Growing Out of Trouble?
Legal Liability and Corporate Responses to Adversity[*]

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Abstract

This paper uses exogenous increases in legal liability to analyze the importance of agency conflicts arising from managers' exposure to firm risk. We measure how a typical firm responds when a chemical to which its workers are exposed is newly identified to be a carcinogen. While there is no evidence of a pre-existing trend, we find that firms, particularly those with weak balance sheets, tend to undertake aggressive growth and increased acquisitions after experiencing the liability shock. The acquisitions appear to be targeted at diversifying the firms' assets by acquiring large businesses with relatively high operating cash flows, recent growth, and total payouts. These deals are associated with high takeover premiums and negative abnormal returns. These findings fit well with a managerial agency model. In support of the agency model, we find that total assets grow most among firms with weak external governance, high management ownership, or low institutional ownership. The results suggest that agency conflicts may be exacerbated when firms are closer to financial distress.

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1. Introduction

Exposing managers to a firms' risk is often necessary to induce their effort, and this trade-off provides the basis for many principal-agent models of the firm (e.g. Holmstrom 1979; Grossman and Hart 1983). The risks of bankruptcy and employment loss are likely to provide particularly strong incentives, because these events can entail significant personal costs for a manager, including the loss of private benefits, reputation, and specialized human capital (Grossman and Hart 1982; Gilson 1989). Exposing managers to such risks, however, introduces yet another agency conflict. Managers will have incentives to take actions that reduce the likelihood of bankruptcy, even when these actions are unlikely to maximize shareholder value (Jensen and Meckling 1976).[1] For example, managers may make more conservative investment choices or try to grow the firm through diversifying acquisitions (Amihud and Lev 1981; Holmström 1999).[2]

Although theoretical models and calibrations suggest that agency conflicts arising from managers' exposure to risk can significantly affect firms' investment and financing choices (Parrino, Poteshman, and Weisbach 2005), the empirical relevance of these conflicts is unclear. Empirical evidence is sparse in part because of the difficulty of isolating an exogenous shock to firms' risk that does not also affect current cash flows. Our paper overcomes this challenge by exploiting exogenous increases in legal liability that increase firms' – and thereby managers' – exposure to risk. By investigating firm responses in the aftermath of these shocks, we shed light on this important question.

In particular, we focus on legal liability that accrues when a chemical to which a firm's workers

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[1] Jensen and Meckling (1976) write, "If under bankruptcy the bond holders have the right to fire the management, the management will have some incentives to avoid taking actions which increase the probability of this event (even if it is the best interest of the equity holders) if they (the management) are earning rents or if they have human capital specialized to this firm, or if they face large adjustment costs in finding new employment" (p. 340).

[2] A number of other theoretical papers also find that managers' exposure to risk can cause a misalignment between managers and shareholders' risk preferences. For example, see Smith and Stulz (1985), Lambert (1986), Hirshleifer and Suh (1992), Hugonnier and Morellec (2007) and Acharya and Bisin (2009).

are already exposed is newly identified as a carcinogen. Using this approach, we analyze the new identification of 121 different chemicals as carcinogens, affecting 2,209 firms in more than 100 SIC industries between 1980 and 2006. Despite the presence of the workers' compensation system, these exposures can carry significant corporate legal liability (Ringleb and Wiggins 1990). Discovery of the exposures' carcinogenicity increases the likelihood of large cash outflows for legal fees, damage payments, and insurance premiums in the future – if and when workers eventually fall ill. This increased likelihood of large cash outflows acts to increase the likelihood of future financial distress and bankruptcy.   At the same time, because of the latency of carcinogenic hazards and the protracted nature of American civil jurisprudence, the liability shock is unlikely to have any effect on firms' *current* cash flows, allowing us to cleanly identify a shock to firms' risk.

The most salient risk for these firms is that a chemical will become the next asbestos. Widespread workplace exposures to asbestos, whose medical dangers were known as early as the 1920s (well before the sample period of this study), have come to be regarded as "the worst occupational health disaster in U.S. history" (White 2004; Cauchon 1999). Litigation related to these exposures has targeted more than 8,400 corporate defendants, bankrupted at least 85 firms, and is projected to cost defendants $200 to $265 billion in total (Carroll et al 2005; White 2004). While the expected liability costs of a newly identified carcinogen are unlikely to approach the magnitude of asbestos, there is a small but important chance that the firm will be liable for a substantial payout.

The most dominant finding of our analysis is that firms tend to undertake a period of aggressive growth via both capital investment and acquisitions after experiencing an adverse liability shock. While firms that become exposed to the increased legal liability have similar size, Tobin's *Q*, financial leverage, payout rates, and other characteristics as other firms before the shock hits, exposed firms increase in size by about 10 percent, on average, relative to these otherwise similar firms within a few years

following the shock. All indicators suggest this increase is caused by the liability shock, as there is no evidence of a pre-existing trend. The growth is financed primarily with equity, causing modest decreases in average leverage ratios. On average, exposed firms also return more capital to shareholders in the form of cash dividends and stock repurchases after their liability risk increases.

The liability-induced growth is concentrated among firms that seem to be more vulnerable to the realization of an adverse shock. For example, firms at a high risk of bankruptcy (measured by Altman z-score) grow by an average of 38 to 48 percent relative to otherwise similar firms after the increased liability is discovered. On the other hand, firms at a low risk of bankruptcy show no average growth. The growth is also associated with other indicators of financial vulnerability such as high leverage, low operating cash flows, zero dividends, and small overall size. The increases in payouts, on the other hand, are greater at low-bankruptcy-risk firms than they are at high-bankruptcy-risk firms.

While some of the growth is driven by an increase in capital expenditures, at least half stems from an increase in acquisitions. The discovery of a new carcinogen is associated with a six percent increase in the total number of acquisitions completed in exposed industries. Moreover, these acquisitions appear to be targeted at diversifying the firms' assets away from those causing the liability – by either growing an existing secondary line of business or diversifying into an entirely new industry. Compared to acquisitions undertaken by similar firms without such liability exposures, the targets acquired by the exposed firms can be described as "cash cows": they are on average 39 percent larger and have relatively high operating cash flows, recent growth, and total payout rates. Relative to acquisitions by firms without liability exposure, the exposed firms pay a 13.7-percentage-point greater takeover premium on average, and announcement of the deals are associated with an abnormal return on the acquirers' equity that averages 1.3 percentage points lower.

As a whole, these results broadly support a managerial agency model, where managers try to

ensure the long-run survival of their firms with themselves at the helm. By diversifying and entering new lines of business that have better prospects for producing high cash flows, a manager may be able to reduce the likelihood of losing her job and personal wealth that is tied up in company stock. This agency-based motive for growth can also explain why this growth is financed with equity, which reduces the likelihood of bankruptcy, and strongest for the firms seemingly most vulnerable to financial distress. The negative abnormal equity announcement returns associated with these acquisitions also suggest that this growth may not be in the interest of shareholders.

To further test the agency-based explanation, we examine whether firms' responses to the shock are related to the strength of external governance, the size of senior management's ownership stake in the firm, and the degree of institutional equity ownership. In support of the agency model, we find that total assets grow by almost 35 percent after the shock at firms with weak external governance (as measured by the GIM-index or E-index; Gompers et al. 2003; Bebchuk et al., forthcoming), compared to modest declines at firms with strong external governance. Firm growth is also larger both when senior management holds larger equity stakes in the firm, which increases their exposure to the firm's idiosyncratic risk, and when relatively few equity shares are held by institutional investors, who are thought to be more effective at monitoring managers. On the other hand, firms with strong external governance, low inside ownership, and high institutional ownership do not grow; instead, they greatly increase their payouts to shareholders. We also examine non-agency explanations for this growth, including asymmetric information, costly financial distress, and organizational capital, but we find that none these alternative explanations can explain all of our findings, particularly the governance results.

Overall, our evidence suggests that agency conflicts arising from managers' exposure to risk have the potential to dramatically affect corporate decisions and that acquisitions may play a significant role in managers' attempts to reduce risk. In this regard, our analysis complements cross-country

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comparisons presented by Acharya, Amihud, and Litov (2008), who find that firms are more likely to undertake diversifying acquisitions and less risky investments in countries with stronger creditor rights, particularly rights that increase the likelihood of managers' removal in periods of financial distress.[3] Our evidence is also consistent with Tufano (1996) and Low (forthcoming), who find that managerial risk aversion may be related to firms' risk management choices and stock volatility. In contrast to these papers, we focus on how agency conflicts can affect firm financing and investment choices and show for which firms this distortion is more severe.

Our analysis may also provide insight on how managers' exposure to risk affects firms' responses to other adverse shocks. By increasing the likelihood that a firm's future cash flows will not accrue to shareholders, the increase in legal liability acts to reduce the expected return on both existing and future firm investments. This is similar to other shocks that reduce investment returns, such as new technologies that reduce barriers to entry, the relaxation of international trade barriers, and other changes in government regulation. If agency conflicts arising from managers' exposure to risk affect how firms respond to the liability shock, these conflicts may also affect how firms respond to these other shocks that have a similar impact on future cash flows.

The evidence presented here also offers further insight into managerial preferences. Based on corporate responses to antitakeover legislation, Bertrand and Mullainathan (2003) conclude that the average manager does not have a preference for empire building or diversification. While they find that the average manager is "reluctant to undertake cognitively difficult activities" (p.1067; what they also call "the quiet life"), our results suggest that managers are willing to overcome this reluctance when the stakes for doing so are sufficiently high. Our evidence that the intensive growth following an adverse shock is concentrated among financially vulnerable firms also suggests that managers' motivations for

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[3] Acharya, Bagwai-Wadji, and Subramanian (2008) also find that there is less innovation in countries where it is easier to terminate employees.

growing their firms may be more accurately characterized by "career concerns" than by a preference for empire-building per se. Putting these results together suggests that agency problems can play out quite differently in normal times than when times are tough.

An interaction between managerial agency conflicts and corporate financial vulnerability also has implications for a firm's optimal capital structure. Jensen (1986) describes the scope for using debt to reduce managerial agency problems at "firms that have stable business histories and substantial free cash flow" (p.325). Our evidence reinforces the importance of Jensen's first condition that the business be stable. If managers' objectives and shareholder interests tend to diverge as a firm approaches financial distress, then the high amount of financial leverage that moderates agency problems in normal times may actually amplify these agency conflicts when the firm encounters an adverse shock. This cost of debt-financing has received little attention in the literature.

Finally, our study provides a complement to Blanchard, Lopez-de-Silanes, and Shleifer's (1994) examination of how eleven firms spend cash windfalls from lawsuits. Broadly speaking, firms have access to cash flows and investment opportunities. Whereas Blanchard et al. investigate the effect of an increase in cash flows while holding investment opportunities fixed, the analysis presented here examines the effect of a decrease in investment opportunities while holding cash flows fixed. In essence, both papers examine the impact of increasing the wedge between corporate cash flows and investment opportunities, and both papers find evidence that seems to fit an agency model of managerial behavior. Case studies of various declining industries also point to managerial agency conflicts (e.g., Dial and Murphy 1995; Jensen 1986). However while the empirical strategies employed by these other papers limit their analysis to only a handful of firms, our conclusions are based on the behavior of 2,209 affected firms. The size of our sample also allows us to perform formal statistical hypothesis tests and to explore how and why firm responses to adverse shocks may vary.

The remainder of this paper is organized as follows. Section 2 discusses firms' legal liability for occupational carcinogens and how it is likely to affect the firms' cash flows and investment opportunities. Section 3 presents our empirical strategy and describes the data, and Section 4 summarizes our findings. Section 5 discusses possible explanations for the observed firm responses, and Section 6 concludes.

2. Liability for occupational carcinogens

In the United States, diseases – including cancers – that are contracted by workers in the course of employment are generally covered by a legal institution known as the workers' compensation system. Under this system, employers are required to compensate workers for all job-related injuries irrespective of fault, and the injured workers are not eligible to sue their employers for negligence. Upon establishing that employment was at least a contributing factor in causing a disease, workers typically qualify for payment of their complete medical expenses as well as compensation for lost wages (Peirce and Dworkin 1988). Large firms often self-insure against this risk; others buy insurance policies either in the private market or from state funds (LeRoy et al. 1989).

Damages related to workplace carcinogenic exposures can be significant. Because of the extreme costs of treating many cancers, each exposed worker represents a potentially large damage award. If the disease turns fatal, surviving family members also often qualify for death benefits. Furthermore, sick workers and their survivors are exempt from the exclusive remedy provision of the workers compensation system if they can prove that their employer either had "dual capacity" (for example, if the employer was also the producer of the substance causing the carcinogenic exposure) or committed "willful misconduct" (for example, if the employer took few precautions despite knowing the risks involved in the exposures). In these cases, workers are entitled to sue employers directly for negligence, pain and suffering, and punitive damages. Even a few such suits can lead to significant

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damage awards, and numerous suits can represent sums that are substantial relative to the assets of even large corporations (Ringleb and Wiggins 1990).

Using subsidiary corporate structures is unlikely to shield firms from any major liability emerging from these claims. In principle, a parent corporation enjoys limited liability with respect to investments in a subsidiary, including any liability for damages arising from tort or workers' compensation claims. However, courts can "pierce the corporate veil" and hold parent corporations responsible for their subsidiaries' liabilities as if the liabilities were the parents' own. While there is no set rule or general formula, it is generally understood that liability will be imposed on the parent "when it is necessary to promote justice or to obviate inequitable results" (Lattin 1971, p.72). A subsidiary structure set up to avoid paying foreseeable damages is likely to be pierced on the grounds that the subsidiary is undercapitalized (Thompson 1991). Furthermore, using a subsidiary structure in the occupational injury context may actually increase the firm's total liability, because the exclusive remedy provisions of the workers' compensation system do not generally transfer to the parent corporation (Treece and Zuckerman 1983). Firms also cannot shield themselves from existing liability by spinning off the troubled assets. Selling assets that cause a carcinogenic exposure will prevent the firm from exposing additional workers, but it will not reduce the firm's liability for workers' damages already incurred.

General liability and workers' compensation insurance are also likely to provide firms with only limited protection from these claims. Firms that self-insure naturally retain primary liability. For firms that maintain third-party policies, the premiums charged are intended to meet all future claim payments made under the policies, and are typically adjusted annually based on changes in both industry risk profiles and firm-specific loss experience (Williams 1986). Hence, these policies do not provide the firm with any protection against future premium increases due to changes in the firm's risk exposure. The premiums associated with insuring a known risk to occupational carcinogens can therefore become a

significant cost of doing business (Cummins and Olson 1974).[4]

In this paper, we examine corporate responses to exogenous increases in legal liability from occupational carcinogens. In particular, we measure how a typical firm responds when a chemical that it is currently using in its production process – and to which its workers are exposed – is newly identified to be a carcinogen. Broadly speaking, the discovery of the carcinogenicity is bad news for the firm. First, the probability of a severe *future* cash flow shock increases. Because damages for workplace exposures to carcinogens accrue irrespective of employer negligence, the firm may be liable for large future payouts even if the firm had no knowledge of the danger (Schwartz 1985). The potential for large payouts increases the likelihood of future financial distress and bankruptcy and decreases the value of the firms' assets. Second, the liability shock decreases the returns on new investments. Greater expected liability costs effectively raise the marginal costs of production: incremental carcinogenic exposure incurred with each unit of production increases the expected value of future damage awards. These incremental costs are often low enough that the firm will continue production, but the expected returns are lower after the shock.

Although the liability shock presents the firm with bad news about the future, it is unlikely to have much of an effect on *current* cash flows. First, claims for past carcinogenic exposures are likely to take years to litigate, delaying the cash flow impact of any damage awards. Second, increases in the costs of new production will mostly reduce cash flows only after worker injuries manifest themselves, because damages are typically assessed only for actual – and not speculative – damages (Ringleb and

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[4] Firms also warn about this risk in their financial reporting: "Our manufacturing operations are subject to…environmental hazards such as chemical spills, discharges or releases of toxic or hazardous substances or gases into the environment or workplace…. Furthermore, we could be subject to present and future claims with respect to workplace exposure, workers' compensation and other matters. Although we maintain property and casualty insurance of the types and in the amounts that we believe are customary for our industries, we cannot assure you that our insurance coverage will be adequate for liability that may be ultimately incurred or that such coverage will continue to be available to us on commercially reasonable terms. Any claims that result in liability exceeding our insurance coverage could have an adverse effect on our business, financial condition and results of operations." (Northwest Pipe Company 10-Q, September 2006, p. 18)

Wiggins 1990).[5]   Although premiums for third-party workers' compensation insurance are likely to eventually reflect the increased risk of a payout, they are unlikely to adjust right away (Williams 1986).

The specific liability shock analyzed in this paper thus has a distinctive feature: it represents a substantial adverse shock to a firm's asset value and investment opportunities that increases the likelihood of future financial distress and bankruptcy but has minimal concomitant effect on cash flows. In the analysis that follows, we exploit this unique characteristic to examine firm responses to this increased risk exposure and explore how managerial agency conflicts may affect their responses.

3. Empirical approach

Identifying firm exposures to newly-identified carcinogens requires the combination of information on (1) scientific discoveries related to chemical carcinogenicity and (2) which firms' workers are exposed to these chemicals. For the first set of information – on the timing of discoveries – we use the National Toxicology Program's (NTP) *Report on Carcinogens* (RoC). This report, which is published regularly by the U.S. Department of Health and Human Services under a 1978 Congressional mandate, contains a list of all substances (1) that are known or may reasonably be anticipated to be human carcinogens, and (2) to which a significant number of persons residing in the United States are exposed. Nominations for listing in the report are evaluated by scientists from the NTP, other Federal health research and regulatory agencies, and non-government institutions.   The first two reports were published in 1980 and 1981, and the report has been updated approximately biannually since.

The addition of an agent to the RoC indicates an accumulation of new scientific evidence that the agent may be a carcinogen. In our empirical work, we focus on additions to the RoC after 1981 for

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[5] After learning about the increased risk, it is possible that workers might demand higher wages as a sort of insurance for potential noneconomic harm, such as from pain and suffering. (Economic damages and lost wages would be covered by workers' compensation.) However, using the difference-in-difference framework described below, we do not find any evidence of wages increasing after the shock. Similar tests also find no change in the ratio of cash flow to assets immediately after the shock.

two reasons. First, the initial report in 1980, which only listed 26 agents, was an incomplete listing of known carcinogens at that time; the second report, released only one year later in 1981, contained 62 additional agents.[6] Second, our data source (described below) for identifying firms' chemical exposures is based on information collected between 1981 and 1983. To avoid the possibility that firms may have already eliminated exposures to carcinogens identified in the two reports prior to the survey, we rely on additions to the RoC beginning in 1983. This leaves 121 unique chemical agents.

While there are a number of potential sources for scientific developments related to possible carcinogens, we use the RoC because federal regulations specifically require U.S. firms to monitor the report and treat any substances listed as carcinogens. For example, firms are required to warn employees about their exposures to substances that are included in the RoC [U.S. Government Regulation 29 CFR, parts 1910.1200(b)(1) and (d)(4)]. Because of such regulations, it is likely that firms, and presumably employees, are aware of agents listed in the report. In fact, although it is not required, firms often note relevant changes in the RoC in their financial reporting.   Nevertheless the listing of a substance in the RoC is not in itself a regulatory action that requires firms to limit exposures or uses of the substance in question, although it may prompt regulatory agencies to consider adopting such rules.

We use the National Occupational Exposure Survey (NOES) to identify firms with potential exposures to the newly identified carcinogens. This survey was conducted by the National Institute for Occupational Safety and Health using on-site visits to 4,490 U.S. business establishments employing approximately 1.8 million workers between 1981 and 1983. In these visits, surveyors recorded all chemical, physical, and biological agents to which workers were observed exposed in each firm, the number of workers being exposed to each agent, and the number of these exposures that were

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[6] In the interest of "expeditiously initiating issuance of the first report," the decision was made to include only a limited number of chemicals that "represent substances historically viewed as associated with cancer in man" based on existing monographs prepared by the International Agency for Research on Cancer (National Toxicology Program 1980, pp. vi, 7). Subsequent reports also included chemicals recently identified as carcinogens, usually through animal studies.

uncontrolled. The survey is expansive and lists nearly 13,000 different agents, many of which were not known to be hazardous at the time of the survey. We obtained a custom extract of this data aggregated by 4-digit 1972 SIC code, covering 522 industries.

We determine whether a firm is affected by the listing of a newly-classified carcinogen based on the firm's SIC code in Compustat in the year prior to each new listing.[7] We consider a firm affected if it operates in a 4-digit SIC code where at least 7.5% of workers were observed exposed to the carcinogen in NOES.[8] The cutoff of 7.5% captures roughly the top quartile of observed exposures at the industry level, corresponding to the discoveries that are most likely to result in an increase in legal liability. Our findings are robust to using alternative measures of exposure, including lowering the exposure threshold or restricting treatment only to industries with observed "uncontrolled" exposures in the NOES. Our data on firms is from Compustat. To ensure a consistent sample of observations across specifications, we exclude observations with missing values for ln(assets), ln(sales), ln(capital expenditures+1), equity, ln(debt+1), and ln(dividends+1). We identify a total of 2,209 firms in 106 affected industries.

For each new listing in the RoC, we also construct a comparison group of unaffected firms that were present in Compustat in the year prior to the RoC listing but which are not in a 4-digit SIC industry with observed exposures to any newly-listed carcinogens. To ensure a strong match between our exposed and unexposed firms, we restrict this sample to firms operating in the same Fama-French 48

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[7] To accomplish this this, we first convert the NOES data, which is reported using the SIC 1972 coding scheme, to the SIC 1987 coding scheme, which is used by Compustat, by applying an employee-weighted concordance table from Bureau of Labor Statistics (1989). We then determine which firms were affected by a liability shock based on Compustat's historical measure of a firm's industrial classification (data324), which is available beginning in 1987. In cases where a firm's historical SIC industry is missing after 1987, we use the most recent historical data prior to the missing year, and for observations prior to 1987, we use the earliest historical data that is available to determine the firm's industrial classification.

[8] We measure exposures at the industry level because measuring exposures at the firm level is not feasible. Because the NOES survey was conducted between 1981 and 1983, it measures worker exposures to possible carcinogens before those chemicals were identified as dangerous by the RoC. Although it is possible that changes in production technologies between 1983 and a chemical's listing in the RoC could lead us to misclassify worker exposures, such measurement error would only attenuate our estimates.

industry classification as one of the affected firms. This leaves us with a comparison sample of 9,575

unexposed firms in 333 industries. Our results are also robust to matching either to all unaffected firms

in Compustat or based on 2-digit SIC codes instead of Fama and French (1997) industry classifications.

Descriptive statistics for exposed and unexposed firms in the year prior to the listing of a newly-

classified carcinogen in the RoC are reported in Table I. The ex-ante characteristics of firms with

exposures are reported in column (i), and the ex-ante characteristics of firms without exposures are

reported in column (ii). The estimates suggest that the firms with exposures to the newly identified

carcinogens are very similar to our sample of unexposed firms in the year prior to the actual listing. The

two groups are similar in size, leverage, payout policy, capital intensity, cash balances, and Tobin's Q.

We are unable to reject the null hypothesis that firms experiencing the liability shock are similar to other

firms in all of these dimensions.

To estimate firm responses to the liability shock, we restrict the data to firm-year observations

in the 10 years before and the 10 years after each new carcinogen listing in the RoC for each cohort of

affected and unaffected firms, and estimate the average treatment effect across all cohorts. (We obtain

similar findings if we instead compare the 5 years before to the 5 years after each listing.) Specifically,

we estimate the following firm-panel regression:

$$y_{ijct} = \beta_0 + \beta_1 Exposure_{jct} + \gamma_{ic} + \omega_{tc} + \varepsilon_{ijct}, \tag{1}$$

where y is one of several dependent variables of interest for firm i and year t, *Exposure* is an indicator

that equals 1 if at least 7.5 percent of employees in cohort c and industry j were observed exposed in

the NOES to a known RoC carcinogen. We also include firm-cohort fixed effects, γ_{ic}, to ensure that we

estimate the impact of exposure using only within-firm variation over time; and we include year-cohort

fixed effects, ω_{tc}, as a nonparametric control for any secular time trends. We allow the firm and year

fixed effects to vary by cohort, because this approach is more conservative than including simple fixed effects. (Similar results are obtained in both specifications.) We deliberately do not control for any time-varying accounting variables in these regressions as these variables are likely to be affected by the shock and including them would confound estimates of β_1.[9] In any event, including the standard control variables does not qualitatively affect the results. To account for potential covariance among firm outcomes within the same 4-digit SIC code and over time, we cluster the standard errors at the industry level.

4. Results

4.1 Firm size, investment, and payout policy

Our analysis of how firms respond to the liability shock begins with the impact on overall firm growth. Estimates of the shock's effect on log assets, log sales, and log capital expenditures are reported in Table II.[10]

We find that, on average, firms actually expand following the shock, relative to unaffected firms. The estimates for log assets, reported in column (i), indicate that exposed firms grow total assets by an

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[9] Our identification assumption is that the incidence of the liability shock is as good as randomly assigned within our industry-matched sample. Workers in every firm in the sample are exposed to chemicals, and which firms' chemicals are discovered to be carcinogenic is likely uncorrelated with any other determinants of the dependent variables after controlling for firm and year fixed effects. The results presented in Table I support this assumption. In this framework, β_1 in equation (1) measures the increase in the dependent variable caused by the liability shock. If we include endogenous controls, then β_1 would instead measure only the portion of the increase in the dependent variable caused by the liability shock that is not also correlated with the causal impact of the liability shock on the other variables. For example, suppose the liability shock leads firms to double in size by increasing capital expenditures by the same amount; then a regression of firm size on the exposure indicator and capital expenditures would yield a coefficient on the exposure indicator that is close to zero – even though exposure caused substantial growth.

[10] We use log transformations to examine proportional changes in these variables to account for the fact that an increase in total assets from $10.0 billion to $10.1 billion for a larger firm is not as dramatic as an increase from $100 million to $200 million for a smaller firm.

average of 10.3 percent following the liability shock, relative to unexposed firms.[11,12] The point estimate

for capital expenditures, reported in column (iii), suggests that investments in physical capital also

increase, but the estimate is not statistically significant at conventional confidence levels.   One

possibility is that any increases in assets and capital expenditures that we observe reflect firms making

investments in new machinery or technologies in order to better protect their workers from exposure to

the newly-identified carcinogens.   However, we find that sales at these firms increase by a similar

margin [column (ii)], suggesting that these firms are increasing their overall size and not strictly making

capital investments to protect workers. These results are also not caused by survivorship bias. We find

that firms affected and unaffected by the liability shock drop out of the sample at similar rates.

The timing of the increase in size coincides with the increase in legal liability. Figure 1 plots the

point estimates from a modified version of equation (1), where we allow the effect of *Exposure* to vary

by year from five years before the shock through ten years after.[13] There is no indication of a difference

in overall size prior to the liability shock; exposed firms do not appear to be more or less likely to either

grow or shrink relative to other firms prior to the shock. But after the shock, firms with exposure to a

newly identified carcinogen tend to grow their assets relative to other firms. This growth begins during

the year of the shock and continues for about two to three years afterwards.

To shed some light on how firms fund this aggressive growth, we examine the effect of the

liability shock on log book equity, log debt, and the ratio of debt to assets. These results are reported in

columns (i)-(iii) of Table III. We find that the exposed firms are more likely to fund the growth with

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[11] The increase in log assets is 9.8 log points, corresponding to an increase in assets of $e^{0.098} - 1 = 0.103$, or 10.3 percent. We use this method throughout the paper to interpret estimates from regressions with log dependent variables.

[12] The estimates reported in Table II are robust to including controls for cash flows and the market-to-book ratio.

[13] The plotted coefficients measure the change in log assets (from its level six to ten years before the shock) for affected firms relative to other firms. The confidence intervals shown have much less power than estimates from equation (1), because they compare each year separately against the reference period. Figure 1 illustrates the time path of the asset growth and that there is no pre-existing trend, while Table 2 shows that the overall asset growth is statistically significant.

equity than debt. Similar to the firm's assets and sales, the overall equity of the firm increases by 11

percent on average after the liability shock, and this increase is statistically significant at the five percent

level. Total debt, however, does not exhibit a statistically significant increase, leaving firms with lower

average ratios of debt to assets after the liability shock.[14]

The increase in litigation risk also affects payout policy. We define total payouts to shareholders

as the sum of dividends and repurchases per hundred dollars of total assets and re-estimate equation

(1). The estimates, reported in column (iv) of Table III, find an average increase in overall payouts to

shareholders. Total payouts per hundred dollars of assets increases by 30 percentage points – or

roughly 16 percent relative to the sample mean reported in Table I.

4.2 Heterogeneity in effects

We next examine whether firms' responses to the shock are related to their ability to bear

litigation risk. In particular, we examine whether firms that are potentially more exposed to an adverse

shock, as measured by a greater bankruptcy risk, respond differently to the shock.   To do this, we

calculate each firm's modified-Altman z-score in the year prior to each new listing in the RoC and then

match firms within cohorts based on this measure.[15] In particular, we compare the response of exposed

firms in the lowest quartile (highest bankruptcy risk) to that of unexposed firms in the same quartile,

and then do the same comparison for firms in the highest quartile (lowest bankruptcy risk). These

results are reported in Table IV.

We find that firms with high risk of bankruptcy tend to respond to the increase in litigation risk

by increasing growth sharply, whereas firms with relatively little bankruptcy risk do not. As reported in

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[14] The leverage and payout results are robust to including typical controls, including the proportion of fixed assets,
log sales, modified Altman's Z-score, and ROA.
[15] Following MacKie-Mason (1990), we calculate a modified-Altman z-score as 3.3*(EBIT/assets)+1.0*(sales/ assets)
+1.4*(retained earnings/assets)+1.2*(working capital/assets). Including the ratio of market equity to book debt
decreases our sample size by about 20 percent. Instead, we examine the effect of leverage separately in Table V.

Panel A of Table IV, column (i), exposed firms with the greatest bankruptcy risk grow total assets by 38 percent and sales by 48 percent, on average, after the liability shock relative to unexposed firms with similar bankruptcy risk. Low bankruptcy risk firms, as reported in Panel B, do not exhibit any increase in growth, and the difference in growth between high and low risk firms is statistically significant at the one percent level for both assets and sales. The estimates also suggest that capital expenditures increase more for high risk firms: there is an average increase of 13 percent for affected high-risk firms and no significant increase for low risk firms.

Firms with relatively little bankruptcy risk may also be more likely to increase payouts to shareholders. While both low and high bankruptcy risk firms increase payouts on average, the point estimates suggest that the low-risk firms typically increase payouts by almost three times as much [column (v)]. The standard errors, however, are large and the difference between the types of firms is not statistically significant at conventional confidence levels. The average decline in leverage also appears larger for high-risk firms relative to that of low-risk firms, but the difference is also not statistically significant.

Similar to the full sample, the timing of the growth among high bankruptcy risk firms largely coincides with the publication of a new carcinogen in the RoC and does not seem to reflect a pre-existing trend. Figure 2A plots the point estimates from the model where the effect of exposure is allowed to vary by year for high bankruptcy risk firms. There is no pre-existing trend; before the shock, exposed firms are no more likely to grow or shrink relative to other firms. But in the first 3 to 4 years after the liability shock, total assets for affected high-risk firms grow relative to total assets for unaffected firms. Figure 2B plots estimates from a similar model but for low bankruptcy risk firms. There is little change in the relative growth of these firms after the shock.

To further test whether a firm's financial vulnerability affects its response, we divide the sample

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based on other measures of financial constraints. Following Kaplan and Zingales (1997), we use the following proxies for financial constraints: high leverage, low cash flows, zero dividends, and small size. Similar to before, we match firms within cohorts to compare the differential responses of firms in the top- and bottom-quartiles for each variable, except for dividends, for which we compare those firms that paid dividends to those firms that did not. In all cases, we measure the variable in the year prior to the liability shock. The shock's effect on firms' overall growth, as measured by log assets, is reported in Panel A of Table V, and the effect on the ratio of total payout to assets is reported in Panel B.

Similar to our analysis on bankruptcy risk, we find that firms that are more financially vulnerable to the adverse shock and thereby less able to bear litigation risk tend to respond to the shock by growing, whereas less vulnerable firms do not. As reported in Panel A, firms with high leverage, low cash flows, zero dividends, or small size in the year prior to a liability shock exhibit an average increase in growth of about 19 to 23 percent. These increases are all statistically significant at the five percent level. On the other hand, firms with low leverage, high cash flows, positive dividends, and more assets, do not exhibit a statistically significant increase in average growth following the shock.

Similar to our findings for bankruptcy risk, the increase in the ratio of total payouts to assets appears to be less sensitive to financial vulnerability than the increase in growth. As reported in Panel B, the average payouts to shareholders increase for both financially constrained and unconstrained firms.

4.3 Acquisitions

What are the motivations behind the aggressive growth? To shed some light on this question, we examine the extent and nature of acquisition activity undertaken by exposed firms after the shock. The magnitude and quickness of the growth of financially vulnerable firms after the liability shock, shown in Figure 2A, suggest that acquisitions may play an important role in this growth. The availability of detailed data on corporate acquisition also enables us to analyze these transactions in a way that is

not feasible for organic growth through capital expenditures by allowing us to examine whether the liability shock affects the types of investments undertaken by exposed firms.

To analyze the liability shock's effect on acquisitions, we obtain the sample of all acquisitions of U.S. firms or subsidiaries that are recorded in the Securities Data Company's (SDC) U.S. Mergers and Acquisitions Database. The sample includes all acquisitions announced between 1980 and 2006. Following existing research, we exclude acquisitions meeting any of the following criteria: (1) the ratio of the deal size to market value of the acquirer's assets is less than 1 percent; (2) the acquiring firm controlled more than 50 percent of the target prior to the announcement date or less than 100 percent after the acquisition was completed; (3) the ultimate parent of the acquirer and the target are the same (i.e., consolidations within holding companies); (4) either the acquirer or the target is a financial firm; or (5) the deal was not completed within 1,000 days of the announcement date.

To test for a change in total acquisition activity after a liability shock, we run the following industry-panel regression:

$$Ln(deals)_{jt} = \beta_0 + \beta_1 Exposure_{jt} + \alpha_j + \delta_t + \varepsilon_{jt}, \tag{2}$$

where *Ln(deals)*, is the natural log of the total number of deals completed in year *t* by firms whose primary line of business is industry *j*. We find similar results if we use the aggregate dollar volume of completed deals rather than the total number. *Exposure* is defined as in equation (1): an indicator that equals 1 if more than 7.5% of employees in industry *j* were observed exposed in the NOES to a known *RoC* chemical as of year *t*. Industry-level fixed effects, α_j, control for base differences in the level of acquisitions across industries, and year fixed effects, δ_t, control for any secular time trends and changes in the macroeconomy. As in the analysis reported above, we exclude Fama-French industries where none of the included 4-digit SIC codes experience an exposure during the sample period. This restriction

increases the comparability of exposed and unexposed industries in the sample, but it does not qualitatively affect the results. The standard errors are clustered at the industry level.

We find that industries with exposures to the newly-identified carcinogens undertake more acquisitions after the chemical is listed in the *RoC*. These results are reported in Table VI. Exposed industries complete about 6.6 percent more deals on average, relative to industries without an exposure. Because the specification includes both industry and year fixed effects, the positive coefficient for β_1 indicates the increase in the overall number acquisitions following the liability shock, relative to both the typical number of completed deals in these industries prior to the shock and the concomitant growth in acquisition activity in unaffected industries.

The increase in acquisitions appears to account for a significant proportion of the growth in overall assets reported in Table II. The average aggregate value of acquisitions undertaken by firms with exposures in the ten years after a carcinogen is newly identified is $643 million greater than that of unexposed firms, whereas the average aggregate increase in overall assets is $1,358 million greater. The ratio of these two values suggests that at least 47 percent of the asset growth observed in Table II is attributable to acquisitions. The overall contribution of acquisitions toward growth may be greater as the subsequent growth of an acquired firm would not be captured by this estimate.

To examine whether these acquisitions are consolidating or diversifying in nature, we classify the deals based on whether the target firm's primary 4-digit SIC industry is the same or different than that of the acquirer. Based on these classifications, we calculate the number of "related" and "unrelated" acquisitions in each industry-year and re-estimate equation (2). The resulting estimates are very similar to results based on classifying acquisitions as "related" or "unrelated" based on matches between the primary SIC codes of the target and acquirer at the 3-digit or even the 2-digit level.

The results suggest that exposed firms may be using these acquisitions to diversify their operations away from the affected industry. The number of unrelated deals increases by 6.8 percent on average, and this estimate is significantly different than zero at the 5 percent level. On the other hand, the number of related deals increases by 3.1 percent and is not statistically different than zero. While the estimates are too noisy to distinguish conclusively, these point estimates suggest that the firms may be expanding their operations away from their liability-exposed primary line of business.

The target firms, however, may not necessarily be totally unrelated. The exposed firms may be growing existing side lines of business and/or they may be expanding into completely new industries. To distinguish between these possibilities, we further classify acquisitions based on the SIC codes of the acquirer and target firm. In addition to a firm's primary line of business, SDC lists up to nine other 4-digit SIC codes which represent "any small side lines the company is involved in" (Thomson Financial 1999). Using this information, we classify an acquisition into three distinct groups: (1) "main line" if the primary SIC industry for the acquiring firm coincides with any SIC code of the target; (2) "side line" if an SIC code listed as a side line business for the acquirer matches any SIC code listed for the target, but the acquirer's primary SIC code does not match; and (3) "no match" if none of the target or acquirer's primary or side lines of business coincide. We then calculate the number of acquisitions at the industry-year-type level and re-estimate equation (2) for each type of acquisition. The results are reported in Panel B of Table VI.

The results suggest that the exposed firms are both expanding existing side lines of business and expanding into completely new lines of business. As reported in column (v), there is a statistically significant increase in the 'side line' acquisitions after a liability shock, consistent with firms using acquisitions to expand side lines of business. At the same time, there is also a 5.5 percent increase in the number of acquisitions for which there is no apparent overlap between the target and acquirer's

businesses, relative to industries that do not have such exposures [column (vi)]. This suggests that firms

may also be expanding into businesses where they lack previous experience.

How does the increase in firm risk affect the type of firms being acquired – other than the

increase in diversification? To shed some light on this question, we examine the subsample of

acquisitions for which financial data is available in Compustat for the target firm.[16] We examine

characteristics of the target firms based on their most recent financial data available in Compustat prior

to the announcement date of the acquisition using the following regression:

$$y_{ijt} = \beta_0 + \beta_1 Exposure_{jt} + \alpha_j + \delta_t + \varepsilon_{ijt},$$ (3)

where y is an ex-ante characteristic of target firm i, in industry j, at time t. We examine the following

target characteristics as dependent variables: log total assets, 5-year sales compounded annual growth

rate, the ratio of debt to assets, the ratio of cash flow to asset, and the ratio of the total payout to

assets.[17] As in our other analyses, $Exposure$ is an indicator that equals 1 if more than 7.5% of employees

in industry j were observed exposed in the NOES to a known RoC chemical as of year t. We include both

industry and year fixed effects, and we cluster the standard errors at the industry level.

Liability exposure seems to affect the type of firms being acquired. In particular, the evidence

suggests that the firms are larger, have greater historical sales growth, and less debt. Targets acquired

by exposed firms are 39 percent larger on average in terms of total assets [column (i)]. These firms

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[16] We match the firms in SDC Platinum to Compustat using their CUSIPs. Unfortunately, historical CUSIPs are not available in Compustat, so we determine a firm's historical CUSIP by matching observations to CRSP using the CRSP/Compustat Merged Database, and then using the historical CUSIP reported by CRSP. When the historical CUSIP is missing, we use the CUSIP recorded in Compustat's header file.
[17] Except for the regression of log total assets, the regressions are estimated by weighted least squares, using target firm total assets as weights. Given the magnitude of the size differences between different deals, weighting gives the estimates a more meaningful interpretation: the estimated coefficients represent the effect of liability exposure on characteristics associated with the average dollar of transaction value (rather than the average deal). For example, the regression of the ratio of cash flows to assets examines whether the ratio of the total amount of cash flows across all acquired targets to the total assets acquired increases after the liability shock.

exhibit a compounded annual growth rate (CAGR) in the five years prior to being acquired that is 8.6 percentage points greater on average than targets acquired by unexposed firms [column (ii)]. The targets in these deals also average 6.3 percentage points lower ratios of debt to total assets [column (iii)], which may indicate lower takeover gains for the acquirer (Israel 1991).

Exposed firms also tend to acquire targets that generate and pay out greater cash flows per dollar of total assets. Compared to targets acquired by unexposed firms, targets acquired by exposed firms average 8.3 percentage points greater ratios of operating cash flows to assets [column (iv)], and 3.4 percentage points greater ratios of total payouts to assets [column (v)]. These findings suggest that exposed firms may be seeking to acquire so called "cash cows" after experiencing the adverse liability shock. These results may also explain some or all of the increase in the average ratio of total payout to assets for firms with exposures, documented above. Rather than the exposed firms necessarily increasing the payout ratio from their existing lines of business, it is possible that much of the increased payout is coming from the newly-acquired high-cash-flow business units.

Exposed firms also pay more, on average, to complete these acquisitions and are more likely to finance the deal with stock. We calculate the takeover premium paid over the target firm's market value in each acquisition and estimate how it changes following liability exposure using equation (3). We find that these acquisitions are associated with nearly 14 percentage point greater takeover premiums, on average, than the premiums paid on acquisitions by unexposed firms [Table VII, column (vi)]. The share of financing using stock increases by eight percentage points [column (vii)]. In sum, the liability exposure seems to lead firms to pay relatively high prices to undertake diversifying, stock-financed acquisitions of large, high cash flow generating firms.

To assess how the market values these acquisitions, we estimate the average acquirer abnormal returns ($CAR_{-1,+1}$) associated with their announcement. To estimate abnormal returns, we use standard

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event study methods (see MacKinlay 1997) and compute market model abnormal returns using CRSP

equally-weighted index returns. The parameters for the market model are estimated over the (-300,-46)

day interval.[18] Of the acquisitions analyzed in Table VII, the average abnormal return across all of the

acquisitions by exposed firms is −1.35 percent. Further analysis suggests that the negative abnormal

return is attributable to the liability shock, rather than an industry or year characteristic. We estimate

the effect of liability exposure on abnormal returns using equation (3). The estimate, reported in

column (vi), suggests that acquisitions undertaken by exposed firms are associated with lower abnormal

returns by 1.28 percentage points. This decline in announcement returns also holds after controlling for

how the acquisitions are financed. On average, the market evidently perceived the announcements of

these mergers as bad news for the firms' shareholders.

5. Interpretation

The average firm responds to the liability shock by increasing both overall growth and total

payouts to shareholders. In section 2, we argued that the liability shock decreases asset values and the

expected returns from investment. A perfect capital markets model where money inside the firm is tax-

disadvantaged predicts that optimizing firms will respond to a decrease in the returns to investment by

reducing investment and overall firm growth and distributing the excess capital to shareholders.

This model is consistent with the increase in shareholder payouts that we observe after the liability

shock, but it is not consistent with the sizeable average increase in growth. Moreover, the increase in

payouts for many firms seems to be a by-product of acquiring "cash cows" rather than a direct change in

payout policy. Why do firms respond in this way? In this section, we set out to identify what frictions

can explain our results.

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[18] The results are not sensitive to estimating the parameters for the market model over other conventional periods or to defining abnormal returns using net-of-market returns or using the value-weighted CRSP market return in the estimation of the market model.

5.1 Managerial agency conflict

A managerial agency conflict provides one possible explanation for the observed growth. Managers' objectives often do not coincide with those of shareholders, and the differences are likely to be exacerbated when the firm experiences a negative shock. Negative corporate outcomes can adversely affect a manager's career prospects, separate from their effects on shareholder wealth. For example, managers are likely to be penalized in the labor market, even if poor corporate performance is caused by factors beyond their control (Jenter and Kanaan 2008). In this way, corporate distress has an externality on the manager that he is likely to internalize, contrary to shareholder interest, thus leading them to prioritize the firms' long-run survival or the value of their own human capital above shareholder value. In theory, these personal motivations can lead a manager to take negative NPV investments.

In the presence of these managerial agency conflicts, the increases in growth we observe after the liability shock may actually be value reducing for shareholders. As discussed in section 2, the liability shock (1) reduces profitable investment opportunities and (2) increases the probability of a large decrease in future cash flows. In an agency model, both of these effects will exacerbate the agency conflict. In particular, exposure to firm risk may lead managers to take actions that will reduce the impact of the possible future shocks to cash flows.[19] For example, managers may increase corporate investment (Holmström 1999) or diversify into new lines of business (Amihud and Lev 1981). Growth provides deeper pockets from which to pay future lawsuits, and diversification may provide insurance against the possibility of future litigation targeting the firm's primary business.

The agency model of managerial behavior is consistent with all of the corporate responses to the liability shock documented above. Managers' interest in insuring their career and personal wealth against a negative shock can explain why firms grow through diversifying acquisitions and why the

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[19] Reduced investment opportunities will also increase free cash flow that may be misallocated by a manager acting in private interest (Jensen 1986)

growth is concentrated among firms with weak balance sheets, funded using equity, and targeted at "cash cows" holding less leverage and purchased at a premium. Diversification, lower leverage, and the acquisition of "cash cows" increase the likelihood that the firm survives a potential future barrage of worker lawsuits. Although these means of insurance may offer benefits to shareholders in addition to managers,[20] the negative abnormal returns associated with the acquisitions suggest that for shareholders the costs outweigh the potential benefits.

The nature of the liability shock also suggests that such diversifying growth is unlikely to create value for shareholders. First, the litigation risk is also likely idiosyncratic with respect to the market return; a diversified investor would not price this risk, but a manager who has substantial financial and intangible capital tied up with the firm would benefit from further diversification. Second, because acquired firms are considered assets of the parent company after a takeover, legal liability extends to the target firm.[21] If the potential damage payments are high enough, then extending the legal liability reduces the value of the target's assets. These factors work against such growth creating value for shareholders.

5.2 Additional evidence of managerial agency conflicts

To further explore the plausibility of the agency interpretation, we examine the relation between the aggressive growth of liability-exposed firms, their corporate governance, and their ownership structures. For these analyses, we return to our original Compustat sample and estimate equation (1) separately for firms with different corporate governance, different shares of managerial ownership, and different shares of institutional ownership before the shock.

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[20] For example, diversification may help preserve organizational capital or avoid other costs of financial distress. We examine alternative hypotheses below in more detail and find that the data provide little support for them.

[21] As a lawyer aptly put it to us, "if you are being sued by someone you hit with your car and then you win the lottery, it is the victim's lucky day, not yours". It is possible to try shielding the subsidiary from this legal liability by creating holding company to undertake the acquisition, but as noted in Section 2, these corporate structures may not succeed in actually limiting the legal liability.

Agency problems are likely to be particularly severe when managers are entrenched and can resist hostile takeovers (Jensen and Ruback 1983; Shleifer and Vishny 1989). To measure this sort of external governance, we use the Gompers, Ishii, and Metrick (GIM) governance index. We compare the responses of firms with "weak" corporate governance, as measured by a GIM-index greater than or equal to 11, and firms with "strong" governance, as measured by an GIM-index less than or equal to 5.[22] Because the GIM-index is available only for firms beginning in 1990, we use firms' corporate governance in 1990 as a proxy for their governance in 1988, the year prior to the 1989 RoC report, to increase the number of carcinogenic discoveries that contribute to identification.[23] Despite this addition, this leaves only 69 newly-discovered chemicals affecting 76 industries, as compared to 121 chemicals and 106 industries in the full sample. Our analysis here is also limited to the 18 percent of firms for which we observe the GIM-index. Although these firms are small in number, they are relatively large is size, accounting for 43 percent of total assets in our full sample. The estimates for these regressions are reported in Table VIII.

We find evidence of dramatic increases in growth, concentrated among firms with weak corporate governance. As seen in Panel A, columns (i)-(iii) of Table VIII, firms with weak governance increase their average size dramatically following the increase in legal liability, relative to other weak governance firms. Average total assets and sales increase by about 34 percent, and capital expenditures by 29 percent. On the other hand, strong governance firms, shown in Panel B, do not grow on average after the liability shock and may even shrink.

The increased growth among weak governance firms does not appear to be driven by

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[22] Our results are robust to using alternative cutoffs, including limiting the weak governance sample to firms with a GIM index ≥ 14 (Gompers, Ishii and Metrick 2003). We report the results for the less restrictive sample, because the point estimates are similar and more-precisely estimated. Our results are also similar if we divide our sample based on the entrenchment index constructed by Bebchuk, Cohen, and Ferrell (forthcoming).

[23] We do not backfill governance any earlier than 1989, because governance in 1990 is likely to be less correlated with governance in even earlier years.

differences in bankruptcy risk or investment opportunities. Average bankruptcy risk is similar between strong and weak governance firms prior to the increase in legal liability. The average modified z-score for weak governance firms prior to the shock is 1.94, whereas the average modified z-score for strong governance firms is 2.06. The difference of 0.12 is only one-tenth of a standard deviation, and the *p*-value of the difference is 0.406. Differences in financial leverage are also small in magnitude and not statistically significant. The growth of weak governance firms also does not appear to be explained by better investment opportunities. Tobin's *Q*, a standard proxy for investment opportunities, is larger on average for strong governance firms prior to the increase in legal liability. Strong governance firms have an average *Q* of 2.1 in the year before the shock, compared to only 1.5 for weak governance firms.

While strong governance firms do not grow following the liability shock, they do significantly increase their average total payouts to shareholders. On average, they increase their total payout ratio by 45.9 percent relative to a sample mean of 2.54 for strong governance firms prior to the shock, and the increase is statistically significant at the five percent level [Panel B, column (v)]. Weak governance firms, on the other hand, only exhibit an average increase of 18.9 percent relative to their sample mean of 3.65 prior to the shock, and this increase is not statistically significant [Panel A, column (v)].

These governance results, combined with the negative acquisition announcement returns, suggest that the growth of liability-exposed firms may be driven by managerial incentives rather than shareholders' interests. In fact, if the growth has negative NPV, then this growth may present a concrete example for how shareholder rights can affect corporate performance and firm value.

We next analyze the relation between the aggressive growth of liability-exposed firms and inside stock ownership. If the diversifying growth reflects an attempt by managers to diversify away the increased idiosyncratic risk to their human capital and equity compensation, then this incentive would be particularly strong for risk-averse managers with high degrees of wealth tied to the value of the firm's

assets (Holmström 1999; Hugonnier and Morellec 2007). To measure inside ownership, we use the

reported shares held by a firms' senior management as a fraction of the shares outstanding in the firm,

as recorded by TFN Insider Filing Data.[24] We compare the responses of firms with high inside ownership,

as measured by senior managerial stock ownership in the top quartile, and firms with low inside

ownership, as measured by senior managerial stock ownership in the bottom quartile. While the

ownership data is available beginning in 1986, there are very few observations prior to 1996, limiting

our sample to 38 newly-discovered chemicals affecting 23 industries after 1996. The ownership data is

also only available for 23 percent of firms in our full sample, corresponding to 39 percent of total assets.

The estimates from these regressions are reported in Table IX.

We find evidence of sharp increases in growth, concentrated among firms with high inside

ownership and a larger increase in total payouts among firms with low inside ownership. As seen in

Panel A, columns (i)-(ii) of Table IX, exposed firms with greater inside ownership increase their average

size dramatically following the increase in legal liability, relative to other high inside ownership firms.

Exposed firms with low inside ownership, shown in Panel B, exhibit a much smaller, non-significant

increase after the liability shock and instead increase their total payout to shareholders [column (v)].

Differences in ex-ante financial vulnerability do not appear to explain these results. Firms with

higher inside ownership exhibit both a lower leverage ratio and a lower average bankruptcy risk than

low inside ownership firms prior to the increase in legal liability. The growth among high inside

ownership firms also appears unlikely to be driven by access to better investment opportunities. In our

sample, high inside ownership firms have an average Q of 3.68 in the year before the shock, compared

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[24] While we would ideally measure the value of the insiders' shares relative to their personal total wealth, their share of firm ownership is a useful proxy. The share of ownership is calculated using the filings derived from Forms 3, 4, and 5 over the period 1986-2005. These filings originate from trades by firm insiders that must be reported to the SEC. The measure of managerial ownership reflects the average total holdings of the CEO, CFO, CIO, and COO in the year, adjusted for stock splits. We are grateful to Vasia Panousi and Dimitris Papanikolaou for providing us this data as well as the data on institutional ownership (discussed below). More details on the construction of both data sets are described in Panousi and Papanikolaou (2008).

to 3.56 for low inside ownership firms. The difference is less than 5 percent of a standard deviation and not statistically significant ($p > 0.85$).

Differences in the degree to which managers are monitored by large, institutional shareholders provide a third test of whether the diversifying growth is in shareholders' interest. Institutions are more likely than individuals to hold substantial blocks of shares and thereby to have a financial incentive to monitor management (Shleifer and Vishny 1986). If the increase in growth results from an agency conflict, then we might expect to find the growth concentrated among firms with few institutional shareholders. Similarly, if the increase in payouts to shareholders after the liability shock is concentrated among firms with large institutional shareholders, then we might conclude that shareholders typically prefer that the manager pay out capital than grow the firm. We thus examine the relation between institutional ownership and the growth and payout policies of liability-exposed firms.

We measure institutional ownership as the fraction of a firm's equity that is owned by institutional investors, based on 13(f) filings recorded in the TFN Institutional Holdings database. A 1978 amendment to the Securities and Exchange Act of 1934 requires all institutions with more than 100 million dollars of securities under discretionary management to report their holdings to the SEC through 13(f) filings. Consequently, data on institutional holdings are available for a large sample of firms over our entire sample period. We compare the responses of firms with limited institutional monitoring, as measured by institutional ownership in the bottom quartile, and firms with high institutional monitoring, as measured by institutional ownership in the top quartile. The estimates from these regressions are reported in Table X

We find evidence of increased growth among firms with low outside monitoring, whereas firms with high monitoring increase payouts to shareholders. As seen in Panel A, columns (i)-(iii) of Table X, exposed firms with relatively-little institutional ownership increase their average size sharply following

the increase in legal liability, relative to other low institutional ownership firms. Average total assets increase by about 37 percent, sales by 35 percent, and capital expenditures by 17 percent. On the other hand, exposed firms with high institutional ownership, reported in Panel B, do no exhibit a significant increase in growth after the liability shock [columns (i)-(iii)] and instead increase their total payout to shareholders [column (v)].

One possible concern is that these findings may be explained by differences in bankruptcy risk between firms with low and high institutional ownership. The average bankruptcy risk of firms with low institutional ownership is significantly lower than that of firms with high institutional ownership prior to the shock. The average modified z-score for firms with low institutional ownership is 0.33 prior to the shock, whereas the average modified z-score for firms with high institutional ownership is 2.24. To test the importance of institutional ownership relative to bankruptcy risk, we double sort the data based on bankruptcy risk and institutional ownership to compare how firms' responses vary across these two dimensions. The estimates for these regressions are reported in Table XI.

Both greater bankruptcy risk and less monitoring appear to be independently related to firms' responses to the liability shock. As seen in column (i) of Table XI, exposed firms with lower institutional ownership increase their average size dramatically following the increase in legal liability irrespective of whether they exhibit above or below median bankruptcy risk prior to the liability shock. Firms with low monitoring and low bankruptcy risk still increase growth by 30.5 percent relative to other low monitoring, low bankruptcy risk firms. Only firms with both high monitoring and low bankruptcy risk [column (ii)] do not experience an average increase in growth following the liability shock. It is also only among these high monitoring, low bankruptcy risk firms that we observe a significant increase in total payouts to shareholders [column (iv)].

5.3 Alternative interpretations

Overall, the external governance, managerial ownership, and institutional monitoring results strongly suggest that managerial private interest can play a significant role in corporate responses to an adverse shock. Growth appears larger on average when firms have weaker external governance, when senior management holds larger equity stakes in the firm, and when relatively few equity shares are held by institutional investors. On the other hand, firms with strong external governance, low inside ownership, and high institutional ownership do not grow; instead, they greatly increase their payouts to shareholders. These results suggest that the diversifying growth is not in shareholders' interest, and that shareholders would prefer managers instead payout excess cash.

However, there are four alternative explanations for these results that also merit careful consideration: asymmetric information, costly financial distress, organizational capital, and an end to the "quiet life". We explore each of these alternative explanations.

Asymmetric information

If investors do not have as much information about the potential legal liability as the firms' managers, then the managers may be making money for existing shareholders by exploiting this asymmetric information to issue overvalued equity – through both secondary equity issues and stock acquisitions. While firms are required by law to warn employees about their exposures to substances that are included in the *RoC*, it is possible that the financial market does not pick up on these risks or systematically underestimates the firm's exposure to them. Huberman and Regev (2001) lend some plausibility to this hypothesis by documenting a case example where the market did not price public scientific information (previously published in the journal *Nature* and various popular newspapers) until it appeared in a prominent article in the Sunday *New York Times*.

The asymmetric information model can be reconciled with some of our results. Under asymmetric information, equity is likely to be more overvalued than debt, and the overvaluation is likely

greatest for firms that are most financially vulnerable to the shock. The increase in diversifying acquisitions may reflect the firm's knowledge that the equity of other firms in their industry is overvalued as well, and the lower acquirer announcement returns is consistent with investors being uninformed. Investors, if unaware of the true value of the equity being exchanged, would perceive these acquisitions as over-priced.

To examine whether the investors seem to be aware of the liability shock, we look at how firms' market-to-book ratios change after the shock. The estimates are small in magnitude and not statistically significant, suggesting that investors may not be aware of the liability shock. However, these results should be interpreted with caution, because the estimates are noisy and the effects may vary across firms depending on their financial vulnerability. For example, on average, the market-to-book ratio *decreases* by 0.15 percentage points after the shock at firms with high bankruptcy risk (standard error 0.56). On the other hand, the market-to-book ratio *increases* by 0.22 percentage points after the shock at firms with low bankruptcy risk (standard error 0.22). It is possible that the shock benefits these firms indirectly by improving their competitive position in product markets (Bolton and Scharfstein 1990). In any event, these average effects are small, measuring less than one-tenth of a within-industry (4.19) or within-firm (3.64) standard deviation of the market-to-book ratio.

Asymmetric information, however, cannot easily explain all of our results. It is unclear why information asymmetry would cause a shift towards acquisitions of firms that exhibit higher cash flows. Furthermore, if investors are unaware of the shock and managers are acting on their own, there is no reason to expect the growth to be concentrated among firms with weak external governance, high inside ownership, and low institutional ownership.

Costly financial distress and organizational capital

Models with costly financial distress provide another possible explanation for some of our

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results. When a firm learns that it is exposing its workers to a carcinogen, the probabilities of future litigation, damage payments, and liquidity shocks increase. If financial distress is costly, then as with corporate risk management broadly, mitigating the likelihood that an adverse shock will cause financial distress may create value for shareholders (Froot, Scharfstein, and Stein 1993; Fluck and Lynch 1999). In this scenario, increasing growth through diversifying acquisitions could be an optimal response to ensure the company maintains the ability to finance profitable investments should a lawsuit eventually materialize.[25] This hypothesis matches a number of our results. The growth is stronger among firms for which external finance would be more costly and is funded using equity rather than debt. Unlike asymmetric information, the desire to avoid incurring these costs is also consistent with our finding that acquisitions shift towards high cash flow firms, which may help the firm avoid future financial distress.

One particularly important cost of financial distress may be the loss of organizational capital. Organizational capital is productive capacity that derives from knowledge embedded in a firm's organization and its "people relationships" (Prescott and Visscher 1980; Tomer 1987). Because a firm's organizational capital is vested in the relationships among its workers, much of it may be lost when the firm undergoes significant downsizing. To preserve this value, it may in theory be optimal for shareholders for a firm to maintain its size by redirecting its operations to a new industry after the liability shock (Maksimovic and Phillips 2002).

There is little direct evidence, however, that the growth is driven by a motive to preserve organizational capital. Classifying firms as having high or low organizational capital using their accumulation of SG&A (Eisfeldt and Papanikolaou 2008), we find no difference in how these sets of firms

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[25] From a shareholder's perspective, it may also be optimal for the firm to take on riskier projects since the costs incurred during failure are more likely to be borne by other claimants on the firm's assets, such as the debtholders and workers that may become ill in the future (Jensen and Meckling 1976). Numerical simulations presented by Parrino and Weisbach (1999) show that stockholder-bondholder conflicts cause little investment distortion for most firms. Risk-shifting also does not match well with our findings that the growth is diversifying in nature (which would tend to reduce risk rather than increase it) and is associated with negative average abnormal announcement returns.

respond to the liability shock. We also find no evidence that the effect is larger for firms with a larger market share, which may act as another proxy for organizational capital (Lev and Radhakrishnan 2004).

Organizational capital and other costs of financial distress also cannot explain a number of our other results. If these acquisitions help avoid costly financial distress and thus increase the value of equity, it is unclear why they are associated with negative abnormal announcement returns. One possibility is the combination of costly financial distress and asymmetric information, where shareholders are unaware of the liability shock but managers respond optimally to it by reducing the likelihood of financial distress. The combination, however, cannot easily explain the corporate governance or ownership findings. The increased growth among firms with weak external governance, high inside ownership, and low institutional ownership but increased payouts for firms with strong external governance, low inside ownership, and high institutional ownership does not fit easily into either model.

An end to the "quiet life"

Models of managerial entrenchment provide another possible explanation for some of our results. Entrenched managers may enjoy living the "quiet life", which can be associated with under-investment and under-exploration of new opportunities (Bertrand and Mullainathan 2003). Since large, future cash outflows poses a threat to a manager's ability to remain entrenched in the firm, particularly for financially vulnerable firms, it is possible this liability shock induces managers to forego the quiet life and make optimal investments they would not have made otherwise. In this case, the growth is still driven by managers' exposure to firm risk but is actually in shareholders' interest.

There is little direct evidence, however, that growth following a liability shock is greater on average among firms most susceptible to managers enjoying a quiet life. Classifying firms as having a greater likelihood of a manager enjoying the quiet life using higher average wages (Bertrand and

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Mullainathan 2003), we find no difference in how these firms respond to the liability shock. We also find no evidence that average growth is larger for firms with higher average SG&A/assets, R&D/assets, advertising/sales, or COGS/sales, which Giroud and Mueller (2007) argue are symptomatic of managers enjoying the quiet life. Nor do we find any evidence that either wages or input costs decline following the liability shock. This suggests the observed changes are not driven entirely by an end to the quiet life for managers.

Managerial entrenchment and an end to the quiet life also cannot explain a number of our other results. Although an end to the quiet life may explain an increase in investments and growth or why this growth is concentrated among firms with weak governance, it does not explain why this growth would tend to diversify firms' operations or be targeted at acquiring 'cash cows'. The negative announcements returns are also not consistent with this growth being in shareholders' interest.

This analysis leaves the agency model of managerial risk exposures as the only model that is consistent with *all* of our empirical findings. Nevertheless, information asymmetry, costly financial distress, organizational capital, the quiet life, and even the perfect capital markets model likely also describe the behavior of some firms and managers. However, the governance and share ownership results suggest that shareholders of the *average* liability-exposed firm would prefer that managers pay out the excess cash rather than grow the firm. These results suggest that managerial exposure to firm risk can have a substantial impact on how firms respond to adverse shocks.

6. Conclusion

This paper examines how firms respond to exogenous increases in legal liability from employee exposures to carcinogens. We find that firms tend to grow aggressively via both capital investment and acquisitions, and this growth is concentrated among firms that are more financially vulnerable to the realization of an adverse shock. The acquisitions appear to be targeted at diversifying the firms' assets

away from those causing the liability, and the exposed firms pay high takeover premiums to acquire large firms with relatively high operating cash flows, recent growth, and total payouts. These acquisitions are associated with negative abnormal returns and equity financing. We also find evidence that firms increase payouts to shareholders, but much of this increase could be driven by firms' acquisitions of high cash flow firms, rather than any direct shift in payout policy.

While a number of our findings can be explained by models that incorporate costs of financial distress or asymmetric information between managers and potential investors, firms' responses to the liability shock seem to fit best with an agency model of managerial behavior, in which managers try to ensure the long-run survival of their firms with themselves at the helm. In further support of this model, we find that firms with weak external governance grow by almost 35 percent on average after the liability shock whereas firms with strong external governance do not. Firm growth is also larger both when senior management holds larger equity stakes in the firm and when relatively few equity shares are held by institutional investors. Instead, firms with strong external governance, low inside ownership, and high institutional ownership increase total payouts by more than 15 to 49 percent on average, compared to little or no increase for firms with weak external governance, high inside ownership, or low institutional ownership. While the growth may have benefits for the shareholders of some firms, such as from the sale of overpriced equity, the governance and equity ownership results suggest that the costs from agency conflicts dominate the benefits for shareholders of the average exposed firm.

Managerial incentives in the face of increased litigation risk may similarly explain the growth and diversification of tobacco firms in the 1960s and 80s. The U.S. Surgeon General (1964) released its first report on the health consequences of smoking in 1964. Within a year, all of the major American cigarette companies were expanding by diversifying into nontobacco businesses, such as consumer package goods, dog food, whisky, corn-oil refining, and domestic crude oil and natural gas exploration.

The industry experienced another round of diversification two decades later. The first academic medical study documenting the harmful effects of second-hand smoke was published in 1981 (Hirayama 1981), opening cigarettes to new regulation. Shortly thereafter, R.J. Reynolds bought Nabisco and Philip Morris bought General Foods and Kraft. Jensen (1986) points to these diversification programs as prominent examples of managers taking investments that are contrary to shareholders' interests.

These results have broad implications. The liability shocks we study have similar characteristics to many other business risks that firms face in that it reduces the firm's expected future cash flows and the expected return on investments but has limited affect on *current* cash flows. Roughly speaking, these characteristics are similar to a shock, such as a technological innovation, that increases the probability of future competitive entry into a firm's product market. If entry eventually occurs, the firm's cash flows will be reduced – this is parallel to the reduction in cash flows that is likely to be realized if liability damages are eventually incurred in our setting. In both settings, the shock reduces profit margins as there is risk that the marginal unit being produced will either sell for a lower price, in the case of entry, or expose the firm to further liability damages.

Additional parallels can be drawn to any number of other business risks that involve a decrease in expected future cash flows. For example, the risk that steel tariffs will be eliminated or that new environmental regulations will greatly increase a firm's marginal costs of production. Case studies of declining industries, such as the defense industry after the cold war (Dial and Murphy 1995) or the oil industry in the 1980s (Jensen 1986) also document corporate behavior similar to our findings.

While we cannot be sure how managers may respond to other particular shocks, the results presented here suggest that the responses may not always coincide with shareholders' interests. Our evidence suggests that managers may be less interested in the "quiet life" when doing so may put the firms' survival at risk; instead, managers may respond aggressively to grow and diversify the firms

operations. Finally, this interaction between managerial agency conflicts and financial vulnerability also has implications for a firm's optimal capital structure. If managers' objectives and shareholder interests tend to diverge as a firm approaches financial distress, then a high amount of financial leverage that moderates agency problems in normal times may actually amplify these agency conflicts when the firm encounters an adverse shock. This cost of debt-financing – and the broader interaction of agency conflicts with financial distress – has received little attention in the literature.

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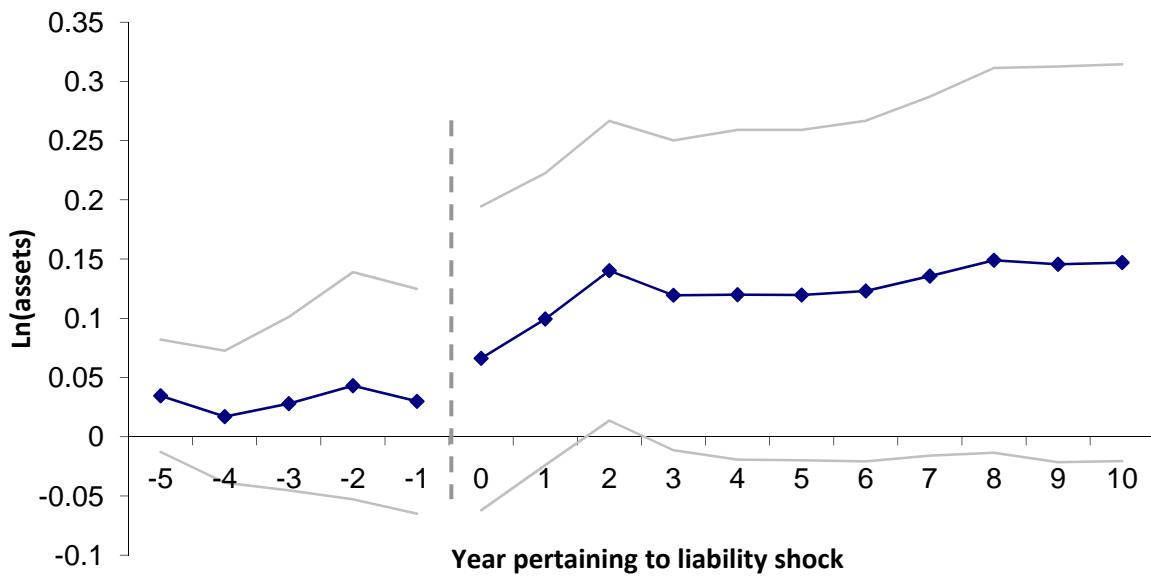
Figure 1 -- Effect of liability shock on growth by year
This figure reports the point estimates from a firm-panel regression of ln(assets) onto on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specification is the same as that reported in Table II except that the effect of liability exposure is allowed to vary by year for each year from five years before the shock through ten years after. 95th percentile confidence intervals, using standard errors clustered at the industry level, are also plotted.

A. High bankruptcy risk: z-score in bottom quartile at t = −1

B. Low bankruptcy risk: z-score in top quartile at t = −1

Year pertaining to liability shock
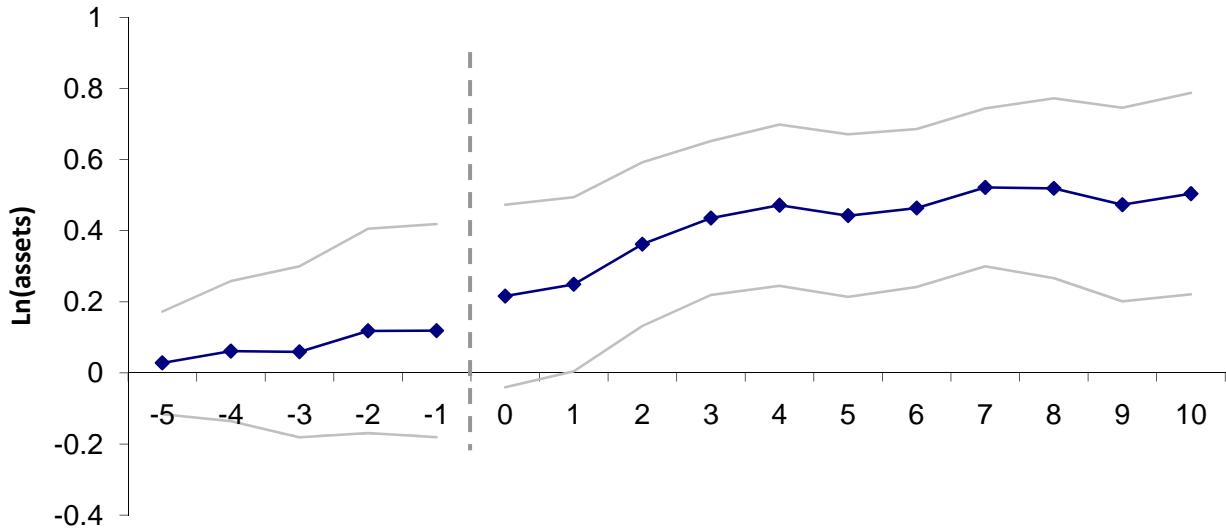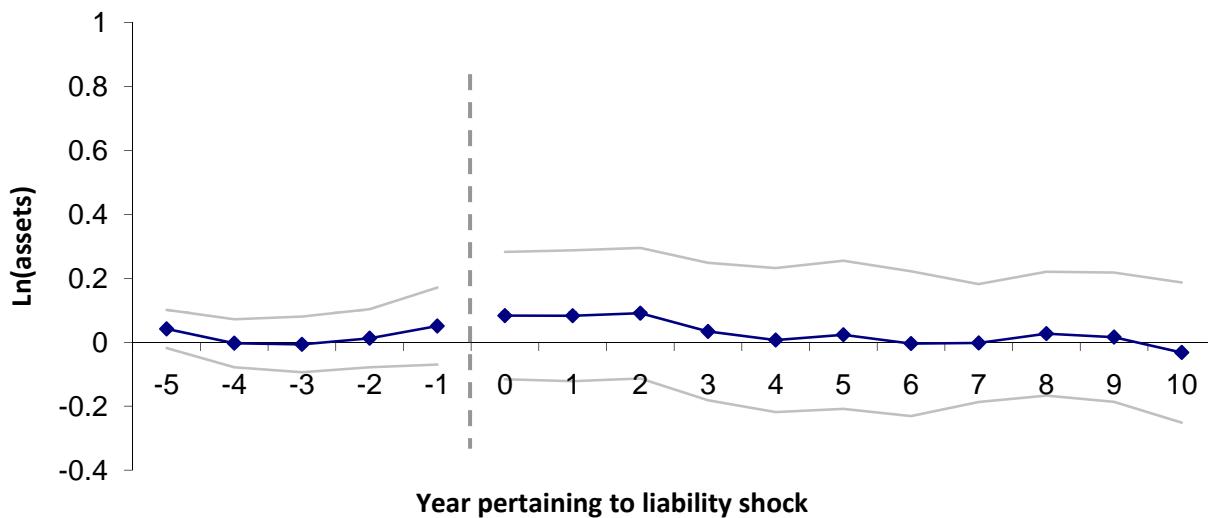
Figure 2 -- Effect of liability shock on growth by year and bankruptcy risk
This figure reports the point estimates from a firm-panel regression of ln(assets) onto on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specification is the same as that reported in Table III except that the effect of liability exposure is allowed to vary by year for each year from five years before the shock through ten years after. Panel A restricts the sample to only firms with Altman z-scores in the bottom quartile while Panel B restricts the sample to only firms with Altman z-scores in the top quartile. 95th percentile confidence intervals, using standard errors clustered at the industry level, are also plotted.

Table I
# Ex-ante firm characteristics

This table reports summary statistics for firm characteristics in the year before a new chemical was added to the *Report on Carcinogens* . The mean and standard deviation (in parentheses) for each variable are reported separately for two samples of firms. Column (i) reports estimates for firms in 4-digit SIC industries for which more than 7.5% of employees were observed exposed to the chemical in the 1981-1983 National Occupational Exposure Survey. Column (ii) reports estimates for other firms in the same Fama-French 48 industry classification. Column (iii) reports the p-value from a t-test on the difference between exposed and unexposed firms, where the standard errors are clustered at the 4-digit SIC industry level. The sample is restricted to firms with nonmissing observations for ln(assets), ln(sales), ln(capital expenditures+1), equity, ln(debt+1), and ln(dividends+1).

	Exposed	Unexposed	p-value of difference
	(i)	(ii)	(iii)
Ln(Sales)	4.286	4.126	0.563
	(2.736)	(2.535)	
Leverage	0.285	0.285	0.983
	(0.252)	(0.269)	
Total payout / Assets * 100	1.856	1.813	0.830
	(3.525)	(3.643)	
Capex / Assets	0.086	0.081	0.228
	(0.076)	(0.085)	
Cash / Assets	0.093	0.094	0.981
	(0.148)	(0.151)	
Market-to-Book Ratio	3.036	3.095	0.929
	(5.614)	(6.081)	
Observations	2,209	8,373	
# of Industries	106	249	

Table II
Effect of liability exposure on firm size and investment

This table reports coefficients from firm-panel regressions of firm size and investment on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The liability exposure indicator equals 1 if more than 7.5% of employees in the firm's 4-digit SIC industry were observed exposed in the 1981-1983 National Occupational Exposure Survey to chemical reported in the most recent edition of the *Report on Carcinogens* (RoC). The dependent variables are ln(assets), ln(sales), and ln(capex + 1). The data include firm-year observations in the 10 years before and 10 years after each new chemical listing in the RoC. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)	Ln(Sales)	Ln(Capex + 1)
	(i)	(ii)	(iii)
Exposure	0.098*	0.105**	0.055
	(0.056)	(0.049)	(0.045)
Observations	144,651	144,651	144,651
# of Firms	10,582	10,582	10,582
R-Squared	0.32	0.27	0.14
Fixed effects:			
Firm-cohort	X	X	X
Year-cohort	X	X	X

Table III

Effect of liability exposure on corporate financing decisions

This table reports coefficients from firm-panel regressions of firm financial choices regarding debt, equity, and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but for different dependent variables: ln(equity + 1), ln(debt + 1), debt / assets, and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Equity + 1)	Ln(Debt + 1)	Debt / Assets	Total payout / Assets * 100
	(i)	(ii)	(iii)	(iv)
Exposure	0.100**	0.0352	-0.017*	0.301***
	(0.050)	0.045	(0.010)	(0.104)
Observations	137,539	144,651	144,651	144,651
# of Firms	10,539	10,582	10,582	10,582
R-Squared	0.26	0.14	0.02	0.01
Fixed effects:				
Firm-cohort	X	X	X	X
Year-cohort	X	X	X	X

Table IV

Heterogeneity in effects of liability exposure based on firm bankruptcy risk

This table reports coefficients from firm-panel regressions of firm size, investment, leverage, and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but Panel A restricts the sample to only firms with modified Altman z-scores in the bottom quartile while Panel B restricts the sample to only firms with modified Altman z-scores in the top quartile. The dependent variables are ln(assets), ln(sales), ln(capex + 1), debt / assets, and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)	Ln(Sales)	Ln(Capex+1)	Debt / Assets	Total payout / Assets * 100
	(i)	(ii)	(iii)	(iv)	(v)
A. High bankruptcy risk: z-score in bottom quartile at t = −1					
[2,561 firms; 29,311 observations]					
Exposure	0.321***	0.390***	0.118**	-0.025	0.227*
	(0.073)	(0.086)	(0.058)	(0.026)	(0.133)
R-Squared	0.12	0.13	0.07	0.02	0.01
B. Low bankruptcy risk: z-score in top quartile at *t* = −1					
[2,561 firms; 37,984 observations]					
Exposure	0.029	0.010	0.029	-0.012	0.633**
	(0.088)	(0.061)	(0.063)	(0.008)	(0.294)
R-Squared	0.51	0.45	0.27	0.03	0.02
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	X	X	X	X

Table V
Other heterogeneity in effects of liability exposure

This table reports coefficients from firm-panel regressions of firm size and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but estimates are obtained for different subsamples of firms: firms with debt / assets in the top and bottom quartiles [columns (i) and (v)], firms with operating cash flows / assets in the top and bottom quartiles [columns (ii) and (vi)], firms with zero or positive dividends [columns (iii) and (vii)], and firms with assets in the bottom and top quartiles [columns (iv) and (viii)]. The dependent variables is ln(assets) in Panel A and total payout / assets * 100 in Panel B, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

A. *Dependent Variable* = Ln(Assets)

	(i)	(ii)	(iii)	(iv)
	High leverage	**Low cash flow**	**Zero dividends**	**Small firms**
Exposure	0.198***	0.173**	0.184**	0.211***
	(0.075)	(0.073)	(0.072)	(0.076)
Observations	34,431	27,193	78,840	29,489
# of Firms	2,648	2,303	6,636	2,648
R-Squared	0.23	0.17	0.23	0.14
	Low leverage	**High cash flow**	**Positive dividends**	**Large firms**
Exposure	0.068	0.043	0.010	0.089
	(0.085)	(0.102)	(0.053)	(0.069)
Observations	34,074	35,285	65811	43,863
# of Firms	2,648	2,303	3946	2,648
R-Squared	0.36	0.44	0.55	0.49
Fixed effects:				
Firm-cohort	X	X	X	X
Year-cohort	X	X	X	X

Table V (cont.)

B. *Dependent Variable* = Total Payout / Assets * 100

	(v)	(vi)	(vii)	(viii)
	High leverage	**Low cash flow**	**Zero dividends**	**Small firms**
Exposure	0.401***	0.197	0.232**	0.283**
	(0.103)	(0.132)	(0.102)	(0.121)
Observations	34,431	27,193	78,840	29,489
# of Firms	2,648	2,303	6,636	2,648
R-Squared	0.02	0.01	0.01	0.01
	Low leverage	**High cash flow**	**Positive dividends**	**Large firms**
Exposure	0.228	0.719***	0.366***	0.460**
	(0.198)	(0.273)	(0.140)	(0.191)
Observations	34,074	35,285	65,811	43,863
# of Firms	2,648	2,303	3,946	2,648
R-Squared	0.02	0.03	0.03	0.04
Fixed effects:				
Firm-cohort	X	X	X	X
Year-cohort	X	X	X	X

Table VI

Effect of liability exposure on acquisition activity

This table reports coefficients from industry-panel regressions of ln(acquisitions) on an indicator for liability exposure, industry fixed effects, and year fixed effects. The liability exposure indicator equals 1 if more than 7.5% of employees in the firm's 4-digit SIC industry were observed exposed in the 1981-1983 National Occupational Exposure Survey to chemical reported in the most recent edition of the *Report on Carcinogens* (RoC). In Panel A, we break down the acquisitions into all, unrelated, and related, where we classify deals as unrelated or related based on whether the target firm's primary 4-digit SIC industry is the same or different than that of the acquirer. In Panel B, we further classify acquisitions into three groups: "main line" if the primary SIC industry for the acquiring firm coincides with any SIC code of the target; "side line" if the acquirer's primary SIC code does not match any SIC code listed for the target, but an SIC code listed as a side line business does; and "no match" if none of the target or acquirer's primary or side lines of business coincide. The sample includes all acquisitions announced between 1980 and 2006 that were recorded in SDC's Mergers and Acquisitions Database, but excludes acquisitions meeting any of the following criteria: (1) the ratio of the deal size to market value of the acquirer's assets is less than 1%; (2) the acquiring firm controlled more than 50% of the target prior to the announcement date or less than 100% after the acquisition was completed; (3) the ultimate parent of the acquirer and the target are the same (i.e., consolidations within holding companies); (4) either the acquirer or the target is a financial firm; or (5) the deal was not completed within 1,000 days of the announcement date. We also exclude Fama-French (1997) industries where none of the included 4-digit SIC codes experience an exposure during the sample period. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dependent Variable **= Ln(Number of Acquisitions)**
[842 Industries; 22,734 Observations]

	A. Type of Acquistions			B. Industry Overlap in Acquisition		
	All	**Related**	**Unrelated**	**Main line**	**Side line**	**No Match**
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Exposure	0.064*	0.031	0.066**	0.037	0.035*	0.054**
	(0.034)	(0.030)	(0.029)	(0.031)	(0.020)	(0.025)
R-Squared	0.22	0.13	0.18	0.15	0.07	0.14
Industry FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X

Table VII
Effect of liability exposure on the characteristics of acquisitions

This table reports coefficients from firm-panel regressions of acquisition and ex-ante target firm characteristics on an indicator for liability exposure, industry fixed effects, and year fixed effects. The liability exposure indicator equals 1 if more than 7.5% of employees in the firm's 4-digit SIC industry were observed exposed in the 1981-1983 National Occupational Exposure Survey to chemical reported in the most recent edition of the *Report on Carcinogens* (RoC). In Panel A, the dependent variables are ex-ante target characteristics: log total assets, 5-year sales compounded annual growth rate, the ratio of debt to assets, the ratio of cash flow to asset, and the ratio of the total payout to assets. In Panel B, the dependent variables are other characteristics of the acquisition: percent of stock used, takeover premium, and acquirer announcement CAR[-1,1]. The sample of acquisitions is the same as that used in Table VI, but further restricted to mergers with non-missing observations for premium, CAR, and log target assets, leaving 2,253 firms. Fewer observations are available for sales growth rate (1,484), cash flow (2,164), and percent stock (2,142). Target characteristics are from Compustat, and abnormal returns are computed using a market model and CRSP equally-weighted index returns, estimated over the (-300,-46) day interval. Estimates for sales growth rate, leverage, cash flow, and total payout are weighted by target firm size. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	A. Target characteristics					B. Acquisition characteristics		
	Ln(Assets)	5-year sales CAGR	Debt / Assets	Cash flow / Assets	Payout / Assets * 100	Takeover premium	Percent Stock	Acquirer CAR [-1,1]
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Exposure	0.331*	0.086***	-0.063***	0.083***	3.425***	0.137**	8.034*	-0.013*
	(0.178)	(0.028)	(0.020)	(0.030)	(1.307)	(0.067)	(4.389)	(0.008)
R-Squared	0.38	0.44	0.48	0.44	0.50	0.07	0.41	0.21
Fixed effects:								
Industry	X	X	X	X	X	X	X	X
Year	X	X	X	X	X	X	X	X

Table VIII

Heterogeneity in effects of liability exposure based on corporate governance

This table reports coefficients from firm-panel regressions of firm size, investment, leverage, and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but Panel A restricts the sample to only firms with a GIM score ≥ 11 while Panel B restricts the sample to only firms with an GIM score ≤ 5. The dependent variables are ln(assets), ln(sales), ln(capex + 1), debt / assets, and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)	Ln(Sales)	Ln(Capex)	Debt / Assets	Total payout / Assets * 100
	(i)	(ii)	(iii)	(iv)	(v)
A. 'Weak' governance firms: GIM ≥ 11 at t = −1					
[311 firms; 5,515 observations]					
Exposure	0.295***	0.297***	0.251***	-0.016	0.690
	(0.109)	(0.099)	(0.090)	(0.016)	(0.409)
R-Squared	0.59	0.54	0.30	0.05	0.07
B. 'Strong' governance firms: GIM ≤ 5 at t = −1					
[140 firms; 2,202 observations]					
Exposure	-0.037	-0.011	-0.021	0.042	1.165**
	(0.189)	(0.171)	(0.158)	(0.034)	(0.486)
R-Squared	0.50	0.43	0.22	0.05	0.04
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	X	X	X	X

Table IX

Heterogeneity in effects of liability exposure based on inside ownership

This table reports coefficients from firm-panel regressions of firm size, investment, leverage, and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but Panel A restricts the sample to only firms with managerial ownership in the top quartile while Panel B restricts the sample to only firms with managerial ownership in the bottom quartile. The dependent variables are ln(assets), ln(sales), ln(capex + 1), debt / assets, and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)	Ln(Sales)	Ln(Capex)	Debt / Assets	Total payout / Assets * 100
	(i)	(ii)	(iii)	(iv)	(v)

A. High inside ownership: managerial ownership in top quartile at t = −1

[165 firms; 2,131 observations]

	Ln(Assets)	Ln(Sales)	Ln(Capex)	Debt / Assets	Total payout / Assets * 100
Exposure	0.523**	0.399**	0.239	-0.061**	0.658
	(0.258)	(0.175)	(0.208)	(0.029)	(0.527)
R-Squared	0.49	0.42	0.26	0.05	0.05

B. Low inside ownership: managerial ownership in bottom quartile at t = −1

[165 firms; 2,248 observations]

	Ln(Assets)	Ln(Sales)	Ln(Capex)	Debt / Assets	Total payout / Assets * 100
Exposure	0.195	-0.003	0.119	-0.041	1.797*
	(0.128)	(0.130)	(0.143)	(0.025)	(0.932)
R-Squared	0.50	0.39	0.18	0.06	0.07
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	X	X	X	X

Table X

Heterogeneity in effects of liability exposure based on institutional ownership

This table reports coefficients from firm-panel regressions of firm size, investment, leverage, and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but Panel A restricts the sample to only firms with institutional ownership in the bottom quartile while Panel B restricts the sample to only firms with institutional ownership in the top quartile. The dependent variables are ln(assets), ln(sales), ln(capex + 1), debt / assets, and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)	Ln(Sales)	Ln(Capex)	Debt / Assets	Total payout / Assets * 100
	(i)	(ii)	(iii)	(iv)	(v)
A. Low monitoring: institutional ownership bottom quartile at t = −1					
[1,618 firms; 20,116 observations]					
Exposure	0.318***	0.302**	0.156***	-0.015	0.055
	(0.092)	(0.104)	(0.060)	(0.015)	(0.134)
R-Squared	0.21	0.17	0.10	0.02	0.01
B. High monitoring: institutional ownership top quartile at t = −1					
[1,618 firms; 26,893 observations]					
Exposure	0.077	0.065	0.0585	-0.013	0.470*
	(0.083)	(0.068)	(0.070)	(0.010)	(0.266)
R-Squared	0.54	0.49	0.28	0.04	0.04
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	X	X	X	X

Table XI

Heterogeneity based institutional ownership and bankruptcy risk

This table reports coefficients from firm-panel regressions of firm size and payout policy on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specifications are the same as those reported in Table II, but Columns (i) and (iii) restrict the sample to only firms with institutional ownership in the bottom quartile while Columns (ii) and (iv) restrict the sample to only firms with an institutional ownership in the top quartile. The estimates reported in the first row further restrict the sample to firms with an above median z-score, and the estimates reported in the second row further restrict the sample to firms with a below median z-score. The dependent variables are ln(assets) and total payout / assets * 100, where total payout is the sum of dividends and share repurchases. Standard errors, clustered at the industry level, are reported in parentheses. * = 10% level, ** = 5% level, *** = 1% level.

Dep. Variable =	Ln(Assets)		Total payout / Assets * 100			
	(i)	(ii)	(iii)	(iv)		
	Low Monitoring [inst. ownership in bottom quartile at t=-1]	High Monitoring [inst. ownership in top quartile at t=-1]	Low Monitoring [inst. ownership in bottom quartile at t=-1]	High Monitoring [inst. ownership in top quartile at t=-1]	Number of firms Number of observations	
High Bankruptcy Risk *[Above median z-score at t=-1]*	0.346*** (0.105)	0.193* (0.099)	0.132 (0.155)	0.092 (0.213)	1,071 *12,484*	580 *9,492*
Low Bankruptcy Risk *[Below median z-score at t=-1]*	0.266** (0.127)	0.025 (0.110)	-0.015 (0.299)	0.738** (0.358)	509 *7,222*	1,000 *16,781*