LITIGATION RISK AND HEDGING

by

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ABSTRACT

Firms operating in the United States face important litigation risk, yet little is known on how this risk affects financial decisions. I use a natural experiment to explore the effect of litigation risk on firms' hedging behavior. I find that firms are more likely to use financial derivatives following an exogenous increase in litigation risk. This finding is stronger in the subset of firms with higher distress costs, lower credit ratings, and higher legal concerns. My results imply that litigation risk can at least partially explain the use of financial derivatives.

1. Introduction

Corporate executives take risk management very seriously. Survey evidence suggests that risk management ranks among a manager's top priorities.[1] A growing number of corporations use financial derivatives, such as interest rate swaps and foreign currency derivatives, to manage their exposure to certain financial risks. According to the Bank of International Settlements, the value of outstanding interest rate and foreign exchange derivatives held by nonfinancial customers grew substantially from $9.4 trillion to $44.4 trillion during the period from 2000 to 2009 (Campello et al. (2011)). Therefore, it is important for financial economists to understand why and when firms use such hedging instruments. Conventional explanations for hedging relate to distress costs, tax incentives, managerial risk aversion (Smith and Stulz (1985)), and the underinvestment problem (Froot, Scharfstein, and Stein (1993)). This paper expands on these previously studied determinants of hedging and examines whether litigation risk affects firms' hedging decisions.

Many firms in the United States face important litigation risk. This exposes them to the possibility of large adverse shocks that could have serious consequences on their financial health. For example, Gormley and Matsa (2011) use a calibration test and find that the median potential litigation liability faced by firms in their sample increases the probability of distress 30-fold (from 0.09% to 3.35%). Previous literature has examined the effects of litigation risk on firms' cash holdings, debt, and mergers and acquisitions decisions (see Arena and Julio (2015), Crane (2011), and Gormley and Matsa (2011)). Surprisingly, little is known about how litigation risk affects a firm's hedging decisions.

In this paper I examine the effect of litigation risk, the risk of experiencing a large negative cash flow shock due to litigation, on a firm's risk management practices. More precisely, I test

[1] See Rawls and Smithson (1990).

whether firms facing greater litigation risk are more likely to use financial derivatives. I hypothesize that it is more important for a firm to hedge its interest rate, foreign exchange, or commodity risk if, at the same time, it faces a higher likelihood of costly litigation. A premise to my hypothesis is that it will be especially harmful for a firm to face a negative cash flow shock due to litigation and at the same time face another shock due to currency, interest rate, or commodity price fluctuations.

I test the above hypothesis by examining whether litigation risk affects a firm's hedging decisions. To assess a firm's litigation risk, I use data on material pending litigation disclosed to the Securities and Exchange Commission. My baseline tests uncover an economically important positive association between litigation risk and the use of financial derivatives. However, while the baseline results are consistent with my main hypothesis, an important concern that remains unresolved is the endogenous nature of a firm's hedging decisions. For example, unobservable firm heterogeneity correlated with both litigation risk and the use of financial derivatives could possibly bias my results. To establish causality, I use a natural experiment.

The principle challenge in estimating the causal effect of a higher risk of litigation on a firm's hedging decisions is identifying exogenous variation in this risk. To this end, I focus on an exogenous increase in a firm's litigation risk created by the discovery of a new carcinogen that is used in a firm's operations and to which a firm's workers are exposed. The new discovery represents a substantial increase in the risk of litigation from a firm's own employees. Sick employees and their family members are entitled to sue the firm for negligence, pain and suffering, and punitive damages (Gormley and Matsa (2011)). Even a few lawsuits can result in significant costs for an employer. This setting, therefore, provides exogenous variation in the risk of litigation, allowing me to estimate the causal effect of litigation risk on a firm's hedging decisions.

My main empirical tests use a difference-in-differences approach based on the staggered discovery of carcinogens over the period of 1996 to 2013. I use the Report on Carcinogens (RoC) to identify carcinogens and the year in which they were discovered. The National Occupational Exposure Survey (NOES) provides industry-level data on occupational exposure to various chemicals. A firm is identified as exposed if it satisfies two criteria. First, the firm must operate in a potentially exposed industry according to the NOES data.[2] Second, the carcinogen's name must experience a large increase in the number of times it is mentioned in the firm's 10-k filings around the year of discovery.[3] To measure changes in the risk of litigation over the sample period, I create a carcinogen exposure indicator variable. For each firm that I identify as exposed to a certain carcinogen, the carcinogen exposure indicator equals one starting the year that the carcinogen is added to the RoC, and equals zero otherwise. This variable always equals zero for firms with no carcinogen exposure. To measure changes in the hedging decisions, I use indicator variables that are constructed by searching electronic 10-K filings for text strings that indicate the use of foreign exchange, interest rate, or commodity derivatives.[4] Also, for a smaller subset of firms, I hand-collect data on the percentage of commodities hedged and the net value of outstanding derivatives to better understand firms' hedging decisions. Using a difference-in-differences approach, I examine whether firms are more likely to use financial derivatives after facing an exogenous increase in litigation risk.

I argue that carcinogen exposure results in a substantial increase in default risk. I find evidence consistent with this argument by using the cost of bank debt as a proxy for default risk. If carcinogen exposure has a significant impact on the riskiness of exposed firms, then this should

[2] NOES does not define potentially exposed industries. Please refer to section 3.4.2 (methodology) for more details.
[3] Please refer to section 3.4.2 for a clarifying example.
[4] I thank DJ Fairhurst for providing the hedging data.

be reflected in their cost of debt. I find that credit spreads paid by exposed firms increase by 7.3% following a carcinogen announcement, which implies that capital markets recognize the increase in the riskiness of exposed firms.

My analysis uncovers a positive effect of litigation risk on the use of financial derivatives. The key result is that, on average, the announcement of a new carcinogen – to which a firm's workers are exposed – leads to an economically significant increase of up to 20% in the likelihood of derivatives use. This finding holds after the inclusion of standard hedging controls and firm and year fixed effects. I also distinguish between foreign exchange, interest rate, and currency hedging. When examining foreign exchange, interest rate, or commodity hedging, I limit the sample to firms with ex-ante exposure to that specific risk. By focusing on such firms, I can interpret the absence of derivative use as a choice to not hedge, rather than a lack of exposure to hedgeable risks. I find a large and significant increase in the likelihood of using all three types of financial derivatives. I also show that the increases in the likelihood of hedging occur after the carcinogen announcement, but not before. Overall, these results suggest that a higher risk of litigation leads to an increase in the likelihood of hedging, and that the effect is indeed causal.

To increase confidence in my interpretation of these results, I next study cross-sectional variation in the impact of litigation risk on the use of financial derivatives. First, hedging theory suggests that hedging is more valuable for firms with higher financial distress costs (Smith and Stulz (1985)). In particular, hedging reduces the variability of future cash flows, lowering the likelihood of experiencing financial distress. Hence, firms with higher distress costs are more likely to benefit from hedging. This suggests that carcinogen exposure should have a stronger impact on the hedging decisions of firms that have higher distress costs. I find evidence consistent with this prediction. Specifically, I find that the effect of litigation risk on hedging only exists for firms with above median financial distress.

Second, costly external financing can create a strong incentive for a firm to hedge. Froot, Scharfstein, and Stein (1993) argue that hedging can add value by reducing the volatility of internal cash flows and consequently ensuring that sufficient internal funds are available to fund profitable investments. This implies that firms with limited access to external capital markets are likely to benefit more from hedging. Consequently, carcinogen exposure should have a stronger impact on the hedging decisions of firms that have limited access to external funds. Using credit ratings to proxy for the cost of external financing, I find that the effect of carcinogen exposure on hedging decisions is most prevalent when firms have a below investment grade credit rating or no credit rating.

Third, if litigation risk is driving my results, then carcinogen exposure should have a stronger impact on the hedging decisions of firms that face greater litigation risk. Using the count of the word "litigation" in a firm's 10-K filing as a proxy for litigation-related concerns, I find that the effect of carcinogen exposure on a firm's hedging decisions is only significant for firms with above median litigation count. This confirms my interpretation of the results.

This paper is closely related to a growing body of work that examines the impact of litigation risk on various corporate decisions. Existing evidence suggests that litigation risk has important implications on a firm's financial decisions. For instance, Arena and Julio (2015) find that firms increase their cash holdings as a buffer against anticipated legal costs. Consistent with these findings, Gormley and Matsa (2011) show that firms react to an exogenous increase in legal costs by acquiring large unrelated businesses with high cash flows. This can be conceived as an operational hedge against legal risk. My results expand on these findings by demonstrating that litigation risk has an impact on firms' financial hedging decisions in addition to the previously shown operational hedging decisions. As such, my paper also contributes broadly by increasing our understanding of how litigation risk affects firms' financial policy decisions.

This paper also relates to the literature on the determinants of corporate hedging. An important obstacle that has hindered empirical hedging research is identification. Although prior literature recognizes this identification problem, little has been done to overcome this challenge.[5] I use a natural experiment to address the endogenous nature of a firm's hedging decisions, and in doing so, provide insights on the determinants of firms' risk management policies.

2. Related literature and hypotheses development

2.1 Litigation risk

One body of literature relevant for my paper is on litigation risk. A large body of literature in both finance and accounting examines how litigation risk impacts corporate decisions. For instance, extant work investigates how litigation risk affects equity-based compensation (Dai et al. (2008); Jayaraman and Milbourn (2009)), accounting disclosure (Skinner (1994)), IPO underpricing (Lowry and Shu (2002); Hanley and Hoberg (2010)), institutional monitoring and board discipline (Cheng et al. (2010); Laux (2010)), management discussion and analysis disclosures (Brown and Tucker (2011)), cash holdings (Arena and Julio (2015) ; Crane (2011)), and mergers and acquisitions (Gormley and Matsa (2011)). In this paper, I explore the effect of litigation risk on firms' hedging behavior.

There are various ways in which litigation risk can affect firms' decisions, however, firms'

[5] Graham and Rogers (2002) use a simultaneous equations approach to address reverse causality concerns between hedging and capital structure decisions. More recently, Hankins and Williams (2014) use the introduction of the steel futures market in the London Metals Exchange and the Chicago Mercantile Exchange as a natural experiment.

financing decisions might be particularly sensitive to this risk. Empirical evidence on the effect of litigation on a firm's cash holdings is mixed. For example, Arena and Julio (2015) find that firms facing a greater risk of litigation hold more cash as a buffer against anticipated costs. However, Crane (2011) argues that firms strategically raise their leverage ratios and decrease their cash holdings following increases in litigation risk. He claims that doing so increases a firm's bargaining power and ultimately limits the potential payout to litigants. Gormley and Matsa (2011) study the effect of litigation risk in a natural experiment setting. They find that firms with weaker balance sheets respond to sudden increases in litigation by acquiring large unrelated businesses with relatively high operating cash flows.

Prior studies on the effect of litigation risk on financial policy had to address the concern that firms could simply insure against litigation. Extant evidence suggests litigation insurance does not provide sufficient coverage. For example, Arena and Julio (2015) estimate that during the period from 1996 to 2006 public firms paid an aggregate of 2.2 billion dollars annually in net-of-insurance settlements. [6] Moreover, they find that 52% of firms that agreed to settle had to pay out-of-pocket settlement costs.[7] They also show that public firms had an average litigation insurance limit of $15 million while the average settlement amount was $56 million for firms in their sample. However, this distribution might be skewed due to a small number of large settlements. Gormley and Matsa (2011) also note that third-party policies are often limited in scope and do not provide protection against future premium increases. Therefore, my study sheds light on a case where financial policy is used to mitigate risks that can only be partially reduced with explicit contracts.

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[6] Arena and Julio (2015) use a sample of Compustat firms that have available litigation data from the Securities Class Action Clearinghouse website for the period from 1996 to 2006. They also use Towers Perrin Directors and Officers Liability Survey to get information on litigation insurance.

[7] Firms might not always find it feasible to increase insurance limits as insurance premiums can become a very significant cost of doing business (Williams (1986); Cummins and Olson (1974)).

One key challenge facing empirical research in this area is measuring litigation risk. Litigation risk is inherently unobservable and hard to estimate. Prior papers use several proxies for this risk. One kind of proxy estimates a firm's propensity for getting sued using a probit or logit model (see Rogers and Stocken (2005)). Another proxy considers spillover effects of litigation. Specifically, this proxy considers cases filed against a firm's peers as indicative of an overall increase in an industry's legal risk. This reflects that a precedent has been set or that the litigation environment has changed. A third type of litigation measure explores exogenous shocks to the legal environment. For example, Gormley and Matsa (2011) use the discovery of a new carcinogen that a firm's workers are exposed to as an exogenous increase in litigation risk. This approach allows for a better identification of litigation risk.

2.2 Determinants of financial hedging

Another body of relevant literature examines the determinants of hedging. The Modigliani and Miller irrelevance theory suggests that in a world with perfect and complete markets, hedging does not add value. This follows because shareholders could hedge on their own and, hence, there is no reason for a firm to hedge. However, several market frictions can make hedging valuable. The remainder of this section discusses some of these market frictions and how they may influence a firm's hedging decisions.

A. Expected cost of financial distress

Smith and Stulz (1985) argue that transaction costs associated with bankruptcy can induce firms to hedge. They demonstrate that hedging can increase a firm's value by reducing cash flow volatility and, thus, lowering the probability of encountering costly financial distress. Haushalter (2000) and Graham and Rogers (2002) both find empirical evidence supporting the distress hypothesis. An important prediction from this hypothesis is that firms facing costlier financial distress are more likely to hedge.

B. Inefficient investment costs

Froot, Scharfstein, and Stein (1993) argue that if capital market imperfections make external funds costlier than internally generated funds, then this will incentivize hedging. They argue that hedging can increase firm value by reducing the volatility of internal cash flows and, consequently, ensure that sufficient internal funds are available to fund profitable investments. The underinvestment hypothesis predicts that hedging will be more valuable for firms facing costly external finance.

Empirical evidence on this hypothesis is mixed and depends on the proxy used for investment. For example, using book-to-market to proxy for investment opportunities, Nance et al. (1993), Mian (1996), Geczy et al. (1997), and Graham and Rogers (2002) find no support for the underinvestment hypothesis while Gay and Nam (1998) find supportive evidence. On the other hand, when R&D expenses are used to proxy for investment opportunities, Nance et al. (1993), Dolde (1995), Gay and Nam (1998), and Graham and Rogers (2002) find supportive evidence while Howton and Perfect (1998) find no supportive evidence.

C. Tax incentives

Smith and Stulz (1985) show that if a firm's tax function is convex in earnings, then hedging can be value enhancing. They show that by reducing income volatility, hedging can result in a lower expected tax liability. This reduction follows directly from Jensen's inequality. The empirical evidence regarding this prediction is mixed. While Nance et al. (1993) find supporting evidence, Graham and Rogers (2002) find no supporting evidence.

Another tax incentive for hedging follows from increasing a firm's debt capacity. Stulz (1996), Ross (1997), and Leland (1998) show that by reducing income volatility or reducing the probability of distress, firms are able to increase their debt capacity and, consequently, increase their tax shield. Leland (1998) also shows that unused debt capacity can increase value by reducing the probability of distress.

D. Managerial incentives

Managerial incentives could also influence a firm's decision to hedge. Smith and Stulz (1985) show that a risk-averse manager has an incentive to hedge in order to reduce the volatility of his compensation. Consistent with this argument, Tufano (1996) finds that hedging is positively related to managerial ownership and negatively related to managerial option holdings. However, Haushalter (2000) finds no evidence that stock ownership or managerial risk aversion is related to hedging.

2.3 Firm value and derivative usage

In order to fully understand the implications of my results, it is important to shed light on the importance and the value implications of hedging. Theoretical evidence suggests that hedging can add value by mitigating market imperfections, however, empirical evidence is mixed.

Allayannis and Weston (2001) document a positive association between firm value and the use of financial derivatives. Moreover, Graham and Rogers (2002) find that hedging foreign exchange or interest rate risk can increase firm value by 1.1% through the tax benefits of increasing debt capacity. Guay and Kothari (2003) study the derivative usage of 234 nonfinancial firms and conclude that derivative positions are too small to account for the valuation premium in Allayannis and Weston (2001). Jin and Jorion (2006) study the hedging activities of 119 oil and gas producers and find that hedging reduces the sensitivity of stock prices to oil and gas prices, however, it does not increase firm value. While these findings question the importance of hedging, several recent papers suggest that hedging raises firm value. For example, Carter, Rogers, and Simkins (2006) study hedging positions in the airline industry and conclude that the average hedging premium of airlines is in the range of 5% - 10%. They argue that jet fuel prices are substantially more volatile than other underlying assets typically studied (e.g. interest rates or currencies) and therefore can have greater value implications. They suggest that the sample choice (oil and gas industry) of Jin and Jorion (2006) biases against finding results because investors prefer exposure to oil and gas prices. Consistent with the results of Carter et al. (2006), Mackay and Moeller (2007) provide additional evidence that derivative usage adds value. Moreover, Gilje and Taillard (2015) use exogenous changes in basis risk to show that hedging adds value. Overall, the empirical evidence is mixed, however, the fact that firms continue to invest in building and maintaining costly hedging programs suggests that hedging is indeed valuable.

2.4 Hypothesis and testable predictions

As mentioned in section 2.2, Smith and Stulz (1985) argue that hedging can increase firm value by reducing the volatility of cash flows and, therefore, decreasing the probability of financial distress. Stulz (1996) emphasizes the importance of hedging in eliminating costly left tail outcomes. To the extent that litigation risk increases cash flow volatility, increases the probability of financial distress, or reduces the availability of internal funds for investments, then all else equal, companies with higher litigation risk should be more likely to engage in hedging.

I hypothesize that it is more important for a firm to hedge its interest rate, currency, or commodity risk if, at the same time, it faces a higher likelihood of costly litigation. I argue that it will be especially harmful if a firm faces a negative cash flow shock due to litigation and, at the same time, it faces another shock due to interest rate, foreign exchange, or commodity price fluctuations. The following example develops the intuition behind my main hypothesis.

Consider firms A and B where the two firms are identical except that firm A is exposed to higher litigation risk. Due to this risk, firm A faces greater uncertainty over its future cash flows. I predict that a cash flow shock due to interest rate, currency, or commodity price fluctuations is going to be relatively more harmful for firm A compared to firm B. Thus, all else equal, I hypothesize that firm A will be more willing to engage in hedging relative to firm B. My main hypothesis is formally stated as follows:

Hypothesis 1: Firms facing higher litigation risk are more likely to use financial derivatives.

A testable prediction of this hypothesis is that firms that face ex-ante exposure to interest rate, currency, or commodity risk are more likely to hedge those risks when faced with greater litigation risk. The increase in the use of hedging should persist even after controlling for previously known determinants of hedging.

3. Data and methodology

3.1 Sample selection

My sample consists of all industrial firms included in the CRSP/COMPUSTAT merged database (excluding financials and utilities) for which I am able to construct the variables required in my main tests. The sample period is from 1996 to 2013. The sample starts in 1996 because electronic 10-K filings became widely available for most public firms that year. I use two major tests to measure the effect of litigation risk on firms' hedging decisions. First, I use a logit model to estimate the cross-sectional association between litigation risk and hedging. Second, I use a natural experiment to better understand the causal effect of litigation risk on the use of financial derivatives. The remainder of this section is organized as follows: Section 3.1 explains the hedging data; Section 3.2 discusses tests on the cross-sectional association between litigation risk and hedging; and Section 3.3 discusses the data and empirical tests related to the natural experiment.

3.2 Hedging data

Information on the use of financial derivatives is gathered from 10-K filings found in the SEC's Electronic Data Gathering and Retrieval (EDGAR) database. Previous studies use the notional value, net value, and/or a binary variable to measure hedging. All these approaches do not perfectly measure a firm's hedging positions. Graham and Rogers (2002) find that using net derivative positions increases the power of their tests, nevertheless, they also find that using a binary variable provides similar results. Given the difficulty in accurately estimating the net value of derivatives, I use binary hedging variables. Doing so allows me to construct hedging variables for a larger sample.[8] The hedging variables are constructed by searching a firm's 10-K filing for text strings that indicate the use of financial derivatives. I create four variables: *IR dummy* indicates the use of interest rate hedging, *FX dummy* indicates the use of foreign exchange hedging, C*ommodity dummy* indicates the use of commodity hedging, and *All hedging dummy* indicates the use of any of the three types of hedging.

3.3 Exposure to interest rate, foreign exchange, and currency risk

I limit my analysis to firms with ex-ante exposure to interest rate, foreign exchange, or commodity risk. This means that I analyze interest rate hedging on the subsample of firms with exposure to interest rate risk. Similarly, I analyze foreign exchange and commodity hedging on

[8] I also hand-collect data on the percentage of commodities hedged and the net value of outstanding derivatives for a smaller subsample of firms. Section 4.5.1 goes over the results using the hand collected hedging data.

the subsamples of firms with exposure to foreign exchange and commodity risk, respectively. Doing so allows me to interpret the absence of hedging as a choice not to hedge, rather than an absence of exposure to hedgeable risk. I identify exposure to these risks in the following manner.

First, following Geczy et al. (1997), I identify a firm as having exposure to foreign exchange risk if it meets any of the following criteria: a) it reports foreign currency sales in COMPUSTAT geographical segments; or b) it discloses nonzero foreign income taxes, deferred foreign currency taxes, foreign currency adjustment, or pre-tax foreign income in the annual COMPUSTAT files.

Second, following Graham and Rogers (2002), I identify a firm as exposed to interest rate risk based partially on the sensitivity of operating income to interest rates. Specifically, I regress changes in operating income on changes in the six-month LIBOR rate using seven years of quarterly data. Based on the sign of the regression coefficient, I identify each firm as having positive, negative, or no operating interest rate exposure. A firm has zero operating exposure if the regression coefficient is not significant at the 10% level. A firm is identified as having interest rate exposure if it meets any of the following criteria: a) it has zero operating exposure to changes in interest rates and positive amounts of short-term debt; b) it has negative operating exposure to changes in interest rates; or c) it has positive operating exposure to changes in interest rates and less than 50 percent of debt is short-term.

Third, following Hankins and Williams (2014), I identify a firm as exposed to commodity risk if it operates in a six-digit NAICS code industry that has inputs or outputs traded on major financial markets. Hankins and Williams identify exposed industries by utilizing data from the 2002 Bureau of Economic Analysis' benchmark Input-Output tables and the November 2009 issue of Futures Magazine. I borrow the list of exposed industries from Hankins and Williams.[9]

[9] The list of industries can be found in appendix C of Hankins and Williams (2014), page 28.

3.4 Cross-sectional association between litigation risk and hedging

My first set of tests investigates the cross-sectional association between litigation risk and the use of financial derivatives. I use the Audit Analytics' Legal Case and Legal Parties database to obtain information on litigation filed against public firms. This includes details on the original date of filing, the type of case, and the involved parties for all civil litigation disclosed to the SEC as material pending litigation. Audit Analytics provides data starting from January 2000. While this database does not capture all litigation filings, it probably includes all material cases, which are the ones most likely to cause shifts in the legal environment. This data is then merged with the CRSP/COMPUSTAT merged annual database using CIK and firm name.

I use a logit model to test the effect of litigation on hedging. This model is most suitable because my hedging variables can only take the value of zero or one. However, my results are robust to using a probit or a linear probability model. The regression model is as follows:

$$Hedging_{i,t} = \alpha + \beta \cdot litigation\,proxy_{i,t-1} + \gamma \cdot \boldsymbol{X} + \varepsilon_{i,t} \qquad (1)$$

where $Hedging$ is a binary variable indicating the use of either interest rate, foreign exchange, or commodity derivatives. I run separate equations with the following dependent variables: *All hedging dummy*, *IR dummy*, *FX dummy*, or *Commodity dummy*. As mentioned earlier, I limit my sample to firms with ex-ante exposure to interest rate, foreign exchange, or commodity risk when examining that specific type of hedging. X is a vector of control variables and $Litigation\ proxy$ is a proxy used to measure litigation risk. I use two different proxies for litigation risk to ensure that the results are not specific to the proxy I use. The first proxy is the number of cases disclosed to the SEC as material pending litigation in the previous year. The underlying assumption is that firms facing higher litigation risk are more likely to receive a greater number of cases. The second proxy captures exogenous variation in the probability of litigation by examining spillover effects on other firms that are not actually involved in litigation. Specifically, I use a litigation dummy variable set to one if any firm in the same four-digit SIC industry discloses material pending litigation in the previous year, and zero otherwise. Because of judicial precedent or industry-wide legal trends, lawsuits against a firm's peers would increase the probability that a firm would get sued. Both Gande and Lewis (2009) and Crane (2011) find that lawsuits against a firm's peers significantly increase the probability of future litigation.

The vector *X* contains standard control variables used in hedging tests (e.g. Graham and Rogers (2002)), including debt ratio, natural logarithm of assets, market-to-book assets (a proxy for investment opportunities), R&D spending scaled by total assets (another proxy for investment opportunities), and capital expenditures (a proxy for current investments). The squared debt ratio is included to capture the non-monotonic relation between leverage and hedging (Purnanandam (2008)). I also include the product of debt ratio and equity market-to-book to proxy for expected distress costs. Graham and Rogers (2002) argue that this proxy captures both the probability of distress and the associated cost if distress occurs. The probability of distress increases with the debt ratio and the cost of distress (if encountered) increases with the market-to-book ratio (Myers (1977)). I include delta and vega as defined in Core and Guay (1999) to proxy for the CEO's incentive to alter a firm's risk. Also, because Nance et al. (1993) note that sufficient liquidity could reduce the need for hedging, I include the dividend yield, the quick ratio, and the return on assets to address this concern. Finally, I include the percentage of foreign sales to proxy for the importance of foreign sales. The definitions of these variables can be found in Table 2.

I recognize that my litigation proxies are not perfect. While it would be preferable to use data on the expected legal liabilities, I only observe data on the number of material cases. Moreover, my litigation measures might be correlated with some unobservable factors that are also influencing firms' hedging decisions. This could ultimately lead to an omitted variable bias. Given these limitations, I also use a natural experiment that provides better identification for the effect of litigation risk on the use of financial hedging.

3.5 A natural experiment

3.5.1 Litigation related to occupational carcinogens

Following Gormley and Matsa (2011), I use the discovery of a new carcinogen that a firm's workers are exposed to as an exogenous increase in the firm's litigation risk. The new discovery represents a substantial increase in the risk of lawsuits from a firm's own employees.

3.5.2 Identifying exposed firms

I use The National Toxicology Program's Report on Carcinogens (RoC) to identify the timing of new carcinogen discoveries. The RoC is a congressionally mandated, science-based, document prepared for the U.S. Department of Health and Human Services Secretary. The report identifies agents that are known or reasonably anticipated to cause cancer in humans. I rely on the National Occupational Exposure Survey (NOES) to obtain industry-level data on the number of employees exposed to each carcinogen. The NOES was conducted between 1981 and 1983 and is publicly available at the 2-digit SIC code level. I use a two-step procedure to identify exposed firms. First, I identify a firm as *potentially exposed* if it operates in a 2-digit industry with more than 1000 employees exposed to a carcinogen as per NOES. Second, for all potentially exposed firms, I search the 10-K filings for the count of a carcinogen's name around the discovery. If the count of the carcinogen's name more than doubles after the discovery, the firm is identified as exposed. I identify 917 firms exposed to 17 carcinogens announced in 1998, 2000, 2002, 2004, and 2011. [10]

My approach is slightly different from that of Gormley and Matsa (2011) who obtain custom extracts of the NOES data aggregated at the 4-digit SIC code level. They then identify exposed firms as those operating in a 4-digit SIC code where at least 7.5% of the workers are exposed to a certain carcinogen. Their approach does not allow for within industry variation in exposure (i.e. either all firms or no firms in an industry are exposed).

An example should clarify my procedure. In the year 2000, Tetrafluoroethylene was added to the report on carcinogens. The national occupational exposure survey shows that the Printing and publishing industry (SIC 27) had 14,121 employees exposed to Tetrafluoroethylene. I identify all firms with SIC code 27 as *potentially exposed*. I then search the 10-K filings of these potentially exposed firms for the count of the text string "Tetrafluoroethylene" in the five years around 2000 (i.e. 1998-2002). If the "Tetrafluoroethylene" count more than doubles after 2000, I code the firm as being exposed.

3.5.3 Difference-in-differences methodology

I use a difference-in-differences approach to examine the effect of exogenous increases in litigation risk due to carcinogen announcements on the hedging decisions of exposed firms. The model I use is similar to the model in Bertrand and Mullainathan (2003). Specifically, I use the following linear probability model for my main specification:

$$Hedging_{it} = \alpha\ Post\text{-}announcement_{ict} + X_{i,t}\,\beta + \gamma_i + \delta_t + \varepsilon_{it} \qquad (2)$$

where i denotes firm i, t denotes year t, and c denotes carcinogen c. *Hedging* is a binary variable

[10] I redefine my exposure identification criteria to be: the number of times a carcinogen name is mentioned in 10k increases by either three times or four times following a carcinogen discovery. My main results hold, however, the significance levels decreases. The results are available upon request.

indicating the use of financial derivatives, $Post\text{-}announcement_{ict}$ is an indicator that equals one if firm i is exposed (as per the above mentioned procedure) to carcinogen c as of year t, X is a vector of control variables (see section 3.3), γ_i is a firm fixed effect, and δ_t is a year fixed effect. For each exposed firm, my control group consists of all unexposed firms in the same 2-digit industry. The coefficient α is the difference-in-differences estimate which captures the effect of carcinogen announcements on firms' hedging decisions. Intuitively, α captures the change in the probability of hedging of firms with carcinogen exposure relative to the contemporaneous change in the probability of hedging of unexposed firms in the same 2-digit industry. One advantage of this identification strategy is the staggered announcement of carcinogens over time. This allows for firms to belong to both the "treatment" and "control" groups at different points in time. The firm fixed effects control for time-invariant omitted characteristics and the year fixed effects control for time trends or economy-wide factors that could affect both the likelihood of hedging and the risk of litigation. The estimated standard errors are always clustered at the firm level.

4. Results

4.1 Summary statistics

Table 1 reports summary statistics for the key variables used in my analysis. Continuous variables are winsorized at their 1st and 99th percentiles. The usage of financial derivatives in my sample is similar to what is found in survey data. Specifically, 49% of my sample uses foreign exchange derivative, 44% uses interest rate derivatives, and 11% uses commodity derivatives. The mean total assets value is $1,183 million and the mean debt ratio is 0.21.

4.2 Cross-sectional association between litigation risk and hedging

My first set of tests examines the cross-sectional association between litigation risk and the use of financial derivatives. Table 2 reports the average marginal effects from logit regressions of hedging on lagged litigation risk proxies (equation 1). I use Audit Analytics' data on material pending litigation disclosed to the SEC to assess a firm's litigation risk. $Cases_{t-1}$ is the number of material cases disclosed to the SEC as material pending litigation in the previous year. Following Crane (2011), I exclude class action suits, although my results are not sensitive to this restriction. $Litigation\ dummy_{t-1}$ is a dummy variable set to one if any firm in the same four-digit SIC industry discloses material pending litigation in the previous year, and zero otherwise. In columns 1 and 2 the dependent variable is *All hedging dummy* – a binary variable set to one if a firm uses any of the three types of hedging. In models 3 and 4, I report the results for the use of foreign exchange hedging while limiting my sample to firms with ex-ante exposure to foreign exchange risk. Similarly, in columns 5 and 6 (7 and 8) I report the results for the use of interest rate (commodity) hedging while limiting my sample to firms with ex-ante exposure to interest rate (commodity) risk.

The results in Table 2 reveal a strong positive association between litigation risk and the use of financial derivatives. Column 1 shows that the average marginal effect of a one unit increase in the number of cases in the previous year is associated with a 6.2% increase in the likelihood of hedging. Likewise, column 2 documents that a change in a firm's industry legal environment is associated with a 7.9% increase in the likelihood of hedging. Similar results are found in columns 3 and 4 for foreign exchange hedging, columns 5 and 6 for interest rate hedging, and column 8 for commodity hedging. The results, however, are weaker in column 7. It is important to note that the foreign exchange, interest rate, and commodity dummies are not measuring the same thing. The largest correlation between any two of these three variables is 0.36, in the case of foreign exchange and interest rate hedging. Overall, the results are consistent with the hypothesis that firms with a higher risk of litigation are more likely to hedge.

While my baseline results in Table 2 support my main hypothesis, a serious concern remains unresolved. Specifically, firms' hedging decisions are endogenously determined and unobservable firm heterogeneity correlated with both litigation risk and the use of financial derivatives could bias my results. To estimate the causal effect of litigation risk on firms' hedging decisions, I need to identify exogenous variations in this risk. I use a natural experiment to identify such exogenous variation.

4.2.1 Carcinogen announcements and changes in firms' cost of debt

I use the discovery of a new carcinogen to which a firm's employees are exposed to identify exogenous variation in the risk of litigation. Carcinogen discoveries represent a substantial increase in the risk of lawsuits from a firm's own employees. To increase confidence in the effect of these discoveries on firms' risk, I examine the cost of debt following a carcinogen discovery. If carcinogen exposure has a significant impact on the riskiness of exposed firms, then it should be reflected in the cost of debt. I focus on credit spreads of bank debt as a proxy for default risk.

Table 3 presents the regression results for the effects of carcinogen discoveries on the cost of bank loans. My regression model is similar to that in Graham et al. (2008). In column 1, results are presented for the cost of debt with *post-announcement* as the only independent variable. *Post-announcement* is an indicator set to 1 if the loan is initiated by an exposed firm in the years following a carcinogen discovery, and zero otherwise. Industry fixed effects are included in all my models. The estimated coefficient is positive and statically significant at the 5% level, indicating that after carcinogen exposure, the cost of debt for exposed firms increases by 7.3%. In Column 2, the results remain significant even after controlling for firm characteristics that influence the cost of debt. I further control for loan characteristics in column 3. The post-announcement coefficient remains significant. In column 4, loan type and loan purpose fixed effects are included. Overall, the results suggest that the cost of bank debt increases significantly following carcinogen exposure. This evidence is consistent with the view that carcinogen exposure significantly impacts default risk and that capital markets recognize this increase in risk.

4.3 Evidence of causality using a difference-in-differences approach

The difference-in-differences estimates of the impact of carcinogen discoveries on the hedging decisions of exposed firms are reported in Table 4. Column 1 analyzes the use of all three types of hedging without limiting the sample to firms with ex-ante exposure to hedgeable risks. Columns 2-4 analyze each type of hedging separately while at the same time limiting the sample to firms with ex-ante exposure to that risk. Because I use firm fixed effects, the results represent within firm variation in the likelihood of hedging.

I find that being exposed to an exogenous increase in litigation risk significantly influences the likelihood of using financial derivatives. The results in column 1 show that following a carcinogen discovery, exposed firms are 4.4% more likely to hedge compared to unexposed firms in the same industry. The likelihood of hedging increases substantially as I limit my sample to firms with ex-ante exposure to hedgeable risks (columns 2-4). This is consistent with the conjecture that some firms examined in column 1 did not have any exposure to hedgeable risks resulting in a lower likelihood of hedging. The results in column 2 (3) suggest that following a carcinogen discovery, exposed firms are 6.0% (6.2%) more likely to hedge their foreign exchange (interest rate) risk compared to unexposed firms in their industry.

Perhaps column 4 presents the most striking results. The likelihood of commodity hedging for exposed firms increases by 20.8% following a carcinogen discovery.[11] This larger effect for commodity hedging is consistent with two possible explanations. First, it is possible that commodity price fluctuations have a greater impact on a firm's cash flows in comparison to interest rate or foreign exchange fluctuations (Crater et al. (2006)). The arguments underlying my main hypothesis will then predict a larger likelihood of commodity hedging. Second, interest rate or foreign exchange hedging decisions could reflect covenant requirements by lenders rather than conscious risk management decisions. However, commodity hedging decisions are more likely to reflect a conscious risk management decision by the management. Overall, the results support the view that litigation risk increases the likelihood of using financial derivatives.

Table 5 presents results from a timing test that examines the timing of hedging decisions relative to the timing of carcinogen announcements. This addresses potential concerns about reverse causality and the validity of my empirical methodology. The key identifying assumption of a difference-in-differences approach is the "parallel trends" assumption. This assumes that trends in the hedging decisions of treatment firms (exposed firms) and control firms (unexposed firms in the same industry) are parallel prior to the discovery of new carcinogens. Finding a significant difference in hedging between exposed and unexposed firms prior to carcinogen discoveries would violate this assumption. Moreover, such a violation would bias the estimated coefficients in an unknown direction.

The timing test results are presented in Table 5. Columns 1-4 are as defined in Table 4. The key variable of interest is *Year before announcement*, which is a binary variable set to one if a firm will be exposed to a carcinogen in the next year, and zero otherwise. A statistically significant

[11] Oil and gas companies do not drive this result. The result holds even after excluding firms in SIC 13 (Oil and Gas Extraction).

coefficient of any sign on this variable will imply a violation of the parallel trends assumptions. I find that the coefficient on *Year before announcement* is not statistically significant in all four columns. Also, as predicted, the coefficient on post announcement remains statistically significant in all columns. Overall, these results suggest that likelihood of hedging increases after carcinogen exposure, but not before. Hence, a violation of the parallel trends assumption or reverse causality does not explain my results.

4.4 Cross-sectional variation in the effect of the litigation risk on hedging decisions

Next, I study cross-sectional variation in the impact of litigation risk on the use of financial derivatives. To do so, I split my sample into two groups based on whether a characteristic is above or below the sample median and estimate the main specification for each group. These tests increase confidence in my interpretation of the results and point to the mechanisms behind the use of financial derivatives.

First, hedging theory suggests that costs related to financial distress can incentivize hedging because hedging reduces the variability of cash flows, resulting in a lower probability of financial distress (Smith and Stulz (1985)). Thus, firms facing higher distress costs will find hedging more valuable. Consequently, carcinogen exposure should have a stronger impact on the hedging decisions of firms that face higher distress costs.

Table 6 reports the results from the difference-in-differences approach for the subsample of firms with above and below median distress. Following Graham and Rogers (2002), I define *distress* as the product of the debt ratio and the equity market-to-book ratio. My results are robust to using the debt ratio or a dividend paying dummy as alternative measures of distress. In columns 1-6, I split the sample according to whether *distress* is above or below the sample median and estimate my main specification for each group. Supporting my predictions, the coefficients on *post announcement* are only significant for the subset of firms with above median distress. Further, the estimated coefficients on *post announcement* are larger in comparison with the results in Table 4. Columns 1-4 show that the results hold for interest rate and foreign exchange hedging. However, the results are weaker for commodity hedging. This is not surprising given the small sample size for commodity hedging. Overall, the results in Table 6 suggest that carcinogen exposure has a stronger impact on the hedging decisions of firms with higher distress costs.

Second, costly external capital can incentivize hedging. Froot, Scharstein, and Sein (1993) demonstrate that hedging can add value by ensuring that sufficient internal funds are available to fund future investments. The value added is proportional to the cost of external capital. In particular, Froot et al.'s theory predicts that hedging will be more valuable for firms facing costlier external capital. Consequently, carcinogen exposure should have a stronger impact on the hedging decisions of firms that have limited access to external funds.

In Table 7, I examine how the cost of external capital affects the impact of carcinogen exposure on hedging decisions. I use credit ratings to proxy for the cost of external financing. Specifically, I split the sample based on whether a firm has an above or below investment grade credit rating (BBB-). Columns 1, 3, and 5 include firms with a rating of BBB- or above. Columns 2, 4, and 5, include all other firms including those with no credit rating. I find that the effect of carcinogen exposure is especially strong when firms have a low or no credit rating. This result holds for all three types of hedging. Interestingly, carcinogen exposure has no impact on the hedging decisions of firms with investment grade credit ratings. This further supports the view that the hedging decisions of exposed firms is influenced by the underinvestment problem discussed in Froot, Scharfstein, and Stein (1993).

Last, I argue that litigation risk increases the likelihood of hedging. If this is the case, then carcinogen exposure should have a stronger impact on the hedging decisions of firms that face greater litigation risk. Tests of this prediction are presented in Table 8. I use the count of the word "litigation" in a firm's 10-K filing, relative to the size of the filing, to proxy for litigation-related concerns. I then split the sample according to whether the "litigation" count is above or below the sample median and estimate my main specification for each group. Consistent with my predictions, I find that the effect of carcinogen exposure on interest rate and currency hedging decisions is only significant for firms with an above median litigation count. This result does not hold for commodity hedging, potentially because of the small sample size.

4.5 Robustness tests

4.5.1 Hand-collected hedging data

To this point, I have only used binary variables to measure hedging. This allows me to construct hedging variables for a larger sample of firms. Binary variables, however, may not perfectly measure hedging. More accurate measures include the percentage of commodities hedged or the net value of outstanding derivatives. I hand-collect data on the percentage of commodities hedged and the net value of outstanding derivatives for the 787 firms in my sample with ex-ante commodity risk exposure. Doing so allows me to confirm that my findings are robust to using alternative measures of hedging. Moreover, using continuous hedging variables enables me to capture firms that were hedging throughout my sample period but increased their derivatives usage after carcinogen exposure.

For most firms in my sample, I was able to find data on either the percentage of commodities hedged or the net value of outstanding hedging instruments by fiscal year end. I only collect hedging data for firms that are hedgers based on my binary commodity hedging variable. The percentage hedged and the net value of derivatives is zero for all other firms. I collect the hedging data from 10-K filings in EDGAR's database.

Table 9 presents the main difference-in-differences results using the hand-collected hedging data. The dependent variable in column 1 is the percentage of commodities hedged. The results show that following a carcinogen discovery, exposed firms increase their hedging positions by 11.9% compared to unexposed firms in the same industry. The results in column 2 confirm this finding. Specifically, I find that following a carcinogen discovery, the net value of outstanding derivatives increases significantly compared to unexposed firms in the same industry.

4.5.2 Excluding acquiring firms

Gormley and Matsa (2011) find that firms react to carcinogen discoveries by acquiring large unrelated firms with high cash flows. If acquisitions, for any reason, increase the likelihood of hedging, then my results can be attributed to acquisitions rather than to litigation risk. To rule out this possibility, I use the Thomson Reuters SDC database to exclude all exposed firms that underwent an acquisition in the years following a carcinogen discovery.

Table 10 presents the main difference-in-differences results after excluding exposed firms that had an acquisition. The results remain statistically significant and the economic significance increases when compared to the results in Table 4. Overall, this suggests that the hedging decisions of exposed firms cannot be explained by the acquisition behavior reported in Gormley and Matsa (2011).

4.5.3 Accuracy of the hedging data

The hedging variables used are constructed by searching firms' 10-K filings for text strings that indicate the use of financial derivatives. To determine the error rate in the data, I randomly select 100 firm-year observations and manually look through the 10-Ks. Defining the null hypothesis as being that the firm does not hedge, I am interested in estimating the occurrence of Type I and Type II errors. A Type I error occurs when a firm is coded as a hedger when it actually does not hedge. Alternatively, a Type II error occurs when a firm is coded as a non-hedger when it actually does hedge. I calculate Type I and Type II errors for the following variables: *IR dummy*, *FX dummy*, C*ommodity dummy*, and *All hedging dummy*.

Table A1 presents the results for the accuracy of the hedging data and shows that the frequency of Type I and Type II errors is low. The findings suggest that Type I errors occur in approximately 3%, 3%, 4%, and 7% of the observations for the *IR dummy*, *FX dummy*, C*ommodity dummy*, and *All hedging dummy*, respectively. Type II errors occur in approximately 0%, 2%, 2%, and 1% of the observations for the *IR dummy*, *FX dummy*, C*ommodity dummy*, and *All hedging dummy*, respectively.

4.5.4 Accuracy of the Audit Analytics litigation proxy

In Table A2, I use the number of cases disclosed to the SEC as material pending litigation to proxy for litigation risk. To determine the validity of this proxy, I manually collect data on the legal reserves from the 10-Ks of 100 random firm-year observations. I am interested in validating whether this proxy has any power in predicting whether firms report a legal reserve. Defining the null hypothesis as being that the firm does not report any legal reserves, I am interested in determining the occurrence of Type I and Type II errors. Here, a Type I error occurs when a firm is coded as having material pending litigation while it does not report any legal reserves. Alternatively, a Type II error occurs when a firm is coded as not having any material pending litigation while it reports a legal reserve in its 10-K. Table A2 shows that the frequency of Type I and Type II errors is low. The findings suggest that Type I errors occur in approximately 10% of observations, while Type II errors occur in 11% of observations.

4.5.5 Accuracy of the litigation count variable

In Table 8, I use the count of the word "litigation" in a firm's 10-K filing, relative to the size of the filing, to proxy for litigation-related concerns. To determine the validity of this proxy, I manually check the accuracy of the litigation count variable for a random sample of 100 firm-year observations. For each firm, I count the number of times the word "litigation" refers to a firm's own legal concerns. I find that the approximate accuracy of this variable is 84%. In other words, 16% of the time the word litigation does not reflect firms' legal concerns.

To increase confidence in the validity of this proxy, I examine the change in the litigation count around carcinogen announcements. The results in Panel A of Table A3 show that litigation count increases significantly following carcinogen exposure. Moreover, Panel B provides the results in a difference-in-differences setting while controlling for firm and year fixed effects. The results show that following a carcinogen discovery, litigation count increases significantly for exposed firms compared to unexposed firms in the same industry.

4.5.6 Validity of the ex-ante risk exposure criteria

To check the validity of my ex-ante interest rate, foreign exchange, and commodity exposure criteria, I rerun Table 4 on the subset of firms without exposure to hedgeable risks. If the criteria used truly captures risk exposure, then I should not find any results for firms without any exposure. Consistent with this prediction, I find that carcinogen exposure does not impact the hedging decisions for firms without any exposure to hedgeable risks. This confirms the validity of my ex-ante risk exposure criteria.

4.5.7 Industry clustering

Conducting accurate statistical inferences is critical for any empirical analysis. One challenge to this is having clustered or non-independent error terms. Failure to control for clustering can lead to underestimating the standard errors and over rejecting the null hypothesis (Moulton (1990)). Throughout my tests, I cluster the standard errors at the firm level. To check the robustness of my results I also cluster the standard errors at the four-digit SIC industry level. This allows for correlation between observations at the industry level. My main results are robust to using industry clustering.

4.5.8 Net debt

I also look at net debt as an alternative measure of firms' financial obligations. Net debt is calculated by subtracting from a company's total debt its cash reserves. I rerun all my tests using net debt instead of actual debt and the results are similar.

5. Conclusion

In this paper, I examine the effect of litigation risk on firms' hedging decisions. I hypothesize that firms facing higher litigation risk are more likely to use financial derivatives. I provide two tests of this hypothesis. First, I test the cross-sectional association between litigation risk and hedging. Second, I use a difference-in-differences approach that exploits the staggered discovery of carcinogens over the 1996 to 2013 period. The discovery of a new carcinogen, to which a firm's employees are exposed, represents an exogenous increase in litigation risk arising from a firm's own employees. This allows for better identification of litigation risk.

Supporting my hypothesis, I find a strong positive association between litigation risk and hedging. Difference-in-differences estimation results support a causal interpretation of the relationship. In particular, I find that being exposed to an exogenous increase in litigation risk significantly influences the likelihood of using financial derivatives. Following a carcinogen discovery, exposed firms are more likely to hedge compared to unexposed firms in the same industry. Using a timing test, I show that the increased likelihood of hedging occurs after, but not before, carcinogen discoveries. This further supports a causal interpretation of the results.

The cross-sectional variation in the impact of carcinogen discoveries on hedging supports the economic mechanisms outlined in the paper. The impact is especially strong for firms facing higher distress costs, for firms with more costly external capital, and for firms with higher legal concerns.

Table 1: Summary statistics

The table reports summary statistics for the main variables used in this study. The sample period is from 1996 to 2013. Panel A reports the summary statistics for the full sample, while Panel B reports the summary statistics for exposed and unexposed firms. Exposed firms are firms identified as being exposed to a carcinogen during the sample period. Unexposed firms are firms without observed exposures to any newly listed carcinogens that were in the same 4-digit SIC code industry as one of the exposed firms. *FX dummy* is a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. *IR dummy* is a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. *Commodity dummy* is a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *All hedging dummy* is a binary variable set to one if *FX dummy* , *IR dummy*, or *Commodity dummy* equals one. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Litigation count* is the number of times the phrase "litigation" is mentioned in a firm's 10-K filing, relative to the size of the filing. *Litigation count* is multiplied by 10^6 for ease of presentation. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one-percentage point increase in stock return volatility.

Panel A: full sample

	N	Mean	Median
FX dummy	16,303	0.492	0
IR dummy	16,303	0.445	0
Commodity dummy	16,303	0.118	0
All hedging dummy	16,303	0.668	1
Size	16,303	7.076	6.928
ROA	16,303	0.060	0.078
Market-to-Book Assets	16,303	2.107	1.658
Debt ratio	16,303	0.210	0.198
Market-to-Book Equity	16,303	3.194	2.351
Distress	16,303	0.599	0.360
Capital expenditures	16,303	0.057	0.040
Dividend yield	16,303	0.009	0
Quick ratio	16,303	1.951	1.407
Litigation count	16,303	18.72	29.57
Foreign sales	16,303	0.270	0.209
Delta	16,303	600.8	211.5
Vega	16,303	149.6	61.56
R&D	16,303	0.001	0

Panel B: Summary statistics for exposed and unexposed firms

	Unexposed			Exposed		
	N	Mean	Median	N	Mean	Median
FX dummy	12,074	0.472	0	4,229	0.550	1
IR dummy	12,074	0.436	0	4,229	0.471	0
Commodity dummy	12,074	0.112	0	4,229	0.132	0
All hedging dummy	12,074	0.653	1	4,229	0.710	1
Size	12,074	7.036	6.898	4,229	7.192	7.003
ROA	12,074	0.057	0.0773	4,229	0.068	0.0805
Market-to-Book Assets	12,074	2.099	1.644	4,229	2.130	1.706
Debt ratio	12,074	0.211	0.200	4,229	0.208	0.195
Market-to-Book Equity	12,074	3.183	2.335	4,229	3.227	2.400
Distress	12,074	0.598	0.355	4,229	0.601	0.372
Capital expenditures	12,074	0.059	0.0416	4,229	0.051	0.037
Dividend yield	12,074	0.009	0	4,229	0.010	0.002
Quick ratio	12,074	1.947	1.399	4,229	1.963	1.427
Foreign sales	12,074	0.253	0.184	4,229	0.317	0.281
Delta	12,074	607.3	205.6	4,229	582.3	229.8
Vega	12,074	145.0	58.58	4,229	162.6	69.24
R&D	12,074	0.001	0	4,229	0.001	0

Table 2: Litigation and hedging

The table reports the average marginal effects from logit regressions of hedging on litigation risk. The sample period is from 2000 to 2013. Financial and utility firms are excluded. $Cases_{t-1}$ is the number of material cases disclosed to the SEC as material pending litigation (excluding class-action suits) in the previous year as reported in the Audit Analytics database. $Litigation\ dummy_{t-1}$ is a dummy variable set to one if any firm in same four-digit SIC industry discloses material pending litigation in the previous year and zero otherwise. In column 1 and 2, the dependent variable is *All hedging dummy* – a binary variable set to one if a firm mentions the use of foreign exchange, interest rate, or commodity derivatives in its 10-K filing. In column 3 and 4, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 5 and 6, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 7 and 8, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Distress* is scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t- statistics are in parentheses.

	Dependent variable:							
	All hedging dummy		FX dummy		IR dummy		Commodity dummy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Cases_{t-1}$	0.062***		0.070***		0.041***		0.095	
	(6.54)		(6.70)		(0.007)		(1.50)	
$Litigation\ dummy_{t-1}$		0.079***		0.075***		0.045***		0.173***
		(10.61)		(8.45)		(5.54)		(4.48)
Debt ratio	0.209***	0.206***	-0.005	-0.008	0.429***	0.427***	0.606***	0.584***
	(6.77)	(6.63)	(-0.14)	(-0.20)	(0.053)	(8.01)	(2.89)	(2.78)
$(Debt\ ratio)^2$	-0.043**	-0.044**	-0.006	-0.007	-0.138***	-0.139***	-0.377	-0.386*
	(-2.33)	(-2.35)	(-0.29)	(-0.34)	(0.051)	(-2.69)	(-1.61)	(-1.65)
Distress	0.000	0.000	-0.000	-0.000	-0.000*	-0.000*	-0.001	-0.001
	(1.58)	(1.58)	(-0.13)	(-0.05)	(0.000)	(-1.65)	(-0.93)	(-0.97)
Market-to-Book Assets	-0.002	-0.002	0.001	0.001	-0.014***	-0.013***	-0.009	-0.006
	(-0.93)	(-0.67)	(0.38)	(0.61)	(0.004)	(-3.21)	(-0.32)	(-0.19)
Capital expenditure	-0.121*	-0.126*	-0.288**	-0.294**	-0.056	-0.063	0.200	0.166
	(-1.73)	(-1.81)	(-2.44)	(-2.53)	(0.086)	(-0.73)	(1.57)	(1.34)
R&D	-0.125**	-0.124**	-0.320*	-0.295	-0.075	-0.058	0.220**	0.155
	(-2.11)	(-2.03)	(-1.73)	(-1.59)	(0.143)	(-0.39)	(2.14)	(1.58)
Dividend yield	-0.048**	-0.045**	-0.100	-0.094	-0.018	-0.015	-0.201	-0.157*
	(-2.06)	(-1.98)	(-1.50)	(-1.51)	(0.019)	(-0.85)	(-1.37)	(-1.66)
Quick ratio	-0.010***	-0.010***	-0.012***	-0.013***	-0.009***	-0.009***	0.006	0.005
	(-5.22)	(-5.45)	(-4.26)	(-4.50)	(0.003)	(-2.80)	(0.84)	(0.67)
ROA	0.056***	0.050***	0.010	0.005	0.087***	0.083***	0.104	0.072
	(4.36)	(4.01)	(0.71)	(0.35)	(0.025)	(3.32)	(1.23)	(0.85)
Size	0.057***	0.062***	0.062***	0.067***	0.057***	0.061***	0.017	0.027**
	(18.83)	(21.08)	(16.98)	(18.82)	(0.003)	(20.07)	(1.31)	(2.08)
Foreign sales	-0.082***	-0.080***	-0.029*	-0.028*	-0.117***	-0.117***	-0.275***	-0.250***
	(-4.84)	(-4.74)	(-1.70)	(-1.67)	(0.023)	(-5.19)	(-3.60)	(-3.33)
Observations	22,978	22,978	14,642	14,642	14,439	14,439	1,211	1,211
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: The cost of debt following a carcinogen discovery

The table presents the regression results on the effect of carcinogen discoveries on the cost of bank debt. The dependent variable is Ln(loan spread) defined as the natural logarithm of the spread (in basis points) over the LIBOR. Loan data is from the DealScan database. The dummy variable post-announcement is equal to one if the loan is initiated after the discovery of a new carcinogen in which the firm employees are exposed to and zero otherwise. The sample period is from 1996 to 2011. Log Loan Maturity is defined as the natural logarithm of the number of months until the loan matures. Log Loan Size is defined as the natural logarithm of the loan amount (in millions). Size is the natural logarithm of total assets. ROA is the return on assets defined as pretax income divided by total assets. The model used is similar to the model in Table 3 of Graham et al. (2008). All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t- statistics are in parentheses.

	(1)	(2)	(3)	(4)
Post announcement	0.073**	0.069**	0.059*	0.053*
	(2.13)	(2.21)	(1.91)	(1.72)
Size		-0.160***	-0.072***	-0.065***
		(-22.67)	(-8.09)	(-7.51)
Market-to-Book Assets		-0.100***	-0.095***	-0.089***
		(-7.04)	(-6.94)	(-6.69)
Debt ratio		0.696***	0.725***	0.702***
		(10.32)	(10.78)	(10.57)
ROA		-0.370***	-0.374***	-0.361***
		(-4.19)	(-4.29)	(-4.26)
Tangibility		-0.671***	-0.648***	-0.606***
		(-8.96)	(-8.98)	(-8.74)
Cash flow volatility		2.933***	2.756***	2.655***
		(17.48)	(16.92)	(16.66)
Z-score		0.013**	0.012**	0.010**
		(2.31)	(2.19)	(1.97)
Ln(loan maturity)			0.051***	-0.058***
			(5.81)	(-5.26)
Ln(loan amount)			-0.127***	-0.120***
			(-16.38)	(-16.02)
Control for:				
Loan type	No	No	No	Yes
Loan purpose	No	No	No	Yes
Industry effects	Yes	Yes	Yes	Yes
Observations	17,038	17,038	17,038	17,038
Number of firms	3,659	3,659	3,659	3,659

Table 4: Difference-in-differences results

The table reports results from difference-in-difference regressions for the use of financial derivatives following the discovery of new carcinogens. A linear probability model is used. The sample consists of all Compustat firms with available variables for the period from 1996 to 2013. Financial and utility firms are excluded. In column 1, the dependent variable is *All hedging dummy* – a binary variable set to one if a firm mentions the use of foreign exchange, interest rate, or commodity derivatives in its 10-K filing. In column 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 4, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one-percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent variable:			
	All hedging dummy	FX dummy	IR dummy	Commodity dummy
	(1)	(2)	(3)	(4)
Post announcement	0.044***	0.060***	0.062***	0.208**
	(2.62)	(2.96)	(2.81)	(2.45)
Debt ratio	0.207***	0.054	0.378***	0.679
	(4.63)	(1.04)	(6.47)	(1.59)
(Debt ratio)^2	-0.050**	-0.021	-0.095***	-0.359
	(-2.13)	(-1.49)	(-3.70)	(-1.36)
Distress	-0.041	0.054**	-0.086***	-0.508
	(-0.44)	(2.21)	(-4.18)	(-0.29)
Market-to-Book Assets	-0.001	0.000	0.003	0.096*
	(-0.34)	(0.20)	(0.54)	(1.88)
Capital expenditure	-0.149	0.092	-0.006	-0.196
	(-1.40)	(0.65)	(-0.04)	(-0.58)
R&D	-0.205	-0.099	0.386**	-0.017***
	(-0.86)	(-0.57)	(2.04)	(-7.10)
Dividend yield	0.037	-0.015	0.052	0.336
	(1.01)	(-0.33)	(1.08)	(1.45)
Quick ratio	-0.014***	-0.013***	-0.004	0.015
	(-4.37)	(-3.11)	(-1.22)	(0.50)
ROA	-0.033	-0.005	-0.046	-0.213
	(-1.25)	(-0.15)	(-1.34)	(-1.01)
Size	0.094***	0.093***	0.072***	0.065
	(8.11)	(6.85)	(4.55)	(1.12)
Foreign sales	0.032	0.038**	0.016	0.158
	(1.41)	(2.49)	(1.00)	(1.27)
Delta	0.001***	0.001***	0.001	0.025***
	(3.36)	(2.93)	(1.56)	(3.82)
Vega	-0.031**	-0.048***	-0.017	0.081
	(-2.27)	(-3.41)	(-0.98)	(0.37)
Observations	16,303	12,435	11,725	787
Adjusted R-squared	0.551	0.591	0.531	0.470
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Table 5: Timing test

This table reports results from a linear probability model relating the use of foreign exchange derivatives to the discovery of new carcinogens. The sample consists of all Compustat firms with available variables for the period from 1996 to 2013. Financial and utility firms are excluded. *Year before announcement* is an indicator variable set to one in the year before the discovery of a new carcinogen for firms exposed to that carcinogen and zero otherwise. *Post announcement* is an indicator that equals one in the years following (including the year of) the discovery of a new carcinogen for firms identified as being exposed to that carcinogen and zero otherwise. In column 1, the dependent variable is *All hedging dummy* – a binary variable set to one if a firm mentions the use of foreign exchange, interest rate, or commodity derivatives in its 10-K filing. In column 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 4, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent variable:			
	All hedging dummy	FX dummy	IR dummy	Commodity dummy
	(1)	(2)	(3)	(4)
Year before announcement	-0.009	-0.021	0.032	0.055
	(-0.40)	(-0.79)	(1.12)	(0.31)
Post announcement	0.044**	0.058***	0.065***	0.215**
	(2.46)	(2.75)	(2.77)	(2.46)
Debt ratio	0.207***	0.054	0.378***	0.685
	(4.63)	(1.05)	(6.47)	(1.59)
$(\text{Debt ratio})^2$	-0.050**	-0.021	-0.094***	-0.363
	(-2.13)	(-1.51)	(-3.68)	(-1.37)
Distress	-0.042	0.053**	-0.084***	-0.508
	(-0.45)	(2.19)	(-4.03)	(-0.29)
Market-to-Book Assets	-0.001	0.000	0.003	0.096*
	(-0.34)	(0.20)	(0.53)	(1.85)
Capital expenditure	-0.149	0.091	-0.005	-0.193
	(-1.41)	(0.64)	(-0.04)	(-0.57)
R&D	-0.205	-0.099	0.385**	-0.017***
	(-0.86)	(-0.57)	(2.04)	(-7.06)
Dividend yield	0.037	-0.016	0.050	0.337
	(1.02)	(-0.34)	(1.05)	(1.45)
Quick ratio	-0.014***	-0.013***	-0.004	0.017
	(-4.37)	(-3.11)	(-1.22)	(0.56)
ROA	-0.033	-0.005	-0.046	-0.213
	(-1.25)	(-0.16)	(-1.33)	(-1.01)
Size	0.094***	0.093***	0.072***	0.064
	(8.12)	(6.86)	(4.54)	(1.08)
Foreign sales	0.032	0.038**	0.016	0.161
	(1.41)	(2.49)	(1.00)	(1.28)
Delta	0.001***	0.001***	0.001	0.025***
	(3.36)	(2.93)	(1.57)	(3.83)
Vega	-0.031**	-0.048***	-0.017	0.083
	(-2.27)	(-3.42)	(-0.97)	(0.38)
Observations	16,303	12,435	11,725	787
Adjusted R-squared	0.551	0.591	0.531	0.470
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Table 6: Subsample of firms with high distress

This table reports results from difference-in-difference regressions on the use of financial derivatives following the discovery of new carcinogens for the subsample of firms with above and below median *distress*. *Distress* is the product of the debt ratio and the equity market-to-book ratio. A linear probability model is used. The sample consists of all Compustat firms with available data for the period from 1996 to 2013. Financial and utility firms are excluded. *Post announcement* is an indicator that equals one in the years following (includes the year of discovery) the discovery of a new carcinogen for firms identified as being exposed to that carcinogen and zero otherwise. In column 1 and 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3 and 4, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 5 and 6, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent Variable:					
	FX dummy		IR dummy		Commodity dummy	
	Above median	Below median	Above median	Below median	Above median	Below median
	(1)	(2)	(3)	(4)	(5)	(6)
Post announcement	0.058**	0.041	0.141***	0.022	0.216	0.191
	(2.04)	(1.44)	(4.62)	(0.69)	(1.37)	(1.49)
Debt ratio	-0.093	0.120	0.653**	0.464***	0.400	0.790
	(-0.40)	(1.50)	(2.36)	(5.15)	(0.40)	(1.30)
$(\text{Debt ratio})^2$	0.226	-0.027*	-0.576*	-0.113***	-0.369	-0.261
	(0.70)	(-1.77)	(-1.66)	(-4.36)	(-0.39)	(-0.67)
Market-to-Book Assets	0.000	0.001	-0.002	0.016**	0.025	0.173**
	(0.09)	(0.51)	(-0.21)	(2.04)	(0.45)	(2.17)
Capital expenditure	0.138	0.094	-0.045	-0.107	-0.189	-0.083
	(0.74)	(0.46)	(-0.21)	(-0.49)	(-0.42)	(-0.17)
R&D	0.130	-0.326	0.165	0.452	-0.018***	0.007
	(0.81)	(-0.75)	(0.62)	(1.60)	(-8.19)	(0.43)
Dividend yield	0.005	-0.031	0.053	-0.017	0.334	0.324
	(0.05)	(-0.36)	(1.07)	(-0.19)	(1.32)	(1.16)
Quick ratio	-0.012**	-0.010*	-0.000	-0.005	0.015	0.023
	(-2.14)	(-1.90)	(-0.04)	(-1.17)	(0.34)	(0.42)
ROA	-0.113*	0.044	-0.016	-0.067	-0.233	-0.146
	(-1.71)	(1.16)	(-0.25)	(-1.36)	(-1.09)	(-0.43)
Size	0.094***	0.096***	0.071***	0.076***	0.009	0.125
	(4.48)	(5.10)	(3.30)	(3.22)	(0.13)	(1.17)
Foreign sales	0.030***	0.075**	0.004	0.112*	0.318*	0.080
	(2.68)	(2.00)	(0.48)	(1.86)	(1.85)	(0.37)
Delta	0.001***	-0.002	-0.000	0.002	0.020**	0.037***
	(2.93)	(-1.52)	(-0.07)	(0.80)	(2.44)	(2.73)
Vega	-0.044**	-0.057**	-0.008	-0.070	-0.038	0.107
	(-2.55)	(-2.48)	(-0.48)	(-1.39)	(-0.14)	(0.42)
Observations	6,218	6,217	5,862	5,863	394	393
Adjusted R-squared	0.580	0.640	0.527	0.552	0.556	0.479
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Subsample of firms with high credit rating

This table reports results from difference-in-difference regressions on the use of financial derivatives following the discovery of new carcinogens. Columns 1, 3, and 5 report the results for the subsample of firms with an investment grade (BBB- and above) credit rating. Columns 2, 4,and 6 report the results for the subsample of firms with lower than BBB- rating including firms with no credit rating. A linear probability model is used. The sample consists of all Compustat firms with available data for the period from 1996 to 2013. Financial and utility firms are excluded. In column 1 and 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3 and 4, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 5 and 6, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Post announcement* is an indicator that equals one in the years following the discovery of a new carcinogen for firms identified as being exposed to that carcinogen and zero otherwise. *Capital expenditures* and *R&D* are both scaled by total assets. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent Variable:					
	FX dummy		IR dummy		Commodity dummy	
	Investment grade rating	Other	Investment grade rating	Other	Investment grade rating	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Post announcement	0.049	0.063**	0.039	0.107***	0.094	0.227*
	(1.48)	(2.51)	(1.40)	(2.83)	(0.71)	(1.68)
Debt ratio	-0.007	0.065	0.370***	0.750*	0.0188	0.435**
	(-0.03)	(1.17)	(6.08)	(1.96)	(0.42)	(2.26)
(Debt ratio)^2	-0.116	-0.020	-0.096***	-0.765	0.012	-0.619*
	(-0.44)	(-1.44)	(-4.19)	(-1.17)	(0.52)	(-1.96)
Distress	0.526	0.053**	-0.074***	-0.639	-0.499	-0.171
	(0.98)	(2.11)	(-5.94)	(-1.27)	(-0.28)	(-0.89)
Market-to-Book Assets	0.008	0.001	0.014**	-0.018	0.059	0.377**
	(1.02)	(0.51)	(2.28)	(-1.23)	(0.94)	(2.51)
Capital expenditure	0.259	0.114	-0.008	-0.187	-0.068	-0.055
	(0.66)	(0.74)	(-0.06)	(-0.52)	(-0.18)	(-0.07)
R&D	-0.531	0.050	0.258	0.997*	0.006	-0.013***
	(-1.27)	(0.27)	(1.41)	(1.80)	(0.82)	(-3.55)
Dividend yield	0.056*	-0.041	0.027	0.087	-0.023	0.681
	(1.93)	(-0.80)	(0.42)	(1.47)	(-0.14)	(1.62)
Quick ratio	-0.016	-0.013***	-0.006	0.021	0.036	0.050
	(-0.83)	(-3.00)	(-1.44)	(1.33)	(1.21)	(0.44)
ROA	-0.187	0.015	-0.053	-0.027	-0.128	-0.577
	(-1.45)	(0.44)	(-1.47)	(-0.18)	(-0.50)	(-1.65)
Size	0.091***	0.106***	0.085***	0.043	0.085	0.160*
	(3.09)	(6.76)	(4.61)	(1.12)	(0.97)	(1.84)
Foreign sales	0.075	0.031**	0.008	0.071	0.255	0.131
	(1.31)	(2.53)	(0.69)	(1.00)	(1.45)	(0.97)
Delta	0.001***	-0.002	0.001	0.001**	0.011**	0.030***
	(3.57)	(-1.30)	(0.88)	(1.99)	(2.09)	(2.71)
Vega	-0.047***	-0.034	-0.058	-0.021	0.664	0.076
	(-2.64)	(-1.51)	(-1.48)	(-0.81)	(1.27)	(0.35)
Observations	4,008	8,427	4,112	7,613	376	411
Adjusted R-squared	0.546	0.608	0.494	0.545	0.473	0.543
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Subsample of firms with high litigation count in 10-K

This table reports results from difference-in-difference regressions on the use of financial derivatives following the discovery of new carcinogens for the subsample of firms with above and below median *litigation count*. *Litigation count* is the number of times the phrase "litigation" is mentioned in a firm's 10-K filing, relative to the size of the filing. A linear probability model is used. The sample consists of all Compustat firms with available data for the period from 1996 to 2013. Financial and utility firms are excluded. In column 1 and 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3 and 4, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 5 and 6, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Post announcement* is an indicator that equals one in the years following the discovery of a new carcinogen for firms identified as being exposed to that carcinogen and zero otherwise. *Distress* is the product of the debt ratio and the equity market-to-book ratio *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent Variable:					
	FX dummy		IR dummy		Commodity dummy	
	Above median	Below median	Above median	Below median	Above median	Below median
	(1)	(2)	(3)	(4)	(5)	(6)
Post announcement	0.086**	0.039	0.126***	0.019	0.183	0.109
	(2.56)	(1.59)	(3.56)	(0.71)	(1.51)	(0.98)
Debt ratio	0.192*	0.058	0.661***	0.310***	0.974	0.967*
	(1.79)	(0.91)	(5.83)	(4.01)	(0.98)	(1.80)
$(\text{Debt ratio})^2$	-0.228*	-0.005	-0.391***	-0.062***	-0.129	-0.045
	(-1.90)	(-0.42)	(-4.18)	(-3.08)	(-1.01)	(-1.41)
Distress	-0.461	0.020**	-1.536***	-0.085***	-0.001	0.071
	(-1.56)	(2.18)	(-4.11)	(-7.32)	(-0.03)	(1.35)
Market-to-Book Assets	0.003	-0.001	0.017	0.003	0.112	0.105*
	(0.88)	(-0.18)	(1.64)	(0.39)	(1.37)	(1.75)
Capital expenditure	0.306	-0.125	0.124	-0.127	-0.255	-0.468
	(1.38)	(-0.66)	(0.60)	(-0.71)	(-0.55)	(-1.03)
R&D	0.260	-0.039	-0.909	-0.211	-0.023	0.022***
	(0.41)	(-0.25)	(-1.26)	(-1.12)	(-0.70)	(8.93)
Dividend yield	0.084**	-0.017	0.122*	0.038	-0.017	0.101***
	(2.07)	(-0.22)	(1.72)	(0.58)	(-0.58)	(3.45)
Quick ratio	-0.020***	-0.012**	-0.005	-0.003	0.035	0.004
	(-3.43)	(-2.16)	(-0.56)	(-1.02)	(0.66)	(0.09)
ROA	-0.002	-0.013	-0.069	0.005	-0.844***	0.075
	(-0.03)	(-0.30)	(-1.31)	(0.13)	(-3.33)	(0.28)
Size	0.089***	0.086***	0.063***	0.072***	0.053	0.070
	(4.52)	(5.03)	(3.07)	(3.47)	(0.80)	(0.91)
Foreign sales	0.084**	0.057	0.099*	0.045	0.062	0.206
	(2.11)	(1.49)	(1.87)	(0.78)	(0.23)	(1.25)
Delta	0.002***	-0.001	0.001*	-0.001	0.041***	0.020***
	(3.14)	(-1.56)	(1.87)	(-1.33)	(2.81)	(2.73)
Vega	-0.056**	-0.031*	-0.035	-0.007	-0.114	-0.038
	(-2.25)	(-1.75)	(-1.03)	(-0.42)	(-0.37)	(-0.33)
Observations	6,615	5,820	6,642	5,083	434	353
Adjusted R-squared	0.600	0.654	0.535	0.584	0.546	0.498
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Difference-in-differences results using hand-collected commodity hedging data

The table reports results from difference-in-difference regressions for the use of financial derivatives following the discovery of new carcinogens. The sample consists of firms with ex-ante commodity risk exposure and available variables for the period from 1996 to 2013. Financial and utility firms are excluded. In column 1, the dependent variable is *Percentage hedged* – the fractions of a firms' commodities that were hedged as reported in the annual report. In column 2, the dependent variable is *Net value* – the net value of outstanding commodity derivatives by fiscal year end. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one-percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent variable:	
	Percentage hedged	Net value
	(1)	(2)
Post announcement	0.119***	0.085***
	(4.73)	(3.29)
Debt ratio	0.186*	0.068
	(2.01)	(0.42)
$(\text{Debt ratio})^2$	-0.056	-0.124
	(-0.51)	(-0.62)
Distress	1.377	-0.760
	(1.47)	(-0.57)
Market-to-Book Assets	0.003	0.041
	(0.20)	(0.49)
Capital expenditure	-0.094**	-0.062
	(-2.80)	(-0.52)
Dividend yield	1.435	-1.553
	(0.96)	(-0.83)
Quick ratio	-0.003	-0.002
	(-0.23)	(-0.12)
ROA	-0.002	-0.167
	(-0.03)	(-1.62)
Size	-0.034	0.062
	(-1.65)	(0.94)
Foreign sales	0.103**	0.395**
	(2.21)	(2.51)
Delta	-0.008*	0.028*
	(-2.09)	(1.88)
Vega	0.242	0.252***
	(1.21)	(5.97)
Observations	292	597
Adjusted R-squared	0.586	0.591
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

Table 10: Difference-in-differences results after excluding acquiring firms

The table reports results from difference-in-difference regressions for the use of financial derivatives following the discovery of new carcinogens. A linear probability model is used. The sample consists of all Compustat firms with available variables for the period from 1996 to 2013. Using the Thomson Reuters SDC database, I exclude all exposed firms that underwent an acquisition in the years following a carcinogen discovery. Financial and utility firms are excluded. In column 1, the dependent variable is *All hedging dummy* – a binary variable set to one if a firm mentions the use of foreign exchange, interest rate, or commodity derivatives in its 10-K filing. In column 2, the sample is limited to firms with ex-ante exposure to currency risk and the dependent variable is *FX dummy* – a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K filing. In column 3, the sample is limited to firms with ex-ante interest rate risk exposure and the dependent variable is *IR dummy* – a binary variable set to one if a firm mentions the use of interest rate derivatives in its 10-K filing. In column 4, the sample is limited to industries with inputs or outputs that have tradable future contracts and the dependent variable is *Commodity dummy* – a binary variable set to one if a firm mentions the use of commodity derivatives in its 10-K filing. *Distress* is the product of the debt ratio and the equity market-to-book ratio. *Capital expenditures* and *R&D* are both scaled by total assets. *Size* is the natural logarithm of total assets. *ROA* is the return on assets defined as pretax income divided by total assets. *Quick ratio* is defined as current assets net of inventory divided by current liabilities. *Foreign sales* is defined as the total amount of foreign revenue reported in Compustat segments divided by total sales. *Delta* is the CEO's dollar increase in wealth (in thousands) for a 1% increase in stock price. *Vega* is the CEO's dollar increase in option-wealth (in thousands) for a one-percentage point increase in stock return volatility. *Distress, Delta, and Vega* are scaled by 1000. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

	Dependent variable:			
	All hedging dummy	FX dummy	IR dummy	Commodity dummy
	(1)	(2)	(3)	(4)
Post announcement	0.054**	0.098***	0.064*	0.278***
	(2.27)	(2.98)	(1.89)	(2.73)
Debt ratio	0.214***	0.074	0.410***	0.784
	(4.48)	(1.31)	(6.17)	(1.50)
(Debt ratio)^2	-0.048**	-0.021	-0.099***	-0.494
	(-2.27)	(-1.57)	(-4.07)	(-1.50)
Distress	-0.044	0.057**	-0.080***	-0.709
	(-0.47)	(2.42)	(-4.68)	(-0.34)
Market-to-Book Assets	-0.001	0.000	0.006	0.132**
	(-0.43)	(0.01)	(0.96)	(2.31)
Capital expenditure	-0.150	0.073	0.071	-0.315
	(-1.28)	(0.46)	(0.47)	(-0.80)
R&D	-0.221	0.081	0.355*	-0.017***
	(-0.72)	(0.48)	(1.72)	(-6.62)
Dividend yield	0.015	-0.047	0.073	0.414*
	(0.31)	(-0.96)	(0.94)	(1.75)
Quick ratio	-0.011***	-0.008*	-0.001	0.028
	(-3.67)	(-1.83)	(-0.44)	(0.85)
ROA	-0.037	0.001	-0.052	-0.354*
	(-1.24)	(0.04)	(-1.34)	(-1.83)
Size	0.091***	0.088***	0.073***	0.104
	(6.94)	(5.88)	(3.97)	(1.54)
Foreign sales	0.034	0.042**	0.013	0.007
	(1.34)	(2.32)	(0.90)	(0.06)
Delta	0.001***	0.001***	0.001	0.027***
	(3.38)	(3.84)	(1.53)	(3.95)
Vega	-0.032**	-0.054***	-0.024	0.130
	(-2.21)	(-3.22)	(-1.20)	(0.56)
Observations	13,268	9,913	9,426	684
Adjusted R-squared	0.556	0.597	0.525	0.483
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

APPENDIX A - ADDITIONAL TABLES

Table A1: Accuracy rate for the hedging data

The table reports the approximate accuracy rate of my hedging variables. *All hedging dummy* is a binary variable set to one if a firm mentions the use of foreign exchange, interest rate, or commodity derivatives in its 10-K filing. *FX dummy* is a binary variable set to one if a firm mentions the use of foreign exchange derivatives in its 10-K. *IR dummy* (*Commodity dummy*) is a binary variable set to one if a firm mentions the use of interest rate (commodity) derivatives in its 10-K filing. I manually look through the 10-Ks of 100 randomly selected firm-year observations to determining the occurrence of Type I and Type II errors. The null hypothesis is that the firm does not hedge. Type I error is when a firm is coded as a hedger when it actually does not hedge. Alternatively, Type II error is when a firm is coded as a non-hedger when it actually hedges.

Variables	Accuracy rate (1)	Type I error (2)	Type II error (3)
All hedging dummy	92%	7%	1%
IRS dummy	97%	3%	0%
FX dummy	95%	3%	2%
Commodity dummy	94%	4%	2%

Table A2: Accuracy rate for the Audit Analytics litigation proxy

The table reports the approximate accuracy rate for the variable *Cases*. $Cases_{t-1}$ is the number of material cases disclosed to the SEC as material pending litigation (excluding class-action suits). I manually look through the 10-Ks of 100 randomly selected firm-year observations to determining the occurrence of Type I and Type II errors. The null hypothesis is that the firm does not report any legal reserves. Type I error occurs when a firm is coded as having material pending litigation while it does not report any legal reserves. Alternatively, a Type II error occurs when a firm is coded as not having any material pending litigation while it reports a legal reserve in its 10-K.

Variable	Accuracy rate (1)	Type I error (2)	Type II error (3)
$Cases_{t-1}$	79%	10%	11%

Table A3: Change in litigation count around carcinogen exposure

This table reports the change in litigation count around the announcement of a new carcinogen. *Litigation count* is the number of times the phrase "litigation" is mentioned in a firm's 10-K filing, relative to the size of the filing. *Litigation count* is multiplied by 10^6 for ease of presentation. The sample consists of all Compustat firms with available data for the period from 1996 to 2013. Financial and utility firms are excluded. Panel A presents the mean litigation count for exposed firms pre- and post-carcinogen exposure. Panel B presents the results from a difference-in-differences estimation using the following model: $Litigation\ count_{it} = \alpha\ Post\text{-}announcement_{it} + \gamma_i + \delta_t + \varepsilon_{it}$. Where γ_i is a firm fixed effect, and δ_t is a year fixed effect. *Post announcement* is an indicator that equals one in the years following the discovery of a new carcinogen for firms identified as being exposed to that carcinogen and zero otherwise. All standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Robust t-statistics are in parentheses.

Panel A: The mean litigation count for exposed firms pre- and post-carcinogen exposure

	Pre-carcinogen exposure	Post-carcinogen exposure	difference (t-stat)
Mean litigation count	8.74	11.45	2.71***
			(5.25)

Panel B: Difference-in-differences estimation for litigation count

	Dependent variable: litigation count
Post announcement	3.187**
	(2.84)
Observations	16303
Adjusted R-squared	0.331
Firm fixed effects	Yes
Year fixed effects	Yes

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