizona.edu (Williams).

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Introduction

Firms face a variety of financial and business risks, and managing these risks is a major activity of corporate executives. Although the extant finance literature often considers risk management in the form of corporate hedging, financial and operating leverage, and cash management policies, the literature in other business fields takes a broader view.[1, 2] For example, the operations management literature often perceives firms as facing a variety of operational risks in the course of business. In addition to financial risks such as commodity prices or interest rate risks, firms also face operational risks such as supply chain disruptions, product quality issues, cybersecurity risks, and natural disasters. We test the hypothesis that firms manage overall firm risk by adjusting financial leverage when they experience shocks to other business risks. Specifically, we focus on exogenous shocks to operational supply-chain risks. Our results suggest that when a firm experiences a shock that increases its non-financial supply-chain risk, the firm responds by decreasing financial risk. In addition to managing risk using a variety of financial tools (i.e., hedging versus cash), firms appear to manage financial risk itself as part of a larger risk management strategy that includes non-financial business risks.

A large literature documents that firms actively work to manage financial risks (i.e., Froot et al (1993), DeMarzo and Duffie (1995), Purnanandam (2008)). More recent research examines hedging behavior in the broad context of operational risk management and the firm's product market environment (i.e., Hankins (2011), Haushalter et al (2007), Almeida et al (2017)). Our

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[1] There is a large recent literature documenting effects of the firm's product-market environment on leverage. Serfling (2016) documents a relation between wrongful discharge laws and leverage, and Klasa et al (2018) find a relation between the Inevitable Disclosure Doctrine (IDD) and capital structure. Kale and Shahrur (2007) document that supplier (customer) leverage is lower when the level of customer (supplier) relationship-specific investments (RSI) is higher. Our study is unique in that it documents a substitution effect between financial and non-financial risk management within a firm.

[2] See, i.e., Acharya et al (2013), Bolton et al (2011), Bolton and Oehmke (2015), DeMarzo and Duffie (1995), Disatnik et al (2014), Graham and Rogers (2002).

paper builds on this literature by asking whether a firm balances its various risks, and modifies the level of financial risk in response to external changes in its other business risks.[3]

Our main theme in this paper is that customer OSHA violations are not material in a financial sense (to either the customer or the upstream reference firm), but can represent a negative signal to the supplier firm about its downstream supply-chain risk. In other words, OSHA penalties are generally too small financially to affect a firm's immediate cash flows. However, such penalties may signal that a customer underinvests in workplace safety or have other perceived increases in regulatory or legal risks. Further, given evidence in Cohn and Wardlaw (2016), and Hong, Scheinkman, and Kubik (2012), suppliers may interpret OSHA penalties as evidence of unobserved financial constraints for customers, which threaten future cash flows. Moreover, suppliers can update their beliefs about the customer's workplace safety, and infer that future production disruptions due to accidents are more likely, which are rare but severe shocks to cash flows. Safety violations generate bad publicity for firms and may also be linked to real effects (Cohn and Wardlaw (2016)). More specifically, such violations are explicitly noted in the supply chain risk literature and press as a "red flag" when a firm evaluates its supply chain partners. Therefore, safety violations by a supplier's customer are likely to signal increases in perceived supply-chain risks for a firm.

We specifically consider OSHA violations as a shock in our tests because these violations have several appealing empirical properties. First, our setting uses hand-cleaned data on customer OSHA violations and penalties discovered during random site visits to generate random variation in a firm's perceived supply chain risk. Since these violations typically arise during random site inspections, and OSHA violations by a firm's customer should be generally out of the control of

[3] Note that this is not the well-known "risk shifting" effect (i.e., Eisdorfer (2008)), where a firm has incentives to increase variance in an attempt to gamble its way out of financial distress, due to the limited liability of equity holders.

the firm (or its suppliers), our supply-chain shock plausibly represents exogenous variation in the supplier's perceived supply-chain risk. We also include supplier-customer paired fixed effects to control for unobserved characteristics for a matched supplier-customer pair. We document a negative relation between OSHA penalties by a customer and subsequent changes in leverage by the supplier firm, consistent with the firm balancing difference sources of risk. In order to verify that our effect is driven by *random* (rather than *non-random*) site inspections, we also consider variation between penalties resulting from random inspections and those resulting from accidents. Plant accidents often trigger mandatory OSHA inspections and any resulting violations and/or penalties are not random. Suppliers could plausible anticipate expected future penalties resulting from accidents and such penalties are unlikely to represent shocks. Consistent with this argument, the relation between supplier leverage and customer OSHA violations are driven only by penalties resulting from random inspections.

To further support this intuition, we also use time-series variation in OSHA enforcement, as its regulatory power was significantly weaker during the 1980s than in more recent years. Therefore, OSHA violations are likely to be a weaker signal of supply-chain risk during the 1980s. We document a significantly negative relation between customer OSHA penalties and subsequent supplier leverage only in the post-1991 period, when regulatory changes rendered OSHA more important and consistent with our main hypothesis.

Our results are also inconsistent with reverse causality, for example, the worry that the supplier's leverage at time *t* might in some way affect the probability of a customer's OSHA violation, or that the supplier can anticipate OSHA's random visits to its customers sites in some way. To overcome this potential concern, note again that we include firm-customer pairwise fixed effects in all regression models. Therefore, we capture the *ex-ante* leverage chosen by a specific supplier in relation with to its customer's OSHA shock. If suppliers were aware *ex-ante* of potential violations by their customers, and reduced their leverage in response, then this should be captured by the fixed-effects, and not by the coefficients on penalties. Second, as noted above, we separate penalties driven by random inspections from penalties following an accident, as the latter penalty may be anticipated in advanced by the supplier. Our results are driven by random inspections, consistent with our proposed empirical channel.

Further, in addition to estimating a timing test where we document an insignificant relation between current supplier leverage and future customer OSHA penalties, we also note that the results in Cohn and Warwick (2016) would suggest the opposite result if causality were reversed. Specifically, Cohn and Warwick document a negative relation between a focal firm's financial health and subsequent workplace safety issues for the same firm. A similar intuition is shared in the product market literature, which documents that other factors such as product quality and the viability of implicit contracts decrease as financial health worsens. In general, the extant literature documents that high leverage should negatively affect other supply-chain partners. Instead, this extant research, in combination with the results reported in this article, collectively suggest that the supplier will decrease its subsequent leverage in response to a supply-chain shock.

In order to confirm that our results represent a non-financial shock, we also consider whether the OSHA shock to the customer potentially worsens the future financial condition of either the customer or supplier. In such a case, the supplier's leverage decision could be a function of its own or its customer's financial performance and our tests would not truly disentangle financial risks from non-financial risks. However, we document no significant relation between a customer OSHA shock and subsequent sales growth or profitability for either the firm or its customer. We also find no significant announcement effects by the stock market in response to the

OSHA penalty announcement. We therefore document an adjustment to the financial risk of the supplier in response to a non-financial shock to the customer, consistent with our main prediction.

We further consider other avenues where the firm could adjust financial risk in response to changes in business risks, such as corporate hedging. For example, firms could also increase financial hedging activity in order to offset perceived increases in business risks. We indeed document that firms increase their financial hedging activity following an OSHA penalty to their key customers. Our evidence is therefore consistent with the supplier increasing financial risk management in response to a plausibly exogenous increase in non-financial supply-chain risk.

In addition to documenting other possibilities available to a firm to reduce its financial risk (i.e., hedging), we also consider other factors that can harm its customer's reputation or signal negative qualities. We therefore consider the effect of Corporate Social Responsibility (CSR) on our results. We document that firms whose customers have strong CSR scores appear to offset some of the decrease in leverage driven by OSHA shocks. Further, firms who have customers with strongly negative CSR scores (high levels of "concern" in the literature) decrease leverage even more if this customer experiences an OSHA shock. Our results therefore suggest that CSR behaves in a way similar to avoiding OSHA shocks. We note that some extant literature documents an overall negative effect on firms from CSR, considering CSR to be the manifestation of an agency problem (i.e., Masulis and Reza, 2015). Other literature notes that firms with better CSR scores performed better during the financial crisis (i.e., Lins et al, 2017). One potential interpretation of the conflicting extant literature in combination with our results is that CSR behaves like a reputational hedge. Specifically, CSR may be costly in "normal" states of the world but may pay off in "bad" states.

Our article relates to the traditional finance literature on risk management (i.e., Bolton et al (2011), DeMarzo and Duffie (1995), Disatnik et al (2014), Froot et al (1993), Gilje and Taillard (2017), Graham and Rodgers (2002), Guay and Kothari (2003), Haushalter (2000), Jin and Jorion (2006), Purnanandam (2008), Tufano (1996). We also contribute to a newer literature linking financial and operational hedging (i.e., Chen et al (2017), Gamba and Triantis (2014), Hankins (2011), and Petersen and Thiagarrajan (2000).

Our evidence is also consistent with research documenting that suppliers and customers respond to each other's actions, both ex-ante as well as when the equilibrium relationship experiences a shock (i.e., Costello (2013), Garcia-Appendini and Montoriol-Garriga (2013), Kale and Shahrur (2007), Shenoy and Williams (2017), and Titman and Wessels (1988). We also add to the recent literature exploring product-market dynamics in corporate hedging (Almeida, Hankins and Williams (2017), Haushalter, Klasa, and Maxwell (2007)).

We also add to the literature documenting an array of external product-market forces that can affect a firm's capital structure decisions, such as wrongful discharge laws (Serfling (2016)) and IDD laws (Klasa et al (2017)). Our results relate to the recent corporate finance literature on workplace safety (i.e., Cohn and Warwick (2016)), as well as the literature on Corporate Social Responsibility (CSR).[4]

[4] Various studies document that major CSR concerns such as industrial accidents, big fines triggered by violations of environmental or safety standards, have a significant negative short-term impact on stock returns (see for instance, Krüger, 2015). At the same time, whether CSR positive initiatives such investment in pollution abatement or in employee well-being have a significant impact on stock returns is much more nuanced and mixed (see, Margolis, Elfenbein, and Walsh, 2010, Krüger, 2015, and Flammer, 2016). This could be due to the fact that important CSR activities such as corporate giving/donations are also associated with agency problems (Masulis and Reza, 2015, Cheng, Hong, and Shue, 2016). Moreover, Servaes and Tamayo (2013) show that CSR activities are positively related to firm value only for firms that invest massively in advertising expenditures and customer awareness. More important to our study, Albuquerque, Koskinen, and Zhang (forthcoming) show that CSR activities are associated with less systematic risk because firms investing in CSR benefit from high product differentiation and higher profit margins. In the same vein, Gao, Li, and Ma (2018) shows that investment in stakeholders-oriented activities reduces a firm's risk of default. Finally, as already mentioned, Cohn and Wardlaw (2016), and Hong, Kubik, and Scheinkman (2012) show that financial constraints and financial distress explain why some firms chose to under-invest in safety and CSR in general.

1. OSHA Institutional Details

Our methodology uses OSHA violations and penalties as exogenous shocks to a firm's supply chain risk. Along these lines, the operations management literature on supply chain management considers OSHA violations by supply chain partners to be a major risk factor. For example, such violations may have reputation effects, as well as correlate with other negative policies undertaken by the customer firm. In addition to EPA violations, product quality issues, and sudden changes in a customer's executive team, OSHA violations are considered to be a major warning sign for supply-chain partners.[5] Increases in such risks may signal the risk of future disruptions in the supply chain, which a rational supplier will include in its expectations.

There are also beneficial empirical characteristics to using OSHA shocks. For example, OSHA violations are generally discovered through random site inspections and should be unrelated to *ex-ante* firm characteristics. Inspections by OSHA are not announced in advance. In addition to random inspections, inspections can also be triggered by injuries/fatalities at work, accidents, and referrals by other agencies. Even if OSHA is more likely to give priority to hazardous industries, inspections cover a very small number of factories across the U.S. each year (for more details see Table 2). In that respect, inspections by OSHA can be considered as rare and difficult to anticipate. Later in Table 5, given that accidents are not perfectly random across the universe of firms (they can be provoked by firms that under-invest in safety, and raise an obvious self-selection problem), we separate inspections triggered by accidents (which cause injuries and/or fatalities) from random inspections. Therefore, these random OSHA shocks are plausibly exogeneous, and we further consider reverse causality in later tests. In addition, OSHA enforcement has significant time-series variation. Although created in the early 1970s and active

[5] See, i.e., "Understanding Risk: Avoiding Supply Chain Disruption", IndustryWeek, 5/7/2009.

throughout the decade (not covered by our sample), particularly against newly discovered carcinogens such as asbestos and lead, OSHA's enforcement power declined in the 1980s. President Reagan created a "Regulatory Relief" program to reduce OSHA enforcement activity, and appointed Thorne G. Auchter, an executive vice president of a construction firm in Florida, to head the organization. Among other goals, the new goal was to "take a more cooperative and helpful approach and be less confrontational".[6] The regulatory regime was unchanged until the *Omnibus Budget Reconciliation Act of 1990* went into effect in 1991. This act granted broad new powers to OSHA and increased the maximum penalty by roughly 700%. Although the new law was meant to eliminate the public perception of a cozy relationship between regulator and regulated, the change also raised accusations that the newly-reformed OSHA was now too confrontational with businesses.

[Insert Figure 1]

[Insert Table 1]

We observe this pattern in Figure 1 and tabulated in Table 1, where we document an increase in amount of penalties. In Figure 2, where we scale penalties by violations, the increase is noticeable as well. We also note increased enforcement during the Obama administration, although this does not appear to have been driven by a legislative change. We next explain how we build our OSHA enforcement variables and the rest of our dataset.

[Insert Figure 2]

[6] Department of Labor OSHA History: https://www.dol.gov/general/aboutdol/history/osha13auchter

2. Data

2.1. OSHA penalties

We begin our OSHA data collection by first requesting all corporate inspection reports from OSHA for the sample period 1972— 2012.[7] We then use these inspection reports in order to identify specific customer firms who were inspected by OSHA during this period. Inspection reports indicate whether OSHA cites a firm for violations of safety and health standards following an inspection, as well as the amount of any subsequent fine paid by the customer. Standards are issued and enforced by OSHA and cover a broad range of safety problems at work such as the handling of hazardous chemicals, hearing protection devices, and emergency rules. However, these OSHA reports only list the name of the investigated establishment and do not give any unique firm-level identifier. In order to identify customers in the OSHA database, we follow a three-step procedure that uses a mixture of automated and manual data collection procedures. First, we create pairs of customers' names reported in the CRSP-Compustat merged database, including the historical names provided in CRSP, with establishments' names reported in OSHA (see Section 2.2 below for more information on customer names). We only consider establishments and companies in the manufacturing industries whose 4-digit SIC is below 4000. After creating a large, "fuzzily-matched" dataset, we limit our attention to pairs of names that share the same first character. Next, we use the SAS command SPEDIS in order to calculate the closest spelling distance between each pair of names. We limit the data to the best three matches. Finally, we manually check all matches with a matching score above 80% and manually link the firm's Compustat GVKEY with the name in the OSHA database. For name matches below 80%, we further manually link any matches that have the same two-digit SIC code in the OSHA data and

[7] We thank OSHA for providing this raw data.

the Compustat file. We also use internet sources to identify establishment names reported in OSHA that are subsidiaries or parent companies of the Compustat customers. Our final OSHA-Customer sample is therefore the result of multiple layers of automated and hand-matching of data. We analyze only penalties paid during the course of the relationship between a supplier and a customer. Therefore by analyzing the impact on suppliers of penalties paid by customers in the previous year, we necessarily lose one observation per each customer-supplier-year available in our sample. Our final sample consists of 6,912 customer-year observations over the period 1992 to 2011 with valid OSHA and accounting data.

We create an indicator variable equal to one if the customer was inspected and then fined by OSHA on a given year, denoted *OSHA Penalty_t*. 34% of our customer-year observations (among a total of 2,530 customer-year observations) were inspected by OSHA, and 20% of our 2,530 customer-year observations were fined by OSHA. Note that OSHA inspection data is collected at the factory level, and our *OSHA Penalty* variable is aggregated to the customer level, so this implies that roughly 34% of customer-years have at least one factory that is visited by OSHA, not that OSHA specifically audits the entire firm. The average (median) number of inspections per customer is equal to 4.32 (2). The average (median) amount of penalties is equal to $16,818.27 dollars ($4,925 dollars). Therefore, the small dollar amount of the penalty itself is unlikely to significantly affect the firm's financial position, although we explicitly test this intuition later. Table 2 reports summary statistics.

[Insert Table 2]

2.2. Customer-Supplier Relationships

We use the Compustat Segment database to find the reported customers of suppliers. SFAS 14 and SFAS 131 require public companies to report customers that account for more than 10%

of their annual sales. In the Compustat Segment files, the name of and sales to these customers are reported. We extract the accounting information of customers by matching their names to the corresponding GVKEY in Compustat following the literature (e.g., Fee and Thomas (2004), Kale and Shahrur (2007)). To further insure that the customer represents an important investment to the supplier terms of RSI, we require the supplier to have non-zero R&D (Kale and Shahrur (2007). Finally, we only consider establishments and companies in the manufacturing industries (whose 4-digit SIC is below 4000). Our full sample consists of 15,282 (10,920) supplier-customer-year observations in the manufacturing industry that have identified principal customers from 1980 to 2012 (from 1992 to 2012).

2.3 Control Variables

In addition to utilizing a variety of fixed effects, we also include controls for size (ln(*Assets*)), profitability (*ROA)*, growth options (*Tobin's Q*), and RSI (*RD Intensity)* as controls. For customer controls, we also calculate the above variables at the customer level, as well as the customer's bankruptcy risk, (*Z-score*). We also control for the importance of the customer by using the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). The calculation of all variables is detailed in the Appendix.

[Insert Table 3]

In Table 3, we report the *ex-ante* characteristics of customers (in Panel A) and suppliers (in Panel B) in the year that immediately precedes a customer OSHA penalty. In order to avoid spurious inferences, we exclude from this analysis all customer-year and customer-supplier-year observations associated with at least two consecutive years of customer OSHA penalties. Panel A of Table 3 clearly shows that bigger customers are more likely to be inspected and fined by OSHA on a given year. Accordingly, the cash ratio of treated customers is lower, and their leverage ratio is also higher (see for instance Opler et al., 1999, on the determinants of cash). They also spend slightly less in R&D expenses possibly because treated customers are more mature firms. Finally, their operating performance as measured by their ROA is also higher in comparison with control/untreated customers in the year that immediately precedes an OSHA penalty. The latter result reinforces our view that the impact of customer OSHA penalties is unlikely driven by the financial distress and/or the poor financial performances of customers.

Panel B of Table 3 shows that the only difference between treated and control groups of suppliers is due to investment in R&D. The R&D intensity ratio of treated suppliers is 2% below that of control suppliers in the year that immediately precedes a customer OSHA penalty, statistically significant at the 5% level. But, overall, the *ex-ante* characteristics of treated and control suppliers are very similar in the year that precedes an OSHA shock, in terms of ROA, cash ratio, leverage ratio, and financial distress as measured by the Altman Z-score. Moreover, treated and control suppliers have insignificant differences in terms of percentage of customer sales (customers account for 24% of their total revenues on average), customer-supplier relation length (equal to 6 years on average), and their number of reported customers (equal to 1.5 customers on average). Therefore, suppliers that have a major customer fined by OSHA do not significantly differ from other suppliers on most characteristics. Therefore, we can be confident that our estimates of the impact of customer OSHA penalties on suppliers' leverage and cash-flows are not driven by preexisting trends.

3. Results

3.1. Leverage and Supply-Chain Risk

We begin our multivariate investigation by examining the link between financial risk and supply-chain risk. Specifically, we consider the effect of customer OSHA penalties on the firm's financial leverage. In Table 4, we estimate the following model:

$$Leverage_{it} = f_{ic} + \alpha_t + \beta_1 OSHA\ Penalty_{i,t} + \beta_2 OSHA\ Penalty_{i,t-1} + \sum_{i=3}^{n} B_i\ Control + e, \tag{1}$$

where *i*, *c*, and *t* index firm, customer, and time, respectively. f_{ic} and a_t represent firm-customer pairwise and time fixed effects, respectively. Model 1 includes only the *OSHA Penalty* variables and fixed effects, and we slowly add supplier and customer controls throughout the remaining seven models. We document that $OSHA\ Penalty_{t-1}$ is significantly negative in all seven models, and $OSHA\ Penalty_t$ is significant in six models. The effect is economically significant as well. A customer OSHA shock is related to a 2%-4% decline in the supplier firm's Debt/Assets over two years. Overall, firms appear to downwardly adjust financial risk (leverage) in response to a customer OSHA violation.

[Insert Table 4]

Our empirical strategy relies on the OSHA penalty being random and unanticipated by the supplier and customer. We note above that some OSHA violations are not randomly generated, specifically in the aftermath of an industrial accident. In these situations, firms can likely have some ability to anticipate an upcoming OSHA penalty. Therefore, penalties due to industrial accidents are unlikely to represent a random shock. We test this intuition in Table 5.

[Insert Table 5]

In addition to our indicator variables for penalties, we also include *OSHA Accident* indicator variables for *t* and *t*-1. These variables indicate whether there was an OSHA penalty triggered by a post-accident inspection, and equal one if so. We include the same battery of controls and fixed effects as those used in Table 4. We note that the penalty variables continue to be generally significantly negative, whereas the penalties driven by post-accident inspections are statistically insignificant. This test suggests that only random shocks significantly affect the observed changes in supplier leverage.

In Section 1 above, we describe how OSHA saw its enforcement power significantly increased in the early 1990s. OSHA's regulatory power was relatively weak during the 1980s, as the federal government was actively trying to reduce the perceived confrontational relationship between regulators and industry. Their power increased dramatically following the passage of *Omnibus Budget Reconciliation Act of 1990*, which impacts OSHA beginning in 1991. We use this regulatory change to test the validity of *OSHA Penalty* as a supply chain shock. Specifically, we should expect an OSHA violation to be a weaker signal to suppliers during the 1980s, when OSHA had relatively less regulatory power. As a placebo test, we therefore consider whether the link between customer OSHA penalties and supplier leverage is statistically weaker during the pre-enforcement regime in Table 6. We estimate the same equations as in Table 4, but instead use the 1980-1991 sample period due to the weaker regulatory environment. Consistent with weakened OSHA regulatory power during this era, we document no significant link between OSHA penalties and the firm's financial leverage. We are thereby unable to reject the null hypothesis that OSHA's activity with regards to customer firms had no effect on supplier leverage during this period. Collectively, the results in Tables 3-6 are consistent with the hypotheses that 1) OSHA violations signal increased supply chain risks to suppliers and 2) suppliers adjust financial risk in response to changing business risks.

[Insert Table 6]

3.2. Robustness - Reverse Causality

An additional concern might be that the firm's existing leverage ratio in some way causes customer OSHA violations, and, as a result, we misidentify the causal relation in our study. We first address this concern by noting that our results are inconsistent with one form of reverse causality, given results on workplace safety reported the extant literature. For example, Cohn and Wardlaw (2016) show that for a given firm, *higher* leverage is related to more workplace accidents for the reference firm. If supplier leverage affects future customer safety violations, one would likely expect a positive relation, rather than the negative relation documented in our above tests. To further reduce concerns about reverse causality, we perform a timing test in Table 7.

We estimate the following model in Table 7:

$$Leverage_{ikt} = f_{ic} + \alpha_t + \beta_1 OSHA\ Penalty_{i,t+1} + \beta_2 OSHA\ Penalty_{i,t+2} + \sum_{i=3}^{n} B_i\ Control + e. \quad (2)$$

The intuition is that if we detect a significant coefficient on β_1 or β_2, we may have problems with reverse causality since the firm's leverage is significantly related to future customer OSHA penalties. When examining the coefficients in Table 7, we detect no significant relation between firm leverage and customer OSHA penalties at *t+1* or *t+2*. On the whole, we do not find evidence consistent with reverse causality.

[Insert Table 7]

3.3. Are OSHA Violations Truly Non-Financial Shocks?

We argue above that OSHA violations are non-financial shocks to the supplier and distinguish these shocks from financial risk. The mechanism(s) at work would be somewhat more complex if customer OSHA violations indeed generate a negative financial shock to the supplier, as we would then be unable to distinguish between financial and non-financial risk management.

[Insert Table 8]

In Table 8, we consider whether *OSHA Penalty*$_{t-1}$ and *OSHA Penalty*$_{t}$ are significantly related to *Sales Growth* and *ROA* for either the firm or customer. When we consider the firm's performance variables, we continue to include firm-customer fixed effects. When predicting the customer's performance, we use customer fixed effects. All models contain year fixed effects. In Models 1 and 2, we detect no relation between customer OSHA penalties and the firm's sales growth or ROA. Additionally, we also find no relation between the customer's own performance and OSHA violations in Models 3 and 4.

In Panel B of Table 8, we also estimate the impact of OSHA penalties on the Cumulative Abnormal Returns (CARs) of customers and their suppliers around the dates of each inspection report issued by OSHA. We restrict our analysis to the sample of suppliers-customers described in Section 2. The sample includes 2,088 announcement dates of customer penalties for customers and 4,615 announcement dates of customer penalties for suppliers (recall that suppliers report more than one big customer each year). Panel B of Table 8 clearly shows that the impact of customer penalty announcements on customers and their suppliers' stock returns is economically small. Cumulative Abnormal Returns are equal to -0.2% on average over the period [-5;5] around the announcement date, and we cannot reject the null hypothesis that Cumulative Abnormal Returns for customers and suppliers are equal to zero at conventional levels. As shown in Panel B of Table

8, these results are qualitatively very similar when we use alternative event windows such as the [-1;1] and [-1;5] windows around the announcement date.

In sum, the results in Table 8 suggest that OSHA violations indeed appear to be shocks that do not directly lead to financial distress or poor financial performance. These non-results are consistent with the proposed economic mechanism in the paper, that is, the supplier is extracting some type of negative, non-financial information about its supply-chain risk environment.[8]

3.4. Financial Hedging and Supply-Chain Risk

Our tests to this point focus on the firm's financial leverage as a way for a supplier firm to reduce financial risk following a supply-chain shock. However, the firm has other ways of managing financial risk in response to heighted supply-chain risks. We next consider whether the firm adjusts its financial hedging policies as an alternative mechanism. We predict that firms should increase hedging in response to the customer's OSHA shock. In other words, an increase in supply-chain risk should drive the firm to increase financial hedging. In Table 9, we estimate the following model:

$$Hedging_{ikt} = f_t + \alpha_t + \beta_1 OSHA\ Penalty_{i,t} + \beta_2 OSHA\ Penalty_{i,t-1} + \sum_{i=3}^{n} B_i\, Control + e, \tag{3}$$

where *Hedging* takes the value of one if the firm uses interest rate, foreign exchange, or commodity derivatives/futures during the year.

[Insert Table 9]

We document a significant relation between *OSHA Penalty t-1* and *Hedging* in six of eight models. The evidence is consistent our main hypothesis – that firms attempt to reduce financial

[8] Note again that the extant literature documents a relation in the other direction, i.e., financial distress results in worse workplace safety (Cohn and Warwick (2016)).

risks in response to increases in supply-chain risk. In addition to reducing financial risk via lower debt, firms also appear to increase their hedging behavior/financial risk management to offset increases in supply-chain risks.

3.5. Corporate Social Responsibility, OSHA Shocks, and Supplier Leverage

Our proposed mechanism in the article is that the customer's OSHA shock signals some change in the risk environment for the supplier. In that sense, such shocks have similar intuition to much the literature on Corporate Social Responsibility (CSR), which relates to corporate reputation. The extant evidence on CSR is mixed. Some articles document evidence that CSR does not improvement performance and is therefore likely the manifestation of an agency problem (Masulis and Reza, 2015, Cheng, Hong, and Shue, 2016). Other research shows that firms with higher CSR scores performed better during the recent financial crisis (e.g., Lins et al, 2017). Coupled with the above results, our intuition is that such CSR spending may be a rational "reputational hedge", or a form of "reputational insurance" that only pays off in bad states of the world. We test this intuition relating to CSR, as well as CSR's relation to OSHA violations, in Table 10.

In order to measure Corporate Social Responsibility (CSR) at the firm-year level, we use the dataset provided by KLD Research & Analytics, Inc (KLD). KLD collects information from multiple sources (such as company reports, web reports, and the media in general) on the largest companies in the U.S. (covering since 1991 firms belonging to the S&P 500 Index, and more recently the Russel 1000 Index). KLD builds binary variables that measures each year CSR strengths and concerns along multiple sub-categories such as diversity, employment, or environment. We follow the methodology presented in Servaes and Tamayo (2013) in order to measure CSR at the firm-year level. Our measure of CSR strengths (concerns) is the total number of strengths across all CSR sub-categories (community, diversity, employment, environment, and human rights) excluding the corporate governance, the product, and the industry categories (alcohol, gaming, firearms, military, nuclear, and tobacco) for a given firm-year. We then divide CSR strengths (concerns) by the maximum possible number of strengths (concerns) provided by KLD each year (see for more details Servaes and Tamayo, 2013) because the number of strengths (concerns) reported by KLD has evolved over the years. As mentioned in Chatterji, Levine, and Toffel (2007), the environmental concern "Regulatory Problems" is equal to one if the company has recently paid substantial fines or civil penalties for violations of air, water, or other environmental regulations, or it has a pattern of regulatory controversies under the Clean Air Act, Clean Water Act, or other major environmental regulations. Finally, we also compute a net index of CSR strengths for a given firm-year, which is the difference between the total number of CSR strengths scaled by the total number of strengths on a given year minus the total number of CSR concerns also scaled by the total number of concerns available in the KLD dataset on a given year.

[Insert Table 10]

We note that the CSR sample is smaller than above, given the limited coverage of the KLD data. We therefore replicate our main result in Model 1 prior to moving on to considering the impact of CSR. In Model 2, we note that the interaction term between OSHA penalties and CSR is significantly positive, indicating that higher KLD scores offset some of the impact of OSHA penalties on supplier leverage. In other words, having a higher CSR score dampens the supplier's reaction to OSHA shocks, indicating that OSHA violations are less of a signal in these cases. The relation is directionally consistent in Model 3 but not significant at conventional levels. Finally, in Models 4 and 5, we split the KLD score into only summing the "positive" CSR aspects (Model 4) and the "negative" or concern CSR aspects (Model 5). Our results in Model 5 suggest that firms who have customers with *ex-ante* poor CSR scores have amplified reactions to customer OSHA violations. Although we cannot rule out a number of alternative explanations, our results are consistent with the possibility that CSR represents a form of costly reputational insurance or hedging that pays off in "bad" states of the world, consistent with both conflicting strands of the CSR literature. Our results further suggest that investors react stronger to bad CSR news whereas CSR initiatives are viewed more conservatively (e.g., Krüger, 2015), These results are also consistent with researching showing that KLD "concern" ratings are fairly good summaries of past environmental performance, whereas environmental strengths do not accurately predict future pollution levels or compliance violations (e.g., Chatterji et al., 2007).

4. Conclusions

We document evidence that firms assess financial risk in conjunction with other business risks. Our study specifically considers shocks to supply-chain risk and explores how firms subsequently adjust financial risk in response. Using OSHA penalties resulting from random site visits to a firm's key customer as a shock to the firm's supply-chain risk, we document a negative relation between this shock and subsequent changes in leverage and financial hedging by the supplier firm. Thus, suppliers appear to reduce financial risk when non-financial risks experience a positive shock.

We also find that customers' CSR investment affects the supplier's reaction. Our evidence is consistent with CSR acting as a type of "reputational hedge", where customer OSHA penalties more severely affect suppliers when the customer has worse *ex-ante* CSR scores. Our results are inconsistent with reverse causality and OSHA penalties do not appear to create a financial shock for either the firm or its customers. Rather, our results support predictions from the management literature that financial risk management is only one part of a firm's overall risk management strategy, and that shocks to one type of business risk trigger reductions in other types of firm risk.

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Figure 2

This table reports the number of inspections per year from OSHA.

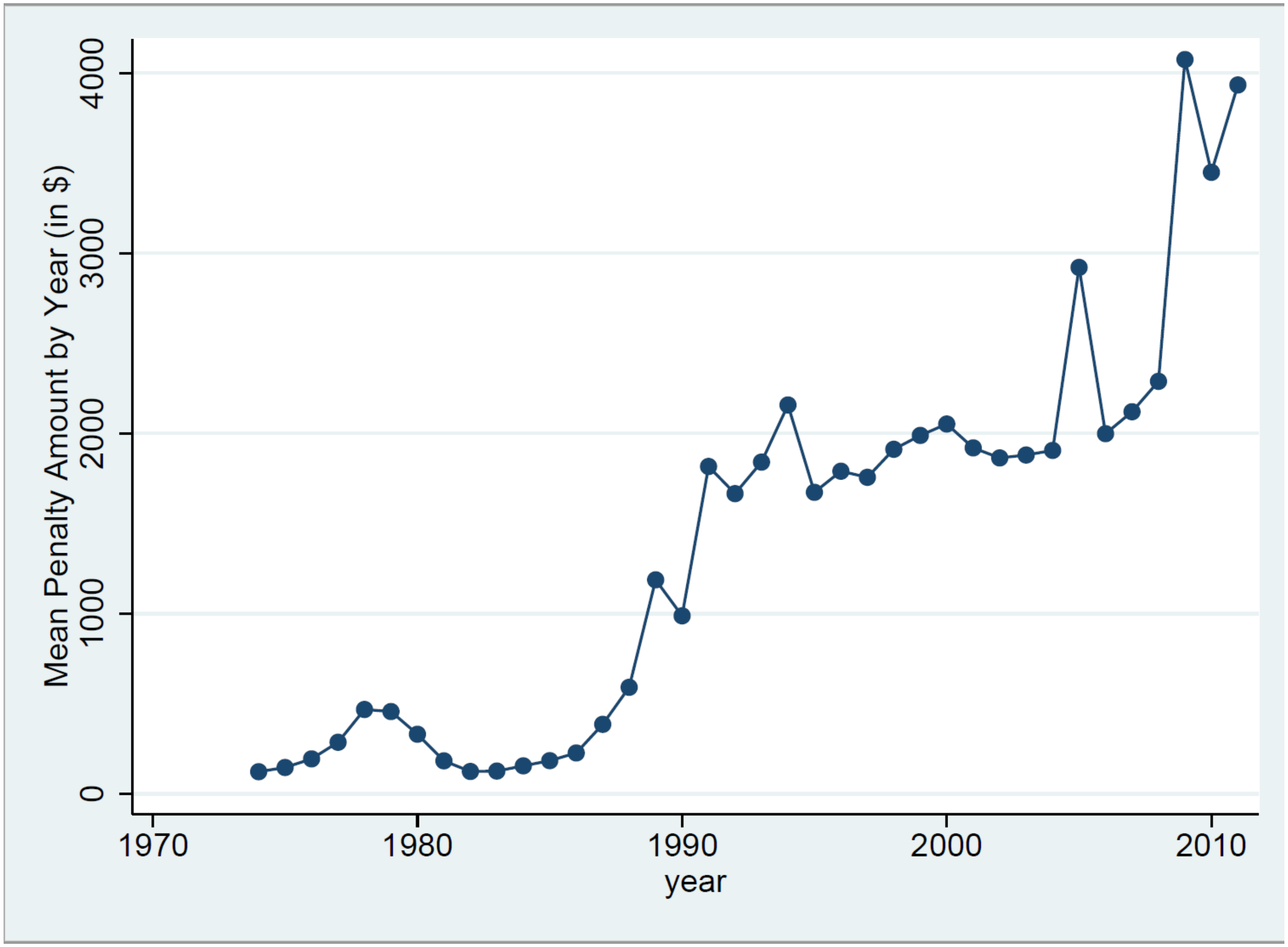

Figure 2

This table reports the mean penalty/violation ratio per year from OSHA.

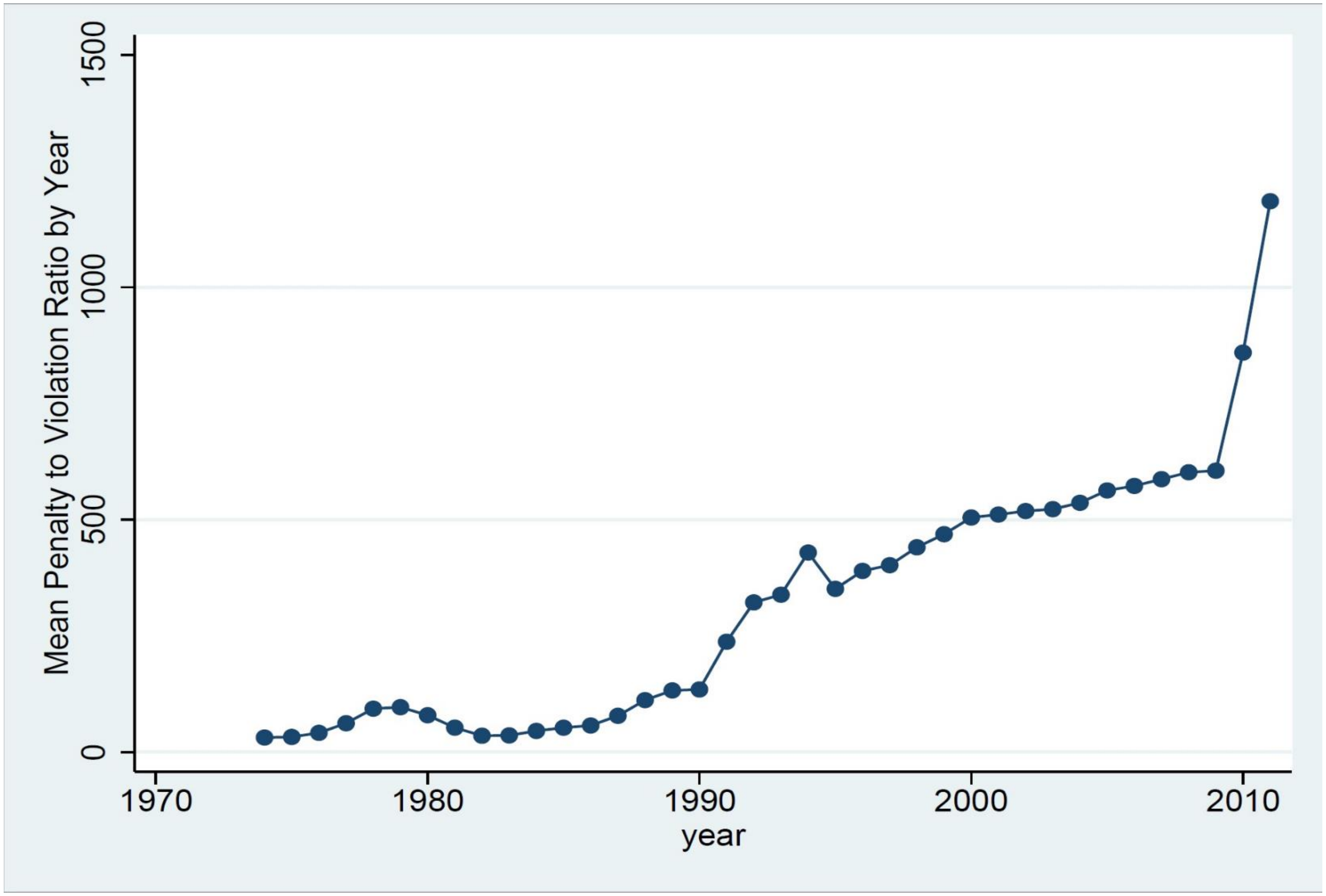

Table 1 – OSHA Penalties

This figure reports the mean penalty amount (in dollars) per year, the mean penalty/violation ratio per year, the number of cited violations per year (to be rescaled or deleted), and the number of inspections per year from OSHA. The sample includes all inspections reports issued by OSHA from 1974-2011 in the manufacturing industry (factories with a SIC code below 4000).

Year	Mean Penalty (in $)	Mean Penalty (in $)/Nb. Violations	Nb. Inspections	Nb. Violations
1974	135	35	64877	40739
1975	169	38	68142	44610
1976	217	46	60555	38942
1977	312	66	50150	27820
1978	512	98	44896	24049
1979	492	101	50396	27809
1980	338	81	58744	32440
1981	186	53	52030	29891
1982	133	37	80062	42216
1983	137	39	102241	54296
1984	166	49	116043	56244
1985	198	56	116148	59026
1986	253	63	106407	59419
1987	438	87	103074	60321
1988	684	127	96361	59535
1989	1400	149	93327	61194
1990	1047	151	99417	64415
1991	2207	272	99139	62392
1992	1863	355	89830	57775
1993	2056	364	80003	52272
1994	2359	427	80260	53244
1995	1946	397	66288	41195
1996	2072	445	64714	39184
1997	1982	454	75094	46564
1998	2100	492	73016	45800
1999	2205	514	74624	46691
2000	2279	550	72824	46415
2001	2082	551	76656	47905

2002	2047	568	81516	50491
2003	2054	568	79531	50270
2004	2066	584	77640	49230
2005	3453	617	75573	48676
2006	2193	626	77910	50885
2007	2276	640	74464	48826
2008	2559	667	75641	49013
2009	4963	665	77192	48922
2010	3831	959	74460	47871
2011	4409	1349	61402	38423

Table 2 – Summary Statistics

This table reports summary statistics for the full sample of customers with available OSHA data considered in our study. **"$penalties"** is the total amount of fines paid by the customer on a given year; "**%inspected**" is the proportion of customers inspected by OSHA on a given year; "**#inspections**" is the number of inspections among customers inspected by OSHA on a given year; "**#penalties**" is the number of violations cited among customers inspected by OSHA on a given year; "**%accidents**" is the number of inspections by OSHA triggered by injuries and/or fatalities at the workplace among customers inspected by OSHA on a given year. We separate the sample of customer-years into two groups, the first group includes all customers-years with zero total penalty amount on a given year (Panel A), and the second group includes all customers-years with positive total penalty on a given year (Panel B). The sample covers the period 1992-2012, and includes a total of 2,530 customer-year observations with valid accounting data. Only the manufacturing industry is considered.

	$penalties	**%inspected**	**#inspections**	**#penalties**	**%accidents**
A. Sample with no penalties (80%)					
N	2026	2026	351	351	351
Mean	0.00	17%	1.62	0.00	24%
Median	0.00	0%	1.00	0.00	0%
SD	0.00	38%	1.29	0.00	43%
Min	0.00	0%	1.00	0.00	0%
Max	0.00	100%	12.00	0.00	100%
B. Sample with penalties (20%)					
N	504	504	504	504	504
Mean	16818.27	100%	6.20	2.87	54%
Median	4925.00	100%	4.00	2.00	100%
SD	41491.84	0%	6.51	3.30	50%
Min	100.00	100%	1.00	1.00	0%
Max	482080.00	100%	49.00	30.00	100%
C. Full sample					
N	2530	2530	855	855	855
Mean	3350.36	34%	4.32	1.69	42%
Median	0.00	0%	2.00	1.00	0%
SD	19686.26	47%	5.54	2.90	49%
Min	0.00	0%	1.00	0.00	0%
Max	482080.00	100%	49.00	30.00	100%

Table 3 –Ex-ante Characteristics.

This table reports summary statistics for firm characteristics in the year before customer OSHA penalties. The mean for each variable is reported in Column (i) for the control firms associated with no customer OSHA penalty next year, and the difference between treated and control firms is reported in Column (ii). Column (iii) reports the t-test for the difference between treated and control firms, where the standard errors are clustered at the firm level. Firm-year observations associated with two consecutive years of customer OSHA penalties are excluded. Only firms with available data on leverage, cash, and ROA are included. The sample covers the period 1992-2012.

Panel A. Customers ex-ante characteristics.

Variables	Control (i)	Treated - Control (ii)	(t-stat) (ii)	N
log (Assets)	8.37	0.57	(4.06)	2,000
Cash ratio	0.31	-0.15	(-6.40)	2,000
ROA	0.13	0.03	(3.34)	2,000
Leverage ratio	0.2	0.02	(1.87)	2,000
R&D intensity	0.07	-0.02	(-4.65)	2,000

Panel B. Suppliers ex-ante characteristics.

Variables	Control (i)	Treated - Control (ii)	(t-stat) (iii)	N
log (Assets)	5.05	-0,19	(-1.79)	5,004
Cash ratio	1.10	-0.10	(-1.10)	5,004
ROA	-0,02	0.02	(1.17)	5,004
Leverage ratio	0.18	0.01	(1.09)	5,004
R&D intensity	0.15	-0.02	(-2.42)	5,004
Z-score	109.20	8.57	(0.42)	3,709
%cust. sales	0.24	-0.01	(-0.45)	4,907
#customers	1.52	-0.04	(-1.19)	5,004
Relation length	6.03	0.11	(0.36)	5,004

Table 4 – Financial Leverage and Supply-Chain Risk

This table presents multivariate results regressing *Leverage* on customer OSHA penalties in year *t* and *t*-1 for the 1992-2012 sample period. We include ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls. For customer controls, we also include the above controls, the Altman Z-score, and the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES				*Leverage*				
OSHA Penalty t-1	-0.01**	-0.02**	-0.01**	-0.01*	-0.02**	-0.01*	-0.01*	-0.02*
	(-2.112)	(-2.215)	(-2.011)	(-1.827)	(-1.982)	(-1.955)	(-1.787)	(-1.940)
OSHA Penalty t	-0.02***	-0.02***	-0.01*	-0.01	-0.01*	-0.01*	-0.01	-0.01*
	(-2.704)	(-2.722)	(-1.871)	(-1.600)	(-1.743)	(-1.868)	(-1.607)	(-1.752)
Ln*(Assets)*		0.00	0.00	0.00	-0.00	0.00	-0.00	-0.00
		(0.021)	(0.086)	(0.019)	(-0.055)	(0.063)	(-0.021)	(-0.093)
ROA		-0.23***	-0.21***	-0.24***	-0.24***	-0.21***	-0.24***	-0.24***
		(-5.383)	(-4.936)	(-4.836)	(-4.867)	(-4.949)	(-4.868)	(-4.899)
Tobin's Q		0.01	0.00	0.01	0.01	0.00	0.01	0.01
		(1.300)	(0.716)	(1.261)	(1.338)	(0.703)	(1.224)	(1.301)
R&D Intensity				-0.13	-0.14*		-0.13	-0.14*
				(-1.621)	(-1.702)		(-1.604)	(-1.685)
Customer Ln*(Assets)*			-0.00	-0.00	0.01	-0.00	-0.00	0.01
			(-0.187)	(-0.203)	(0.434)	(-0.304)	(-0.235)	(0.384)
Customer Tobin's Q			-0.01	-0.00	-0.00	-0.01	-0.00	-0.00
			(-1.188)	(-0.257)	(-0.266)	(-1.267)	(-0.352)	(-0.360)
Customer Z-Score				0.00	0.00		0.00	0.00
				(0.406)	(0.247)		(0.530)	(0.373)
Customer ROA			0.03			0.03		
			(0.487)			(0.478)		
Customer R&D Intensity					0.54*			0.54*
					(1.829)			(1.799)
Pct Sales						-0.00	-0.01	-0.01
						(-0.045)	(-0.343)	(-0.311)
Constant	0.19***	0.15**	0.19	0.19	0.04	0.21	0.21	0.06
	(11.768)	(2.559)	(1.351)	(1.058)	(0.202)	(1.463)	(1.121)	(0.280)
Observations	6,912	6,165	5,322	4,129	4,129	5,216	4,038	4,038
R-squared	0.021	0.091	0.090	0.098	0.101	0.091	0.099	0.102

Table 5 – Financial Leverage and Supply-Chain Risk – Non-random versus Random Inspections

This table presents multivariate results regressing *Leverage* on customer OSHA penalties in year *t* and *t*-1 for the 1992-2012 sample period. We include ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls. For customer controls, we also include the above controls, the Altman Z-score, and the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES					*Leverage*			
OSHA Penalty t-1	-0.01**	-0.01**	-0.01**	-0.01*	-0.02**	-0.02**	-0.01*	-0.02**
	(-2.082)	(-2.124)	(-2.126)	(-1.873)	(-2.063)	(-2.103)	(-1.865)	(-2.047)
OSHA Penalty t	-0.02***	-0.02***	-0.01	-0.01	-0.01	-0.01*	-0.01	-0.01
	(-2.892)	(-2.725)	(-1.639)	(-1.313)	(-1.543)	(-1.653)	(-1.326)	(-1.559)
OSHA Accident t-1	0.01	0.01**	0.01	0.00	0.00	0.01	0.00	0.00
	(1.433)	(2.001)	(1.294)	(0.325)	(0.277)	(1.255)	(0.263)	(0.241)
OSHA Accident t	0.00	0.01	0.00	-0.00	0.00	0.00	-0.00	-0.00
	(0.446)	(0.965)	(0.493)	(-0.037)	(0.042)	(0.369)	(-0.166)	(-0.094)
Ln*(Assets)*		-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00
		(-0.023)	(0.082)	(-0.040)	(-0.133)	(-0.003)	(-0.142)	(-0.229)
ROA		-0.23***	-0.22***	-0.26***	-0.26***	-0.23***	-0.26***	-0.26***
		(-6.169)	(-5.419)	(-5.256)	(-5.289)	(-5.414)	(-5.262)	(-5.296)
Tobin's Q		0.01	0.00	0.01	0.01	0.00	0.01	0.01
		(1.508)	(0.873)	(1.364)	(1.459)	(0.856)	(1.311)	(1.407)
R&D Intensity				-0.13	-0.15		-0.13	-0.14
				(-1.540)	(-1.644)		(-1.494)	(-1.596)
Customer Ln*(Assets)*			0.00	-0.00	0.02	-0.00	-0.00	0.02
			(0.008)	(-0.019)	(0.789)	(-0.043)	(-0.047)	(0.737)
Customer Tobin's Q			-0.01	-0.00	-0.00	-0.01	-0.00	-0.00
			(-1.110)	(-0.056)	(-0.091)	(-1.160)	(-0.121)	(-0.150)
Customer Z-Score				0.00	0.00		0.00	0.00
				(0.277)	(0.080)		(0.472)	(0.278)
Customer ROA			0.04			0.05		
			(0.732)			(0.745)		
Customer R&D Int					0.71**			0.71**
					(2.275)			(2.261)
Pct Sales						-0.03	-0.04	-0.04
						(-0.769)	(-1.072)	(-1.033)
Constant	0.19***	0.15***	0.16	0.17	-0.03	0.18	0.19	0.00
	(11.443)	(2.585)	(1.149)	(0.907)	(-0.141)	(1.297)	(1.051)	(0.009)
Observations	6,912	6,568	5,663	4,400	4,400	5,555	4,307	4,307
R-squared	0.022	0.092	0.091	0.099	0.104	0.092	0.102	0.107

Table 6 – Financial Leverage and Supply-Chain Risk – Weak Enforcement Period

This table presents multivariate results regressing *Leverage* on customer OSHA penalties in year *t* and *t*-1 for the 1980-1991 sample period. We include ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls. For customer controls, we also include the above controls, the Altman Z-score, and the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES				*Leverage*				
OSHA Penalty t-1	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.496)	(-0.274)	(-0.332)	(-0.505)	(-0.504)	(-0.246)	(-0.424)	(-0.423)
OSHA Penalty t	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(-0.256)	(-0.260)	(0.374)	(0.067)	(0.072)	(0.400)	(0.096)	(0.102)
Ln*(Assets)*		0.02	0.01	0.02	0.02	0.01	0.02	0.02
		(0.928)	(0.616)	(1.137)	(1.132)	(0.544)	(1.079)	(1.074)
ROA		-0.32***	-0.30***	-0.31***	-0.31***	-0.30***	-0.31***	-0.31***
		(-5.037)	(-4.655)	(-4.428)	(-4.421)	(-4.686)	(-4.462)	(-4.456)
Tobin's Q		-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
		(-0.250)	(-0.850)	(-0.528)	(-0.529)	(-0.731)	(-0.410)	(-0.410)
R&D Intensity				-0.05	-0.05		-0.05	-0.05
				(-0.383)	(-0.383)		(-0.407)	(-0.408)
Customer Ln*(Assets)*			0.03	0.02	0.03	0.03*	0.02	0.02
			(1.645)	(0.948)	(0.831)	(1.719)	(0.902)	(0.796)
Customer Tobin's Q			0.00	0.00	0.00	0.00	0.00	0.00
			(0.200)	(0.168)	(0.168)	(0.255)	(0.173)	(0.172)
Customer Z-Score				-0.00	-0.00		-0.00	-0.00
				(-0.483)	(-0.475)		(-0.449)	(-0.441)
Customer ROA			-0.01			-0.02		
			(-0.182)			(-0.232)		
Customer R&D Intensity					0.01			0.02
					(0.040)			(0.050)
Pct Sales						-0.06	-0.06	-0.06
						(-1.308)	(-1.110)	(-1.111)
Constant	0.22***	0.15*	-0.07	-0.05	-0.05	-0.06	-0.03	-0.03
	(13.093)	(1.913)	(-0.472)	(-0.247)	(-0.213)	(-0.422)	(-0.123)	(-0.116)
Observations	2,354	2,141	2,029	1,745	1,745	2,029	1,745	1,745
R-squared	0.025	0.146	0.154	0.143	0.143	0.156	0.145	0.145

Table 7 – Financial Leverage and Supply-Chain Risk - Timing Tests for Reverse Causality

This table presents multivariate results regressing *Leverage* on customer OSHA penalties in year *t*+1 and *t*+2 for the 1992-2012 sample period. We include ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls. For customer controls, we also include the above controls, the Altman Z-score, and the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	*Leverage*							
OSHA Penalty t+1	0.01	0.01	0.00	-0.00	-0.00	0.00	0.00	0.00
	(0.833)	(0.654)	(0.154)	(-0.025)	(-0.020)	(0.365)	(0.132)	(0.185)
OSHA Penalty t+2	-0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(-0.162)	(1.252)	(1.071)	(0.880)	(0.883)	(1.159)	(0.856)	(0.918)
Ln*(Assets)*		0.01	0.01	-0.00	-0.00	0.01	-0.00	-0.00
		(0.800)	(0.549)	(-0.088)	(-0.097)	(0.672)	(-0.004)	(-0.083)
ROA		-0.13*	-0.13*	-0.12	-0.12	-0.15**	-0.13	-0.13
		(-1.915)	(-1.930)	(-1.377)	(-1.383)	(-2.226)	(-1.578)	(-1.577)
Tobin's Q		-0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00
		(-0.460)	(0.002)	(0.189)	(0.190)	(-0.346)	(-0.143)	(-0.140)
R&D Intensity				0.04	0.03		0.04	0.03
				(0.324)	(0.313)		(0.310)	(0.262)
Customer Ln*(Assets)*			0.01	0.01	0.01	-0.01	-0.03	-0.02
			(0.406)	(0.224)	(0.280)	(-0.549)	(-0.810)	(-0.410)
Customer Tobin's Q			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
			(-1.347)	(-1.269)	(-1.270)	(-1.049)	(-1.043)	(-1.032)
Customer Z-Score				0.00	0.00		0.00	0.00
				(0.445)	(0.433)		(0.647)	(0.545)
Customer ROA			0.01			0.02		
			(0.095)			(0.327)		
Customer R&D Intensity					0.07			0.54
					(0.124)			(1.581)
Pct Sales						0.04	0.02	0.02
						(1.300)	(0.599)	(0.591)
Constant	0.22***	0.13*	0.04	0.08	0.06	0.24	0.43	0.29
	(10.563)	(1.717)	(0.161)	(0.182)	(0.156)	(1.388)	(1.541)	(0.906)
Observations	4,550	3,808	3,318	2,495	2,495	3,241	2,428	2,428
R-squared	0.030	0.044	0.056	0.048	0.048	0.067	0.059	0.061

Table 8 – Do OSHA shocks result in financial shocks?

This table presents multivariate results regressing various performance variables on customer OSHA penalties in year *t*-1 and *t* for the 1992-2012 sample period. We consider *Sales Growth* and *ROA* for both the firm and customer. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

Panel A: Impact of customer OSHA penalties on *Sales Growth* and *ROA.*

	(1)	(2)	(3)	(4)
VARIABLES	*Sales Growth*	*ROA*	*Customer Sales Growth*	*Customer ROA*
OSHA Penalty t-1	-0.01	-0.00	-0.02	-0.00
	(-0.291)	(-0.113)	(-1.185)	(-0.198)
OSHA Penalty t	0.00	-0.00	0.03*	0.00
	(0.166)	(-0.169)	(1.813)	(1.013)
Constant	0.28***	0.06***	0.14***	0.15***
	(9.410)	(4.395)	(5.380)	(16.145)
Observations	6,936	6,931	2,490	2,508
R-squared	0.086	0.039	0.412	0.756
Fixed Effects	Supp Cust & Year	Supp Cust & Year	Cust & Year	Cust & Year
Sample	Supp-Cust	Supp-Cust	Supp-Cust	Supp-Cust
Supplier-Customer & Year FE	YES	YES	NO	NO

(continued)

Table 8 (continued) – Do OSHA shocks result in financial shocks?
Panel B reports Mean Cumulative Abnormal Returns (CAR) around the announcement dates of customers OSHA penalties for the customers and their suppliers. The sample of customers-suppliers is described in Section 2 and covers the period 1991-2012. We use the Fama-French Three Factor Model to estimate abnormal returns, and the estimation period covers trading days [-140,-20].

PANEL B. Impact of customer OSHA penalties on stock returns.

	N	**CAR [-1;1]**	**(t-stat)**	**CAR [-5;5]**	**(t-stat)**	**CAR [-1;5]**	**(t-stat)**
Customers	2088	-0.12%	(-1.60)	-0.20%	(-1.48)	-0.20%	(-1.85)
Suppliers	4615	-0.01%	(-0.13)	-0.23%	(-1.38)	-0.11%	(-1.15)

Table 9 –Financial Risk Management and Supply-Chain Risk

This table presents multivariate results regressing *Hedging* on customer OSHA penalties in year *t* and *t*-1 for the 1992-2012 sample period. We include ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls. For customer controls, we also include the above controls, the Altman Z-score, and the percentage of the supplier's sales that the customer accounts for (*Pct Sales*). All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES				*Hedging*				
OSHA Penalty t-1	0.02	0.04	0.05*	0.07**	0.07**	0.05*	0.07**	0.07**
	(0.813)	(1.342)	(1.798)	(2.358)	(2.359)	(1.660)	(2.187)	(2.188)
OSHA Penalty t	-0.01	0.00	0.02	0.05	0.05	0.02	0.04	0.04
	(-0.343)	(0.085)	(0.693)	(1.333)	(1.330)	(0.572)	(1.192)	(1.189)
Ln*(Assets)*		0.03	0.02	0.00	0.00	0.03	0.01	0.01
		(1.091)	(0.803)	(0.134)	(0.126)	(1.035)	(0.329)	(0.323)
ROA		0.04	-0.01	-0.03	-0.03	-0.03	-0.04	-0.04
		(0.698)	(-0.230)	(-0.406)	(-0.405)	(-0.464)	(-0.534)	(-0.533)
Tobin's Q		0.01**	0.02**	0.01*	0.01**	0.02**	0.01*	0.01*
		(2.342)	(2.523)	(1.961)	(1.975)	(2.461)	(1.913)	(1.923)
R&D Intensity				-0.01	-0.01		0.02	0.01
				(-0.042)	(-0.061)		(0.080)	(0.065)
Customer Ln*(Assets)*			0.09**	0.14**	0.14**	0.08**	0.13*	0.14**
			(2.402)	(2.112)	(2.186)	(2.014)	(1.924)	(1.987)
Customer Tobin's Q			0.05***	0.05***	0.05***	0.05***	0.05***	0.05***
			(3.441)	(3.065)	(3.055)	(3.244)	(2.994)	(2.980)
Customer Z-Score				-0.00	-0.00		-0.00	-0.00
				(-0.129)	(-0.152)		(-0.539)	(-0.562)
Customer ROA			-0.34			-0.27		
			(-1.515)			(-1.163)		
Customer R&D Intensity					0.15			0.12
					(0.246)			(0.200)
Pct Sales						0.09	0.06	0.06
						(1.179)	(0.787)	(0.781)
Constant	0.38***	0.11	-0.84**	-1.24*	-1.28*	-0.79*	-1.20*	-1.23*
	(8.589)	(0.713)	(-1.978)	(-1.823)	(-1.860)	(-1.832)	(-1.727)	(-1.752)
Observations	3,660	3,269	2,865	2,287	2,287	2,792	2,222	2,222
R-squared	0.035	0.051	0.078	0.079	0.079	0.077	0.076	0.076

Table 10 – Corporate Social Responsibility and Effect of OSHA Penalties

This table presents multivariate results regressing supplier leverage on customer OSHA penalties and Corporate Social Responsibility (*KLD*) in year *t*-1 and *t* for the 1992-2012 sample period. We include in Columns (4)-(8) ln(*Assets*), *ROA*, *Tobin's Q*, *RD Intensity* as controls, the same customer controls, the customer Altman Z-score, and the percentage of the supplier's sales that the customer accounts for. All variables are described in the appendix. All models include year and firm-customer paired fixed effects and standard errors are clustered at the firm-customer level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES				*Leverage*				
OSHA Penalty t-1	-0.02**	0.15**	-0.03	0.00	-0.01	-0.02**	-0.02	0.01
	(-2.250)	(2.139)	(-1.442)	(0.042)	(-0.663)	(-2.024)	(-1.040)	(1.052)
OSHA Penalty t	-0.03***	-0.02**	-0.04*	-0.02	-0.01	-0.01	-0.03	0.00
	(-2.613)	(-2.185)	(-1.924)	(-1.627)	(-1.592)	(-1.358)	(-1.546)	(0.093)
KLD		-0.06				-0.09		
		(-1.083)				(-1.189)		
OSHA Penalty t-1 x KLD		0.15**				0.16**		
		(2.139)				(2.488)		
OSHA Penalty t x KLD		0.04				0.11**		
		(0.819)				(2.037)		
KLD-Strengths			-0.06				0.00	
			(-0.726)				(0.037)	
OSHA Penalty t-1 x KLD - Strengths			0.04				0.04	
			(0.422)				(0.412)	
OSHA Penalty t x KLD - Strengths			0.08				0.11	
			(1.092)				(1.296)	
KLD-Concerns				0.04				0.12
				(0.587)				(1.308)
OSHA Penalty t-1 x KLD - Concerns				-0.18***				-0.21***
				(-2.726)				(-2.682)
OSHA Penalty t x KLD - Concerns				0.02				-0.07
				(0.283)				(-0.970)
Constant	0.21***	0.21***	0.21***	0.20***	-0.21	-0.27	-0.24	-0.29
	(10.071)	(9.933)	(9.639)	(8.249)	(-0.647)	(-0.809)	(-0.699)	(-0.862)
Observations	3,748	3,677	3,677	3,677	1,977	1,936	1,936	1,936
R-squared	0.025	0.028	0.026	0.028	0.093	0.103	0.099	0.102
Supplier controls	no	no	no	no	yes	yes	yes	yes
Customer controls	no	no	no	no	yes	yes	yes	yes