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

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Abstract

This paper analyzes corporate responses to exogenous increases in legal liability from worker exposures to occupational carcinogens. 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 more vulnerable to the realization of an adverse shock, 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 are broadly inconsistent with the perfect capital markets model, but fit well with an agency model where managers have career concerns. 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; whereas firms with strong external governance, low management ownership, or high institutional ownership instead increase their payouts to shareholders. The results suggest that agency conflicts may be exacerbated when firms are closer to financial distress.

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1. Introduction

Substantial adverse shocks to the value of a firm's assets and its investment opportunities pose important risks to firms. Potential sources for such shocks abound – examples include new technologies that reduce barriers to entry, disruptive product innovations, the relaxation of international trade barriers, and changes in government regulation. The prospects of such risks are likely to affect many corporate decisions, including those about future investments, financing sources, and payout policy. Despite the importance of these sorts of shocks, little is known about how firms actually respond to them, due to the difficulty in isolating an exogenous shock to investment opportunities. Under perfect capital markets with taxes, theory 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 as dividends, share repurchases, or debt reductions. Other theoretical models, such as those that include costs of financial distress, asymmetric information, or agency conflicts, suggest that some firms may respond quite differently. However, the empirical relevance of the various theories in this context is unclear. This paper presents evidence to shed light on this important question.

This paper investigates firm responses to negative investment shocks by examining the aftermath of exogenous increases in legal liability, which reduce the expected return from both existing assets and future investments. In particular, we focus on legal liability that accrues when a chemical to which a firm's workers 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 reduce the expected return on both existing and future investments, because there is an increased chance that these returns will not accrue to shareholders. 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 expected returns.

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 (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, whereas 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.

To shed some light on the motivations behind this aggressive growth, we examine the source of this growth. While some of the growth is driven by an increase in capital expenditures, at least about a half is 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 liability exposure, the targets acquired by the exposed firms can be described as "cash cows:" they 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 are broadly inconsistent with the perfect capital markets model, which predicts that investment should decrease following the liability shock, but the results may be consistent with a number of alternative models. First, some of the results can be explained by an asymmetric information model in which managers act in the interest of shareholders. 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. Second, some of the results can also be explained by a model in which financial distress is costly and correlated with the market return, such that it is in the interest of shareholders for highly-leveraged firms to grow or even diversify to avoid incurring these costs after the liability shock. However, in order for this growth to be beneficial for shareholders in either the asymmetric information model or costly financial distress model, the profits from mispricing and the avoided costs of financial distress (i.e., the NPV of financing) must be greater than the potential operating costs of diversification (Berger and Ofek, 1995, Lang and Stulz 1994) and any value lost from exposing the assets of the newly-acquired businesses to liability from the shock.

Another possibility is that managers have objectives that do not coincide with those of shareholders, leading them to invest in negative NPV projects. In this model, the liability shock reduces the firm's profitable investment opportunities, fomenting free cash flow problems for shareholders (Jensen 1986). Furthermore, managerial career and wealth concerns can lead managers to increase corporate investment or distort its risk profile to avoid bankruptcy or a takeover – even if these actions are not in the best interest of shareholders (Holmström 1999; Hugonnier and Morellec 2007). 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 his or her job and personal wealth that is tied up in company stock. If these agency problems exist, managerial exposure to idiosyncratic risk is also likely to exacerbate them when firms are closer to financial distress.

The corporate responses to the liability shock presented in this paper fit well with this agency model of managerial behavior, in which managers try to ensure the long-run survival of their firms with themselves at the helm. This model explains why firms grow after the adverse shock, why the effects

are concentrated at firms that are most vulnerable to financial distress, and why the growth would be targeted at "cash cows", which are purchased at a premium and associated with lower abnormal equity returns. As further tests of the agency model, we examine whether firms' responses to the shock are related to the strength of their external governance, the size of senior management's ownership stake in the firm, and the degree of institutional equity ownership. 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. Neither asymmetric information nor costs of financial distress can directly explain these results.

Our study forms a nice 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 evidence presented here may also offer some 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 high enough. Our evidence that the intensive growth following an adverse shock is concentrated among financially vulnerable firms also suggests that managers' motivations for growing their firms may be more accurately characterized by "career concerns" or risk-adjusted personal wealth maximization 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 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.

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 producing 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 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 in many situations, courts "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).

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).

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). These decreases in expected future cash flows decrease 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.

While 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, the increased economic costs associated current production accrue only after worker injuries manifest themselves, because damages are generally assessed only for actual – and not speculative or hypothetical – damages (Ringleb and Wiggins 1990). Premiums for third-party workers' compensation insurance are likely to eventually reflect the increased risk of a payout, but 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 shock to a firm's asset value and investment opportunities that has minimal concomitant effect on cash flows. In the analysis that follows, we exploit this unique characteristic to examine firm responses to substantial adverse shocks. Such shocks in various forms are commonplace in business, but generally difficult to isolate from other economic forces.

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 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.[1] 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

[1] 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, p.vi,7). Subsequent reports also included chemicals recently identified as carcinogens, usually through animal studies.

Regulation 29 CFR, parts 1910.1200(b)(1) and (d)(4)]. For this reason, it is likely that firms, and presumably employees, are aware of agents listed in the report. However, 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, though 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 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.[2] 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. The cutoff of 7.5% captures roughly the top quartile of observed exposures at the industry

[2] 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.

level, corresponding to the discoveries that are most likely to result in an increase in legal liability.[3] 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 industry classification as one of the affected firms.[4] This leaves us with a comparison sample of 9,575 unexposed firms in 333 industries.

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, 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.

[3] 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.

[4] Our results are robust to matching either to all unaffected firms in Compustat or based on 2-digit SIC codes instead of Fama-French (1997) industry classifications.

Specifically, we estimate the following firm-panel regression:

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

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 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.[5] 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

[5] 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 1 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.

growth. Estimates of the shock's effect on log assets, log sales, and log capital expenditures are reported in Table II.[6]

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 average of 10.3 percent following the liability shock, relative to unexposed firms.[7,8] 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. These findings are in contrast to a decline in overall growth and investment, which would be predicted by the perfect capital markets model. 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 to total assets [column (ii)], suggesting that these firms are increasing their overall size and not strictly making capital investments to protect workers.

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.[9] While there is no indication of a

[6] 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.

[7] 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 results from regressions with log dependent variables.

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

[9] 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

difference in overall size prior to the liability shock, firms with an exposure to a newly identified carcinogen tend to exhibit an increase in their assets after the shock 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 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.[10]

The adverse shock also affects payout policy. To the extent that money inside the firm is tax-disadvantaged, we might expect firms to increase their overall payouts to shareholder if the shock decreases the expected returns from future investments. 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 that are potentially more exposed to an adverse shock, as

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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.

[10] 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.

measured by a greater bankruptcy risk, respond differently to the shock relative to firms with less bankruptcy risk. We test this by calculating each firm's modified-Altman z-score in the year prior to each new listing in the RoC and then matching firms within cohorts based on this measure.[11] 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 at the greatest risk of bankruptcy tend to respond to the adverse shock by increasing growth sharply, whereas firms with relatively little bankruptcy risk do not. As reported in 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

[11] 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.

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. While there is no pre-existing trend, total assets for affected high-risk firms grow relative to total assets for unaffected firms in the first 3 to 4 years after the liability shock. 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.

We further test whether a firm's financial vulnerability affects its response by dividing the sample based on 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 tend to respond to the shock by growing, whereas less vulnerable firms do not. As reported in columns (i)-(iv) of 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 columns (vi)-(ix) of Panel B, the average payouts to shareholders increase for both financially constrained and unconstrained firms after the liability shock.

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:

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

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 one or more of five groups: (1) "primary to

primary" if the primary SIC industries for the acquiring firm and the target firm coincide; (2) "primary to other" if the acquirer's primary SIC code matches an SIC code listed as one of the target's side lines of business; (3) "other to primary" if the target's primary SIC code matches an SIC code listed as one of the acquirer's side lines of business; (4) "other to other" if one of target's secondary lines of businesses matches one of the acquirer's secondary business; and (5) "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 that are unaffected by the liability shock and expanding into completely new lines of business. As reported in columns (vi) and (vii), there is a statistically significant increase in both the 'other to primary' and 'other to other' 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 (v)]. This suggests that firms may also be expanding into businesses where they lack previous experience.

The ability to expand operations away from the primary line of business with exposures may also be easier for firms which already operate in multiple industries. Returning to our analysis of Compustat data using equation (1), we further divide the sample into single- and multiple-segment firms and estimate the liability shock's effect on growth for each subsample. These results are reported in column (v) of Table V. We find that the average increase in growth is larger among firms with multiple segments than among firms with only a single segment. Multiple-segment firms grow by about 18 percent on average after the adverse shock, and this increase is statistically significant at the one

percent level. Single-segment firms, on the other hand, grow by 6 percent on average, and the increase not statistically significant. This is consistent with exposed single-segment firms having more difficulty growing their operations away from the line of business experiencing the liability shock. In contrast to the results for growth, the relative increase in the ratio of total payout to assets is similar for single- and multiple-segment firms [Table V, column (x)].

How does the adverse shock 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.[12] 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:

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

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.[13] 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

[12] We match the firms in SDC Platinum to Compstat 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.

[13] 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.

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 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, which has been associated with lower takeover gains for the acquirer [column (iii)].[14]

Exposed firms also tend to acquire targets that generate and payout 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. 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

[14] Theoretical work on bargaining between targets and acquirers suggests that acquirers' share of the total equity gain from a synergistic acquisition increases with target firm leverage (Israel 1991).

acquisitions by unexposed firms. In sum, the liability exposure seems to lead firms to pay relatively high prices to undertake diversifying 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 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.[15] 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. On average, the market evidently perceived the announcements of these mergers as bad news for the firms' shareholders.

4.4 Corporate governance and shareholder ownership

One interpretation of the negative announcement returns for these acquisitions is that shareholders may not benefit from an exposed firm's expansion after the liability shock. To explore the plausibility of this interpretation, we examine the relation between the aggressive growth of liability-exposed firms, their corporate governance, and their ownership structures. For this analysis, we return to our original Compustat sample and estimate equation (1) separately for firms with different degrees of corporate governance and different ownership structures before the shock.

[15] 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.

To measure external corporate 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.[16] The GIM-index is available only for large firms beginning in 1990. To increase the number of carcinogenic discoveries that contribute to identification, we use firms' corporate governance in 1990 as a proxy for their governance in 1988, the year prior to the 1989 RoC report.[17] 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 much smaller sample of firms for which we observe the GIM-index.[18] Furthermore, we observe only weak evidence of growth among such large firms in our earlier specifications [Table V, column (iv)]. All of these limitations are likely to work against us finding any evidence of growth. 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

[16] Our results are robust to using alternative cutoffs, including limiting the sample of weak governance firms to those with a GIM index greater than or equal to 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).

[17] 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.

[18] We observe the GIM-index for 18 percent of firms in our full sample. While these firms are small in number, they are relatively large, accounting for 43 percent of total assets.

after the liability shock and may even shrink.

The increased growth among weak governance firms does not appear to be driven by differences in bankruptcy risk or financial vulnerability. There is no indication that weak governance firms exhibit a higher average bankruptcy risk than strong 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 increased growth among weak governance firms also appears unlikely to be driven by access to better investment opportunities. It is well known that Tobin's *Q*, a standard proxy for investment opportunities, is positively correlated with external governance (Gompers, Ishii and Metrick 2003). In our sample, strong governance firms have an average *Q* of 2.1 in the year before the shock, compared to 1.5 for weak governance firms. Whether this difference in *Q* is caused by the differences in external governance or by some other factor, the growth of weak governance firms does not appear to be explained by better investment opportunities. In fact, if the growth has negative NPV, then one interpretation is that the growth presents a concrete example for how shareholder rights can affect corporate performance and firm value.

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 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. One possibility is that the diversifying growth may reflect an attempt by managers to diversify away the increased idiosyncratic risk to their human capital and stock-based compensation resulting from the increase in legal liability. In this scenario, this incentive would be particularly strong for firms with high degrees of managerial ownership. To examine this possibility, we analyze the relation between the aggressive growth of liability-exposed firms and inside ownership.

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.[19] 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 a subsample of firms.[20] This approach may be further limited if managers have substantial human capital invested in their firms, in which case moderate variation in financial capital may not be economically meaningful. The estimates from these regressions are reported in Table IX.

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

[19] 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).

[20] We observe ownership for 23 percent of firms in our full sample, corresponding to 39 percent of total assets.

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 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 may provide another test of whether the diversifying growth is in shareholders' interest. If the increase in growth is driven by managerial incentives that conflict with shareholder interests, then we might expect to find less growth among firms with large institutional shareholders, which may more closely monitor the manager. A larger increase in payouts to shareholders following the liability shock among these firms would also suggest that shareholders prefer the manager pay out capital instead of growing the firm. We thus examine the relation between the growth and payout policies of liability-exposed firms and institutional ownership.

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. The difference is large and statistically significant. 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. Possible explanations of our results

Our empirical results establish a broad set of facts describing firm responses to the liability shock. On average, firms respond to the shock by increasing both overall growth and total payouts to shareholders. The increase in growth is concentrated among firms that are more financially vulnerable to an adverse shock, as captured by either being at greater risk for bankruptcy or more financially constrained. The growth is also associated with greater average increases in equity rather than debt, leaving a typical firm less leveraged after the liability shock. Part of the growth is driven by acquisitions, which tend to diversify the firms' operations away from the industry associated with the adverse shock. The firms acquired are also larger, less leveraged, and have greater cash flows, and the acquisitions are associated with greater takeover premiums and lower announcement returns for the acquirer. Finally, firms with weak external governance, high inside ownership, and low institutional ownership tend to grow but not increase overall payouts to shareholders, whereas firms with strong external governance, low inside ownership, and high institutional ownership do not grow but do increase payouts.

Why do firms respond in this way? In section 2, we argued that the liability shock decreases

asset values and the expected returns from investment. In this light, a perfect capital markets model where money inside the firm is tax-disadvantaged is consistent with the increase in shareholder payouts, but it is not consistent with the sizeable average increase in growth. Other findings, such as those pertaining to acquisitions and the heterogeneous responses of firms based on their corporate governance and ownership, are also difficult to reconcile with the perfect capital markets model. We thus turn to other possible explanations.

First, some of the responses to the shock can be explained by an asymmetric information model. 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). At the same time, these firms grow by almost 38 percent (see Table IV). 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), and these firms hardly grow but pay out capital aggressively. 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.

Models with costly financial distress provide a second possible explanation for some of our results. If financial distress is costly and correlated with the market return, then mitigating the likelihood that an adverse shock will cause financial distress may create value for diversified shareholders. In this scenario, increasing growth through diversifying acquisitions could be an optimal

response to avoid incurring costs of financial distress should a lawsuit eventually materialize.[21] This would be particularly true among firms that are more financially vulnerable to the liability shock and would be consistent with firms financing the growth 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, because the acquisition of these "cash cows" may help the firm avoid future financial distress.

The risk of financial distress in this context, however, is likely to be idiosyncratic with respect to a diversified investor's portfolio, suggesting that diversified investors will not price this risk or benefit from further diversification. Chemicals are added to the *Report on Carcinogens* when they may be "reasonably anticipated" to be a human carcinogen. This classification is typically based on results from animal studies, but it does not mean that the chemical causes cancer in human with certainty or that any exposed employees will necessarily fall ill. The actual severity of workers' injuries – the most significant component of the firm's risk – will be realized only over time and is unlikely to be correlated with the macroeconomy. While it is possible that some injured workers may be more likely to file a claim in an economic downturn, lost wages and thus the nominal value of damages may also be lower.

Even if a component of the risks were systematic, costs of financial distress cannot explain a number of our 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

[21] 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). This type of risk-shifting, however, does not match well with the diversifying nature of the growth (which would tend to reduce risk rather than increase it) or the negative average abnormal returns associated with the acquisitions.

likelihood of financial distress. The combination of asymmetric information and costly financial distress, 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.

A third possibility is that managers have objectives that do not coincide with those of shareholders and that the increased growth actually has negative NPV. If managers prioritize the firms' long-run survival above shareholder value, then they may sometimes take negative NPV investments.[22] 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. First, reduced investment opportunities will increase free cash flow that may be misallocated by a manager acting in private interest (Jensen 1986). Second, managerial career and wealth concerns may lead managers to take actions that will reduce the impact of the possible future shocks to cash flows – even if these risks are idiosyncratic and not priced by a diversified shareholder. For example, managers may increase corporate investment (Holmström 1999) or diversify into new lines of business (Amihud and Lev 1981).

The extension of legal liability to the assets of targets acquired by exposed firms also works against such growth being likely to create value for shareholders. Because acquired firms are considered assets of the parent company after a takeover, legal liability would extend to the target

[22] Corporate outcomes are likely to 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 financial distress has an externality on the manager that he is likely to internalize, contrary to shareholder interests.

firm.[23] If the potential damage payments are high enough, then extending the legal liability reduces the value of the target's assets.

An agency model of managerial behavior is consistent with *all* of the corporate responses to the liability shock documented in this paper. The model explains why the effects are concentrated among firms that are the most vulnerable to financial distress: if agency conflicts exist, managerial exposure to idiosyncratic risk is likely to exacerbate them when firms are closer to financial distress. Managerial concerns for his or her career and personal wealth can also explain why firms grow through diversifying acquisitions after the adverse shock, why the growth is funded using equity, and why the growth would be targeted at "cash cows" holding less leverage and be purchased at a premium. Similar to the costly financial distress model, diversification, lower leverage, and the acquisition of "cash cows" help to reduce the likelihood of financial distress and to increase the likelihood the firm survives a potential future barrage of worker lawsuits. But unlike the costly financial distress model, the agency model accurately predicts that these acquisitions will be associated with negative abnormal returns.

Unlike either of the other models discussed above, the agency model also fits well with our findings on the relation between the firms' responses and their external governance and ownership structures. Agency problems are likely to be particularly severe in each of the following scenarios: (1) when managers are entrenched and can resist hostile takeovers (Jensen and Ruback 1983; Shleifer and Vishny 1989); (2) when risk-averse managers hold high levels of undiversified human capital and financial wealth that are tied to the value of the firm's assets (Holmström 1999; Hugonnier and Morellec 2007); and (3) when relatively few of the firm's investors are institutions, who are more likely to hold

[23] 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.

substantial blocks of shares and have a financial incentive to monitor management (Shleifer and Vishny 1986). In each of these cases, we find that the liability-induced growth is concentrated among firms that are more prone to these agency problems, and that these firms do not provide significantly greater payouts to shareholders after the adverse shock. In contrast, we find that firms with strong external governance, low inside ownership, and high institutional ownership do not grow significantly and instead increase their payouts to shareholders.

While the agency model is the only model that is consistent with *all* of our empirical findings, information asymmetry, financial distress costs, 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 payout the excess cash rather than grow the firm.[24] These results suggest that managerial incentives related to career and personal wealth considerations 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' responses are broadly inconsistent with the perfect capital markets model, which predicts that investments should decrease following the liability shock. Instead, 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

[24] While the particular growth or contraction of specific firms may be optimal due to combinations of the various frictions, the estimates indicate that this is not the case on average in our sample.

operating cash flows, recent growth, and total payouts. These acquisitions are associated with negative abnormal returns. 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 (bringing greater exposure to the firm's idiosyncratic risk) and when relatively few equity shares are held by institutional investors (thereby providing less intensive shareholder monitoring). 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. Our analysis focuses explicitly on the liability setting, because we can cleanly identify this shock in a large sample of firms and industries over time. Thousands of firms in more than a hundred industries were affected by such occupational exposures over our twenty-seven year sample period.

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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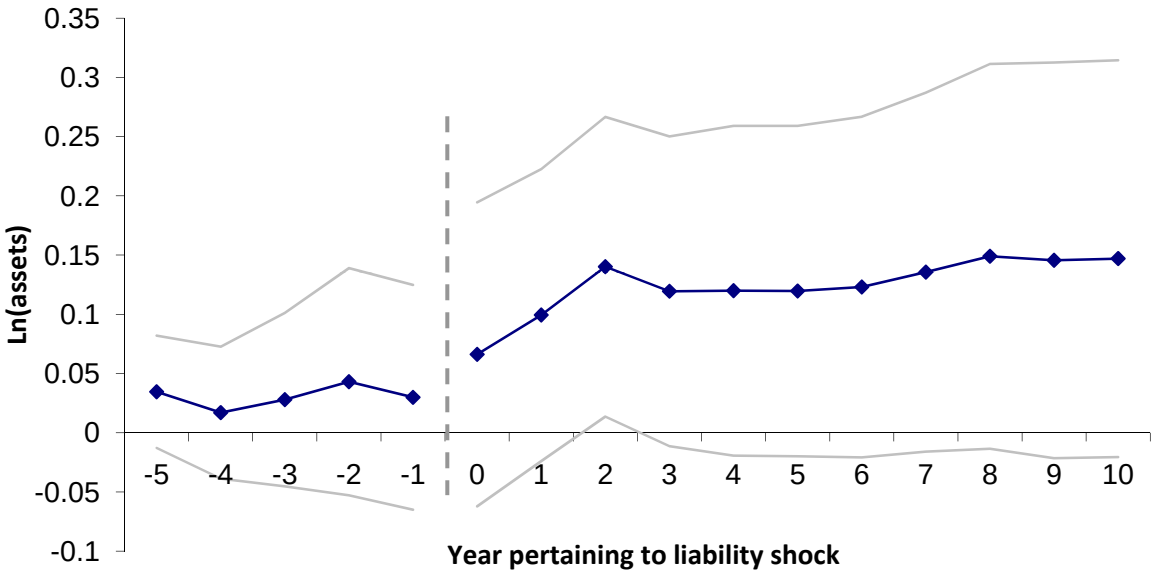

Figure 1 -- Effect of liability shock on growth by year

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.

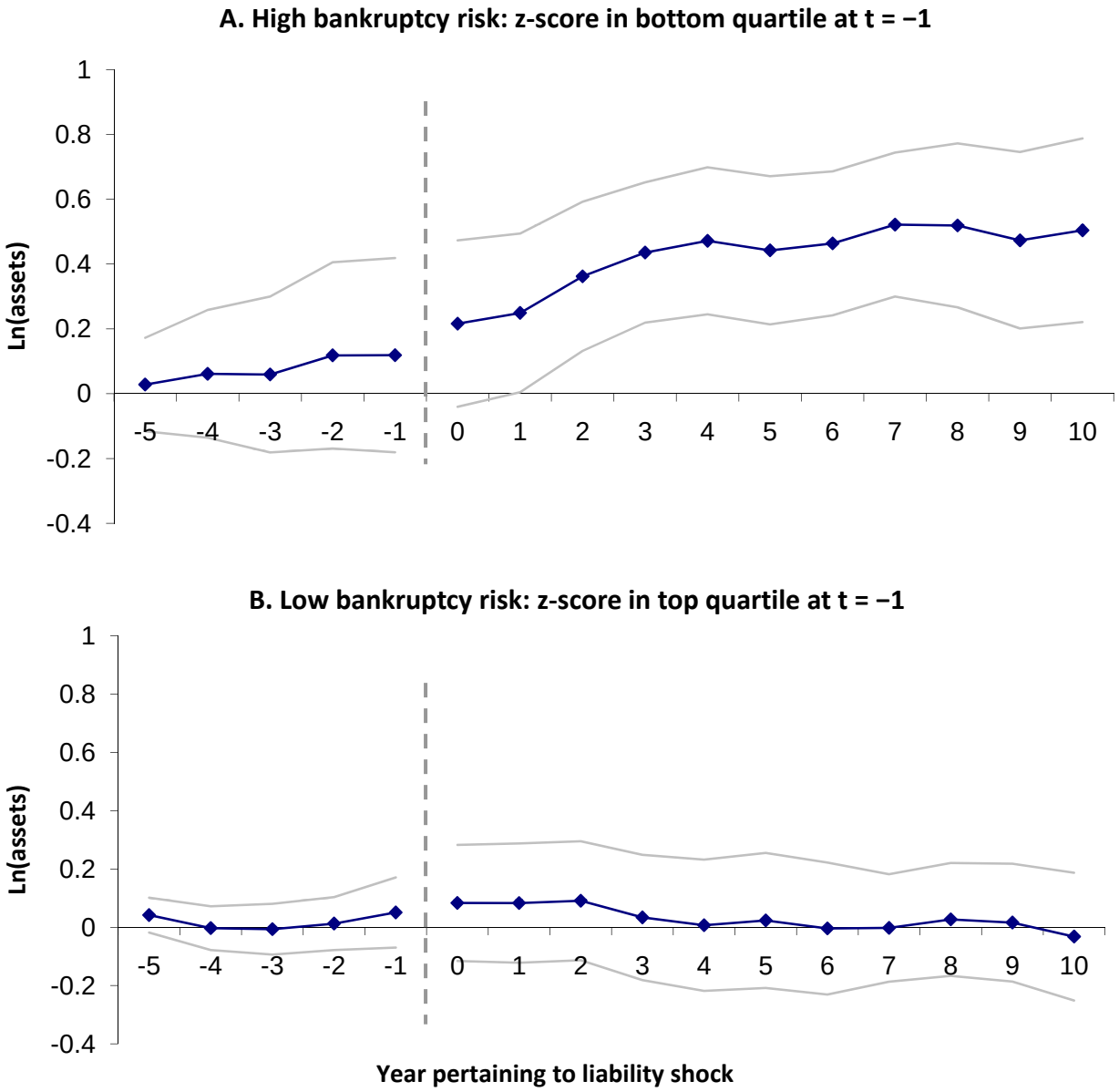

Figure 2 -- Effect of liability shock on growth by year and bankruptcy risk
This figure reports the point estimates from a firm-panel regression of ln(assets) onto on an indicator for liability exposure, firm-by-cohort fixed effects, and year-by-cohort fixed effects. The specification is the same as 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)	
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%

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 (vi)], firms with operating cash flows / assets in the top and bottom quartiles [columns (ii) and (vii)], firms with zero or positive dividends [columns (iii) and (viii)], firms with assets in the bottom and top quartiles [columns (iv) and (ix)], and multi- and single-segment firms [columns (v) and (x)]. 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)	(v)
	High leverage	**Low cash flow**	**Zero dividends**	**Small firms**	**Multiple segment**
Exposure	0.198***	0.173**	0.184**	0.211***	0.167***
	(0.075)	(0.073)	(0.072)	(0.076)	(0.057)
Observations	34,431	27,193	78,840	29,489	35,911
# of Firms	2,648	2,303	6,636	2,648	2,301
R-Squared	0.23	0.17	0.23	0.14	0.33
	Low leverage	**High cash flow**	**Positive dividends**	**Large firms**	**Single segment**
Exposure	0.068	0.043	0.010	0.089	0.063
	(0.085)	(0.102)	(0.053)	(0.069)	(0.062)
Observations	34,074	35,285	65811	43,863	108,740
# of Firms	2,648	2,303	3946	2,648	8,281
R-Squared	0.36	0.44	0.55	0.49	0.32
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	X	X	X	X

Table V (cont.)

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

	(vi)	(vii)	(viii)	(ix)	(x)
	High leverage	**Low cash flow**	**Zero dividends**	**Small firms**	**Multiple segment**
Exposure	0.401***	0.197	0.232**	0.283**	0.301*
	(0.103)	(0.132)	(0.102)	(0.121)	(0.163)
Observations	34,431	27,193	78,840	29,489	35,911
# of Firms	2,648	2,303	6,636	2,648	2,301
R-Squared	0.02	0.01	0.01	0.01	0.02
	Low leverage	**High cash flow**	**Positive dividends**	**Large firms**	**Single segment**
Exposure	0.228	0.719***	0.366***	0.460**	0.296***
	(0.198)	(0.273)	(0.140)	(0.191)	(0.112)
Observations	34,074	35,285	65,811	43,863	108,740
# of Firms	2,648	2,303	3,946	2,648	8,281
R-Squared	0.02	0.03	0.03	0.04	0.01
Fixed effects:					
Firm-cohort	X	X	X	X	X
Year-cohort	X	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 five groups: 'primary to primary' if the primary SIC industries for the acquiring firm and the target firm coincide; 'primary to other' if the acquirer's primary SIC code matches an SIC code listed as one of the target's side lines of business; 'other to primary' if the target's primary SIC code matches an SIC code listed as one of the acquirer's side lines of business; 'other to other' if one of target's secondary lines of businesses matches one of the acquirer's secondary business; 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**	**Primary to Primary**	**Primary to Other**	**Other to Primary**	**Other to Other**	**No Match**
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Exposure	0.064*	0.031	0.066**	0.031	0.023	0.034*	0.044*	0.054**
	(0.034)	(0.030)	(0.029)	(0.030)	(0.016)	(0.020)	(0.023)	(0.025)
R-Squared	0.22	0.13	0.18	0.13	0.06	0.07	0.11	0.14
Industry FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X

Table VII
Effect of liability exposure on the characteristics of target firms

This table reports coefficients from firm-panel regressions of ex-ante characteristics of target firms 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). The dependent variables are log total assets, 5-year sales compounded annual growth rate, the ratio of debt to assets, the ratio of cash flow to asset, the ratio of the total payout to assets, 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) and cash flow (2,164). 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.

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