

The Market Response to Product Safety Litigation

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Abstract

This paper examines the stock market impact of 29 product liability lawsuits reported in the *Wall Street Journal* from 1970-1985, an additional series of Agent Orange events, and a set of regulatory events involving product risks. If these events and the costs associated with them were fully anticipated, then there would be no effect on the stock market price. Adverse stock market effects increase if the event involves a product liability action, bodily injury, or a court decision. Lengthy newspaper coverage and initial reports also have a strong effect. If there are multiple defendants, the market cost per firm is reduced. One widely publicized "good news" event—the final Agent Orange decision—led to a dramatic increase in stock prices.

1. Introduction

The major development of the past decade in society's efforts to control product risks has been the increased role of tort liability. Whereas direct ex ante government regulation formerly was the dominant influence, the rising stakes associated with product liability have created a supplementary form of ex post regulation through judicial sanctions. Indeed, in many instances firms have become more concerned with the ramifications of product regulations for their liability burden than they have been with the direct regulatory costs.

The product liability crisis of the mid-1980's has been manifested in several dimensions. Insurance rates have risen, and in some cases coverage has been denied altogether.¹ The number of court cases has also escalated, as have total court awards.² If the economic costs associated with these claims are in fact consequential and alter the investor's expectations of the firm's profitability, they should be reflected in the firm's stock market prices.³ The main economic ingredient required to observe such effects is that there be an economic event that conveys new information to the stockholders that changes their assessed value of the firm.

The focus of this paper will be on product safety lawsuits arising from both tort liability and regulatory violations and primarily on those events covered in the *Wall Street Journal*. This sample of events is not a random sample of lawsuits, as it is likely to consist of the more

important product liability events. Less consequential events are less newsworthy and will merit less coverage. The empirical analysis will analyze a total of 33 news stories appearing from 1970-85 as well as a series of Agent Orange events.⁴ This coverage captures a small fraction of the product risk lawsuits over that period.

If one were interested in obtaining an estimate of the total economic cost of these lawsuits, analysis of such events would provide only a lower bound since not all suits are included. Moreover, many stages of litigation are not reported in the *Wall Street Journal* so that knowledge of this other information may have already been reflected in the stock market price.

Our focus is narrower than this, however. In particular, our main interest is whether there are in fact stock market repercussions of lawsuits arising from product risks, and if so, what factors determine the size of these effects. How do aspects of the case affect the market impact? A matter of particular interest will be the relative impact of lawsuits involving regulatory violations and suits arising out of tort liability.

After introducing the event study methodology in Section 2, we analyze the variation of the abnormal stock market returns with respect to various economic factors in Section 3. Chief among the variables considered are measures of the informational content of the event (e.g., new coverage as opposed to a news update) and the nature of the product risk information (e.g., product liability action or regulatory sanctions).

The individual stock market effects used in this analysis are of interest in their own right, since they provide a detailed perspective on how the stock market responds to new information about product risks. Section 4 explores the effect of mass toxic torts rather than individual suits. Two particularly protracted events were the Agent Orange and DES litigation efforts, which we explore in detail. A particularly striking result is that for Agent Orange the stock market effects were in both directions. Early "bad news" reports lowered stock prices, whereas later "good news" reports boosted stock prices. In Section 5, we review the stock market effects of other events in the sample.

As the concluding Section 6 indicates, adverse product liability coverage has led to significant negative effects on stock prices that vary systematically with evidence that is being transmitted to investors. In particular, product liability events have a greater impact than do regulatory events pertaining to product safety. In addition, the adverse effects on firm profitability are greater when bodily injury is involved, a lawsuit has been filed, and the news regarding the event is either new or important.

2. The Event Study Methodology

Although the specific aspects of stock market event studies differ depending on the structure of the stock market event data that are used (e.g., daily stock price data versus abnormal returns data), the essential components of such analyses are similar. The underlying assumption is that stock markets operate in an efficient manner.⁵ An unanticipated event that affects investors' expectations regarding the future profitability of the firm will be captured in stock market prices. The empirical procedure that we will adopt consists of two stages. In the first stage, one forms an estimate of what the predicted stock price would have been in the absence of the event. In particular, let

R_{jt} = the continuously compounded daily rate of return for firm j over period t ,
 M_t = the continuously compounded daily equal-weighted market return over period t ,
 e_{jt} = the disturbance term for security j over period t , assumed to be $N(0, \sigma^2)$,
 and a_j and b_j are regression coefficients for firm j . The market model of stock returns relates the firm's daily rate of return to the market rate of return, or

$$R_{jt} = a_j + b_j M_t + e_{jt} \quad (1)$$

Estimates of (1) are then used to obtain the predicted stock market return for the firm, R_{jt} , in the usual fashion.

The second stage of the analysis is to ascertain whether there is a discrepancy between the actual and predicted value of the stock price on the day of the product liability events. This prediction error PE_{jt} for firm j on date t is given by

$$PE_{jt} = R_{jt} - (a_j + b_j M_t) \quad (2)$$

In the case of events in which there are effects on several firms, one can calculate the average prediction error for each day of the event, APE_t , which is given by

$$APE_t = \frac{1}{N} \sum_{j=1}^N (PE_{jt}), \quad (3)$$

where N is the number of firms.

An important issue in the literature has been the definition of the event period. We will focus primarily on the day of the newspaper coverage as the event date $t(AD)$, where t denotes the time period and AD is the announcement date. Results for a variety of alternative event windows yield similar results.

The focus of the analysis will be on product liability events that appeared in the *Wall Street Journal* from 1970-1985. This event set is intended to be comprehensive, in that it includes all product risk events appearing in the annual index under the heading "product safety."⁶ The particular types of events considered were product liability lawsuits and legal actions related to regulatory enforcement.

The event set considered was limited by the availability of stock price information. Since the data set used for the analysis was the University of Chicago Center for Research in Security Prices (CRSP) Daily Stock Returns File, only firms whose stock prices were listed on either the American Stock Exchange or the New York Stock Exchange could be considered. Only a few events were excluded because stock price information was not available. Typically, these involved events affecting a large group of firms, some of which were not listed on the major stock exchanges.

Equation (1) was estimated using 70 days of data beginning 100 days before AD , the announcement day of the event. We calculated the standard error used to make significance tests using returns from this period. Prediction errors (Equation 2) are for a 61-day span around AD (that is, $AD \pm 30$). In testing for the statistical significance of the average abnormal returns for several firms, we correct the individual firms' standard errors for heteroskedasticity, so that less weight is given to the standard errors of more volatile firms.⁷

In order to estimate the change in the dollar value of the firm as a consequence of the event, we calculate the value of the firm using data from the Standard and Poor's Compustat files on the number of shares of common stock outstanding and the closing price per share for the year of the event.

3. Determinants of Stock Market Effects

To provide an overview of the results and to formally test the determinants of the stock market effects in different instances, table 1 reports regression results for the determinants of the percent abnormal return on the event date. This analysis consequently considers the abnormal returns associated with 77 events analyzed in Sections 4 and 5 and assesses how these returns vary with key variables of interest. These findings explore the systematic variations in the differences in the abnormal return that can be explicitly linked to economic variables. The explanatory variables included pertain to the nature of the article and the character of the liability action.

Independent Variables	Coefficient	(t-statistic)
Intercept	14.347	(3.73)
Product Liability (d.v.)	-4.749	(-3.45)
Bodily Injury (d.v.)	-3.598	(-2.84)
Injunction (d.v.)	-0.933	(0.62)
Toxic Tort (d.v.)	-0.073	(-0.08)
Number of Defendants	0.219	(4.15)
Suit Against Company (d.v.)	-5.019	(-1.84)
Decision Announced (d.v.)	-7.911	(-2.57)
Length of WSJ Article	-0.259	(-9.35)
Initial Report (d.v.)	-2.116	(-11.89)
Amount Named	0.001	(1.25)
Amount Not Named (d.v.)	-0.366	(-0.41)
R^2	0.68	

In particular, we estimate a linear model of the form

$$\text{Abnormal Return } i = \alpha + \sum_{j=1}^m \beta_j \text{ Case Characteristics}_{ij} + \sum_{k=1}^n \delta_k \text{ Article Characteristics}_{ik} + \epsilon_i, \quad (4)$$

where each article i is an observation in the analysis and ϵ is a random error term. This error would include, for example, error in measurement of the abnormal return, which is based on the first stage of analysis reported in the earlier sections. Most of the explanatory variables included pertain to case characteristics (e.g., bodily injury), but some pertain more

narrowly to the character of the news event (e.g., article length). The article characteristic variables may serve in part as a proxy for omitted variables pertaining to the importance of the liability event. Variables that lead to greater adverse effects on a stock price will have a negative sign, and those that increase the stock's attractiveness will have a positive sign.

The first explanatory variable in table 1 is a 0-1 dummy variable (d.v.) for whether the news event pertained to a product liability action as opposed to a regulatory violation. Controlling for the different aspects of the information, such as the amount of the damages named, there is more of a reduction in the stock market return in the case of product liability actions. The second attribute of the information is whether it pertained to a bodily injury case as opposed to property damage alone. Bodily injury cases are associated with a greater expected effect on stock market returns, which is consistent with the pattern of product liability more generally. In particular, cases involving bodily injury impose higher expected losses and have higher associated premiums than the property damage line.

The injunction variable does not have a statistically significant influence. The use of injunctions is one dimension of regulatory actions that arose in the sample, and this form of intervention has no effect above what regulatory actions would have otherwise had.

Two variables that are occasionally related are those for toxic torts and for the number of defendants, since mass toxic torts usually involve more than one defendant. The number of defendants used is the number of firms listed as defendants in the *Wall Street Journal* article. Whereas the character of the case in terms of the toxic aspect of the injury is not influential, the number of defendants is of consequence. The positive influence of the defendants variable reflects that when many firms are involved the loss per firm will be less. The lower loss per firm may reflect the fact that liability for a given outcome may be shared, leading to a lower potential loss to a firm than when the firm is the sole defendant. In addition, it may also reflect an absence of an intra-industry competitive effect if there is a broadly based lawsuit rather than an action against only one firm's products.

Both variables pertaining to information given with respect to the status of the case have a significant negative effect, implying that the stock market losses are greater if a lawsuit has been filed against the company or if a decision has been announced. Articles that are more speculative in nature and do not pertain to ongoing or completed litigation are of less consequence.

The effect of the news event on investors will be greater to the extent that it provides new information and it indicates that the company's losses will be substantial. One measure of the novelty and importance of the information is the length of the article (in column inches). This variable has a negative effect that is strongly significant.

Similarly, the variable pertaining to whether the article was an initial report also has a strong effect. New information is expected to be of greater consequence. Stories that provide updates of existing litigation will tend to have less of an impact as they alter investors' expectations less. Although these updates may be useful in reporting on changes in the firm's liability, this aspect of the information is captured separately in the regression through the variable pertaining to the amount named.

The dollar amount estimate in the article did not, however, have a significant effect. The ultimate losses to the firm will depend on the actual loss across a product line rather than the amount claimed in a particular lawsuit. Moreover, the losses of consequence are net of any insurance coverage the firm may have. A better predictor of the firm's losses may not

be the dollar estimate of the loss but the cluster of variables pertaining to the character of the litigation. It is, however, possible that the weakness of the effect is due in part to the lack of a direct correspondence between the dependent variable (abnormal return) and the loss variable (size of the loss).

All of the six statistically significant (5 percent level) coefficients had the expected sign, which is consistent with a rational response of investors to the information. The variables of greatest consequence were those that pertained to the most fundamental legal aspects of the event (product liability, bodily injury, number of defendants, and decision announced), and the novelty of the information provided (length of article and initial report).

4. Mass Toxic Tort Actions with Multiple Defendants

One of the distinctive developments in product liability law in the past two decades has been the rapid emergence of mass toxic tort actions. These suits represent a much larger scale of legal action than the typical tort claim, often imposing billions of dollars in potential costs that threaten the viability of the defending firm and their insurers. The subsequent unpredictability that arises from the change in the character of litigation increases the variance in the firm's likely loss. This variance is coupled with the potential for reorganization of the firm under Federal bankruptcy laws, which effectively caps potential liability. There is also the possibility that multiple firms may be involved because of the difficulty in establishing responsibility for deferred product risks from a product that is marketed by multiple firms. The multiple and protracted events also suggest that the stock market event studies will greatly underestimate the cost effects, and that the impact of any given event may take a longer time to be generated than when information can be processed immediately.

The A. H. Robins' suits involving the Dalkon Shield, to be considered in Section 5, is quite extensive, but since multiple defendants were not involved in that mass tort action, these news events were more targeted than those considered in this section. For each event, we first report the average effect for the pooled sample of firms. We then report the estimated impact on each particular firm named in the suit. Perhaps the most intriguing aspect of the Agent Orange litigation is the presence of both "good news" and "bad news" events—a distinction that will be important in assessing the differing effects.

Agent Orange

Table 2 reports estimates of the stock price effects of the Agent Orange litigation. This mass tort action by thousands of Vietnam veterans who possibly experienced ill effects from Agent Orange exposure was an extremely complex lawsuit involving a long sequence of important events. In order to obtain a perspective on the effects of the litigation, we selected the two event dates reported in the *Wall Street Journal* as well as the three most prominent litigation events identified in Schuck's (1986) analysis of the case: the initial filing of the Agent Orange suit, Judge Pratt's decision regarding the applicability of Federal common law, and Judge Weinstein's final decision in the case.

The pattern of abnormal returns reported in table 2 directly accords with one's expectations, given the character of the events. One expects the largest impacts to be experienced by the chief producer of Agent Orange—Dow Chemical Company—which is in fact the case.

Table 2. Effect of Agent Orange Suits on Individual Firm Value				
A. Agent Orange Suit Reported in Wall Street Journal				
Firm Value	Estimated % Abnormal Return AD (t-statistic)	Change in Value of Firm (\$millions)	% Abnormal Return (AD-4,AD+5) (t-statistic)	Estimated Change in Value of Firm (\$millions)
Agent Orange suit 5-30-80, for \$310 million (day of suit).				
Pooled Firm Sample	0.408 (1.83)	na	2.872 (3.97)	na
Diamond Shamrock	-1.633 (-6.02)	-32.49	-4.039 (-4.71)	-80.33
Dow Chemical	0.655 (2.17)	38.44	-3.760 (-3.94)	-220.68
Hercules Inc.	-0.116 (-0.51)	-0.94	3.382 (4.71)	27.28
Monsanto Co.	-0.376 (-1.74)	-9.33	7.792 (11.42)	193.41
North American Philips Corp.	-1.021 (-5.06)	-5.12	6.09 (9.55)	30.57
Uniroyal Inc.	0.045 (0.12)	0.07	7.764 (6.79)	12.12
Agent Orange Suits for \$310 million 7-10-80 (day of WSJ article).				
Pooled Firm Sample	-0.562 (2.53)	na	-1.063 (2.97)	na
Diamond Shamrock	-0.912 (-4.03)	-18.11	-6.858 (-9.61)	-136.42
Dow Chemical	-1.380 (-6.34)	-80.98	-1.657 (-2.41)	-97.23
Hercules Inc.	-1.670 (-7.51)	-13.47	-7.996 (-11.38)	-64.49
Monsanto Co.	1.349 (7.53)	33.49	-0.217 (-0.38)	-5.39
North American Philips Corp.	-1.120 (-5.89)	-5.62	-3.150 (-5.23)	-15.81
Uniroyal Inc.	0.360 (0.94)	0.56	13.501 (11.17)	21.07
B. Agent Orange Events from Agent Orange on Trial.				
Agent Orange Suits 1-8-79 (Yannacone files class action suit).				
Pooled Firm Sample	-0.442 (-2.11)	na	-0.339 (0.80)	na
Diamond Shamrock	2.091 (8.77)	35.03	-1.912 (-2.54)	-32.04
Dow Chemical	-1.044 (-4.66)	-60.74	-0.871 (-1.23)	-50.69

Table 2. Continued				
Hercules Inc.	-0.714 (-3.51)	-6.24	-3.526 (-5.48)	-30.82
Monsanto Co.	-0.963 (-7.47)	-20.68	0.455 (1.12)	9.76
North American Philips Corp.	-0.313 (-1.83)	-1.09	0.452 (0.84)	1.57
Uniroyal Inc.	-1.710 (-4.04)	-1.93	3.367 (2.52)	3.80
Agent Orange Suits 11-20-79 (Judge Pratt rules Federal common law applies).				
Pooled Firm Sample	-3.379 (-6.39)	na	-2.890 (-5.77)	na
Diamond Shamrock	0.567 (3.69)	9.51	2.388 (4.92)	40.02
Dow Chemical	0.752 (4.92)	43.78	-3.072 (-6.35)	-178.83
Hercules Inc.	-0.243 (-1.47)	-2.12	1.996 (3.83)	17.45
Monsanto Co.	-0.676 (-5.76)	-14.52	-5.522 (-14.87)	-118.63
North American Philips Corp.	-2.618 (-18.93)	-9.09	-5.391 (-12.33)	-18.71
Uniroyal Inc.	0.766 (3.07)	0.86	-7.742 (-9.82)	-8.74
Agent Orange 5-7-85 (Judge Weinstein announces decision).				
Pooled Firm Sample	0.451 (3.64)	na	3.454 (7.45)	na
Diamond Shamrock	-0.710 (-2.24)	-11.63	1.273 (1.27)	20.86
Dow Chemical	1.069 (8.08)	83.35	3.857 (9.21)	300.69
Hercules Inc.	1.110 (8.40)	23.75	6.018 (14.40)	128.76
Monsanto Co.	1.808 (13.37)	66.27	5.573 (13.04)	204.26
North American Philips Corp.	-1.539 (-9.38)	-16.567	2.658 (5.12)	28.61
Uniroyal Inc.	0.968 (3.77)	na	1.343 (1.66)	na

The initial *Wall Street Journal* article announcing the suits had little apparent immediate effect; but for a 10-day spread (extending 4 days before and 5 days after the announcement date) there was a significant effect of over \$200 million for Dow Chemical Company.

The second *Wall Street Journal* article (7-10-80) reported on another lawsuit, the

coverage led to a substantial negative abnormal return both on the announcement date and over a 10-day period around it.

The next three events analyzed were judicial outcomes not reported in the *Wall Street Journal*. Because of possible lags in information transmission, the longer event window may provide a better estimate of the effect of these events. The first salient event was the initial filing of the suit by Victor Yannacone. This event led to a negative abnormal return in both sets of estimates reported in table 2, where the largest losses were reported for Dow Chemical Company.

A second critical juncture was the ruling by Judge Pratt that Federal law applies. This was a key issue since the companies had sought immunity for the claims related to military service. Because of possible information dissemination lags (i.e., news coverage follows an event), the losses are much greater using a 10-day event window rather than a one-day event window. Once again, the greatest loss was to Dow Chemical Company—\$179 million.

The final event—Judge Weinstein's decision was the event of greatest significance in the Agent Orange litigation. This decision led to payments of damages by the defendants, but because of Judge Weinstein's skepticism regarding the proof of causality, the settlement amount was far less than had been expected. Thus, this adverse judgment against the defendants was generally viewed as constituting favorable news.⁸

This event led to positive excess returns both on the announcement date and even more dramatic increases during the 10-day event window. Indeed, the 10-day event window effects represent what is by far the greatest abnormal return encountered in our study. The total increase in the value of the five affected firms for which such calculations are feasible was \$683 million.

The distribution of the positive excess returns is also quite striking. Whereas the largest negative returns observed in the first four Agent Orange events were always for Dow Chemical Company, following the Weinstein decision Dow exhibited the largest positive returns. Moreover, the magnitude of the estimated increased value of the firm from Judge Weinstein's decision exceeded the estimated negative effect of any of the previous earlier events. On balance, taking all five events into consideration, Dow Chemical Company was a net loser from the litigation. The main effect of the Weinstein decision was to temper these losses to an amount below the expected losses anticipated by investors.

DES

The DES suit was even more diffuse in terms of its implications. The first *Wall Street Journal* report on these cases (9-18-74) had no significant effect on average, with mixed positive and negative excess returns for the firms named in the suit (see table 3). This news article reported a series of suits against 29 drug manufacturers, only 7 of which were listed on major stock exchanges. Since the total claims amount stated in the article for the women alleging birth defects and miscarriages from taking the drug DES during pregnancy was only \$35 million, the cost per firm was only just above \$1 million. This diffusion of the costs may have accounted in part for the small effect, but a more likely explanation is that the implications of the suit were not fully known. The suit had just been filed, and some of the companies named in the suit had not yet even been served copies of the complaint.

If one uses a somewhat longer event period defined as a 10-day spread around the

Table 3. Effect of DES Suits Reported in the Wall Street Journal on Firm Value				
DES Suits 9-18-74, for \$35 million. ^a				
Firm Value	Estimated % Abnormal Return AD (t-statistic)	Change in Value of Firm (\$millions)	% Abnormal Return (AD-4,AD+5) (t-statistic)	Estimated Change in Value of Firm (\$millions)
Pooled Firm Sample	0.001 (0.43)	na	0.114 (0.87)	na
Abbott Labs	-1.433 (-7.83)	-9.91	-7.781 (-13.44)	-53.79
Johnson & Johnson	2.428 (14.59)	113.47	-0.642 (-1.22)	-29.98
Eli Lilly	-1.246 (-5.67)	-58.51	-4.012 (-5.72)	-188.34
Merck & Co.	1.244 (7.11)	61.91	-7.282 (-13.16)	-362.36
Miles Labs Inc.	-1.226 (-3.94)	na	4.631 (4.70)	na
Squibb Corp.	3.905 (16.62)	50.09	8.247 (11.10)	105.79
Upjohn Co.	-3.680 (-17.80)	-55.13	7.638 (11.72)	114.41
DES Suits 3-4-76, for \$2.55 billion ^b				
Pooled Firm Sample	-0.488 (-2.18)	na	1.294 (2.13)	na
Abbott Labs	1.343 (6.56)	19.45	1.887 (2.91)	27.32
Alcon Labs	1.853 (8.23)	2.69	9.607 (13.48)	13.93
Dart Ind. Inc.	-3.392 (-11.92)	-26.26	-4.617 (-5.13)	-35.74
Du Pont	0.374 (2.96)	24.42	-1.914 (-4.78)	-124.90
Eli Lilly	-1.114 (-5.72)	-36.67	1.919 (3.12)	63.17
Merck & Co.	0.090 (0.55)	4.63	4.428 (8.61)	227.82
Rorer Group	-0.249 (-1.16)	-0.72	-8.294 (-12.16)	-23.92
Schering Plough Corp.	0.160 (0.81)	3.86	8.720 (13.93)	211.04
G. D. Searle & Co.	0.787 (3.10)	5.41	1.883 (2.34)	12.94
Squibb Corp	-3.472 (-18.70)	-45.73	2.552 (4.35)	33.61
Upjohn Co.	-1.751 (-9.13)	-19.96	-1.941 (-3.20)	-22.12
^a Data were not available for the following firms also included in 1974 DES suit: Burroughs Wellcome and Warner-Lambert.				
^b Data were not available for the following firms also included in 1976 DES suit: Ormont Drug & Chemical, Boyle & Co., G.W. Carrick, Kremers-Urban, Miller Pharmaceutical, Ulmer Pharmaceutical, Webcon.				

announcement date ($AD-4$, $AD+5$) then the impact is substantial. There is a significant negative abnormal return on average, and some of the companies experienced substantial drops in the value of the firm. Of particular note is that Merck experienced a \$362 million decline in shareholder value, and Eli Lilly experienced a \$188 million drop.

The DES suit reported in the *Wall Street Journal* of 3-4-77 represented primarily a news update on the status of the DES litigation. This litigation update had little effect—a relationship that follows the general pattern found in Section 3's regression results.

5. Results for Individual Firms

The remaining events consist of a series of 29 individual product risk events reported in the *Wall Street Journal*. These events are divided into two groups. The first 21 events, which are listed in table 4, consist of lawsuits directly based on product liability concerns. The final eight events, which are reported in table 5, are all product risk-related, but they focus more on cases based on specific regulatory violations rather than the common law responsibilities of a firm to provide safe products. Tables 4 and 5 summarize the character of each event, the percent abnormal return on the event date and the associated t-statistic, and the estimated change in the dollar value of the firm associated with the event. Since tables 4 and 5 provide a description of the events and their impacts that is quite extensive, the discussion here will focus only on results of greatest interest.

The industrial distribution of the events is particularly noteworthy. Of the 29 events, 8 are for firms in the pharmaceutical industry and 6 are for automobiles and automotive products. Inclusion of the DES cases would enhance the pharmaceutical industry's ranking even further.

Product Liability Lawsuits

A series of five events all pertain to reports of suits involving the Dalkon Shield intrauterine contraceptive device, which was marketed by A. H. Robins. These events do not all represent new information since for the most part they represent status reports on a continuing set of liability disputes. The pattern of losses is particularly intriguing, as it directly corresponds to the character of the information provided. The initial coverage on 3-19-75 indicated there were 186 suits and that A. H. Robins had experienced a \$4 million increase in the deductible on its insurance policy. The \$18 million loss on that date far exceeded the deductible increase, which is rational given the expectation of losses at the earlier deductible level, losses spread over several years, and further insurance-related expenses, such as higher premiums.

The largest estimated effect occurred when the number of reported suits jumped from 186 on 3-19-75 to 547 on 2-19-76. The estimated losses on 2-19-76 of \$49 million were substantial, but this amount was an order of magnitude below the damages claimed for several reasons. Some of the damages had already been accounted for in response to earlier events. In addition, damages claimed in all likelihood will exceed damage amounts paid, and the A. H. Robins portion of the damages, taking into account insurance coverage, will be even less.

The other event with significantly negative abnormal returns was the individual suit on 8-2-76 that led to a stock price loss that was double the value of the suit. Experiencing a

Table 4. Selected Characteristics of Product Liability Lawsuits			
Firm Name Event Date	Description	%Abnormal Return on Event Date (t-statistic)	Estimated Change in Dollar Value of Firm (\$ millions)
Pharmaceutical Companies (except DES)			
Johnson & Johnson 3-2-83	Physicians sue Johnson & Johnson for \$410 million in class action due to alleged unreliability in some CAT scan models in Federal court. Johnson & Johnson subsidiary previously had sued plaintiff.	1.124 (4.59)	87.93
Johnson & Johnson 4-7-83	Individual sues over adverse reaction to Zomax.	-0.560 (-2.80)	-43.75
Eli Lilly 8-3-82	Nader group and others file Federal suit seeking ban of Oralflex as an imminent hazard.	-4.044 (-22.03)	-176.35
A.H. Robins 3-19-75	A.H. Robins discloses that it has been named in 186 product liability suits over Dalkon Shield. Deductible on its insurance is raised to \$4 million.	-6.222 (-15.71)	-18.29
A.H. Robins 2-19-76	Dalkon Shield suits naming A.H. Robins rise to 547 seeking total of \$444 million.	-15.698 (-58.127)	-49.22
A.H. Robins 4-28-76	A.H. Robins report 533 pending Dalkon shield actions seeking \$480 million in damages.	0.541 (1.58)	1.70
A.H. Robins 8-2-76	Dalkon Shield suit filed in W.Va. Federal court claiming \$2.7 million in damages for "loss of right to natural childbirth."	-1.943 (-9.22)	-6.09
A.H. Robins 8-19-76	A.H. Robins files SEC report listing 609 Dalkon Shield suits. Company has paid \$3 million in settlements. Pending cases claim over \$480 million damages.	0.117 (0.62)	0.37
Automobile Companies			
Ford Motor Co. of Canada 4-27-76	Class action over rusted cars claiming \$371 million in damages.	-0.839 (-5.23)	-6.21
General Motors 2-24-72	Class action seeks \$1 billion over recall of Chevrolets produced in 1965-69 to fix engine mounts.	2.783 (24.41)	645.41

Table 4. Continued			
Other Industries			
American Can Co. 7-26-82	Two canneries sue American Can for allegedly faulty machinery leading to botulism, seeking \$95 million in damages.	0.668 (4.11)	3.84
Beech Aircraft 7-30-71	Several suits allege that four Beech models had defective fuel tanks, leading to numerous crash deaths.	-27.401 (-98.47)	-23.04
Eastman Kodak 3-5-73	Two class actions alleging pocket instamatic defect affecting picture quality.	1.410 (10.95)	263.85
Her Majesty Ind. 3-20-75	Annual report lists flammability claims in about 10 cases that should diminish in the future since past two years of production have been flame-retardant.	0.512 (1.56)	0.04
McDonnell Douglas 3-7-77	Shareholder sues company and executives alleging awareness of DC-10 defects leading to crash.	-1.979 (-10.42)	-19.60
Northwest Industries 2-27-78	Michigan seeks \$119.2 million in damages and \$60 million for gross negligence in suit due to feed mixup leading to PBB hazards and destruction of 2 million farm animals.	-1.426 (-11.75)	-11.37
Penn Central Transportation 7-14-71	Ohio Attorney General sues Penn Central for \$14.1 million damages and correction of "unsafe conditions."	0.532 (1.57)	na
Pullman Inc. 6-15-79	New York City seeks \$112.3 million in damages for defects in subway cars. Pullman directors meet to discuss bribery allegations to get NY officials to accept faulty railroad equipment.	-3.904 (-20.98)	-16.42
Rockwell Intl. 6-15-79	Rockwell Intl. involved in Pullman suit since it designed and mounted undercarriage of subway cars.	-0.153 (-1.26)	-2.64
Syntex Corp. 8-15-85	Syntex will contest five dioxin suits in Missouri seeking \$2.4 billion in damages.	-0.903 (-7.14)	-27.18
Westinghouse Electric Corp. 4-27-72	Allegheny Power Systems sues over alleged malfunction of 2 steam generators, seeking \$17 million in damages.	1.243 (8.11)	47.11

loss that is in excess of the suit's value may be due to the suit's introduction of a new slant on these cases, alleging a "loss of right to natural childbirth." The two events that did not significantly lower returns—the stories on 4-28-76 and 8-19-76—represented updates on the progress of the litigation.

The automobile suits appeared to be of less consequence, perhaps in part because they involved only property damage and no catastrophic bodily injury losses. As the results in table 1 indicated, bodily injury loss events have greater effect than property damage events.

Of the eleven lawsuit events reported for other industries, five led to statistically significant negative abnormal returns, and three were associated with significant positive returns on the day of the *Wall Street Journal* coverage.

Regulatory and Other Product Risk Events

One can perform a similar type of analysis for news coverage of regulatory violations involving product risks. The regulatory actions that are included are not too dissimilar from the product liability suits in terms of the accident situations that are being addressed.

The main difference is that for all of the liability suits in table 4 the plaintiff has experienced some damages. Even in the case of the class actions, damages have already occurred. In contrast, the claims amounts sought in the suits listed in table 5 are for regulatory penalties rather than for damages already incurred. These claims amounts may include the prospective costs of replacing or repairing defective products, but this is an entirely different emphasis from table 4. The table 4 liability lawsuits represent ex post compensation for accidents that have already occurred. The table 5 lawsuits are based on regulatory violations, which would imply an expectation of accidents, but the damage amounts are not linked to these accidents, should they occur, but rather to the costs of coming into compliance with the regulatory standard. Regulatory violations may, however, increase future liability costs.⁹ The general pattern reflected in the estimates in table 5 is that the adverse effects of regulatory violations far exceed the dollar value of the regulatory penalties.

It would be an overly simplistic characterization of the different kinds of legal actions to conclude that product liability suits are more costly than other regulatory litigation. Regulatory actions typically involve modest financial penalties, but they lead to far greater economic costs as the firm is forced to recall or modify its products. In contrast, product liability events generate reductions in shareholder wealth which are less than the dollar damage amounts that are claimed.

6. Conclusion

Product liability events are similar to other outcomes that affect the profitability of a firm in that they have important stock market ramifications. The potential importance of liability costs should not be surprising to even casual observers of the tort system, but what is noteworthy is that there are often significant empirical effects associated with particular public announcements regarding the suits. The effects that were observed generally accorded with the character of the event. New information about liability costs depressed stock price returns, news regarding improvements in the firm's liability burden boosted returns, and news stories that updated but did not alter existing information did not affect stock returns.

Firm Name Event Date	Description	% Abnormal Return on Event Date (t-statistic)	Estimated Change in Dollar Value of Firm (\$ millions)
Ford Motor Co. 7-25-77	Federal suit by Ford engineer alleging Pinto and Mercury below safety standards for windshields. Damages sought are \$500,000.	-0.575 (-4.64)	-31.17
General Motors 11-9-70	U.S. files civil suit for \$400,000 against GM because of failure to notify 200,000 truck owners that wheels are unsafe.	-0.593 (-4.21)	-136.65
General Motors 1-21-75	U.S. sues GM to notify owners of safety defects and loss of vehicle control.	0.003 (0.03)	0.53
General Tire and Rubber Co. 6-22-71	U.S. sues General Tire over alleged tire safety violations, seeking \$8000 penalties and injunction against tire sales.	-1.603 (-8.82)	-7.99
Heinz 8-22-74	U.S. Attorney's office sues Star Kist for sending adulterated food across state lines.	-0.324 (-2.03)	-1.87
K-Mart 8-15-85	Justice Department files suit seeking \$800,000 in penalties for selling turn signals and hazard flashers that do not meet Federal safety standards.	0.365 (2.33)	16.25
M. Loewenstein 3-16-72	FTC charges company with selling potentially flammable carpeting.	2.085 (11.08)	1.55
Montgomery Ward 10-17-77	U.S. files Federal suit to stop sales of children's clothing treated with Tris.	0.438 (4.25)	29.52

Perhaps the most dramatic example of the operation of efficient markets is that of the Agent Orange litigation. The early events substantially depressed stock prices, but the final court decision involving an unexpectedly modest award boosted stock prices. In each case, the distribution among firms of the stock price effects accorded with the distribution of the liability burden.

The regression analysis of the systematic factors influencing the estimated abnormal returns indicated that the investor behavior driving the stock market impacts was in line with one's expectations. The influential factors included variables pertaining to the degree to which the news constituted new information or was associated with large expected losses for the firm. Perhaps the most noteworthy individual result is that, controlling for all other factors included in the analysis, product liability events had a greater impact than did regulatory actions.

The rise in product liability costs to firms has been accompanied by increased public attention to these burdens. Rational investors will respond to this knowledge, and the set of results considered here indicates that these impacts are often quite substantial.

Notes

1. Studies of insurance rates and product liability claims include: Insurance Services Office (1977), the U.S. Department of Justice (1986), and Viscusi (1986). See Landes and Posner (1987) and Viscusi (1984) more generally.
2. A number of authors have examined trends in court cases, including: Hensler, et. al. (1987), U. S. Department of Justice (1986), and Viscusi (1986). More generally, see Huber (1988) for a discussion of the change in the product liability environment.
3. The key finance study in this literature is by Fama, et. al. (1969). For an example of such studies, see Hughes, Magat, and Ricks (1986).
4. The Agent Orange events will be based on the chronology provided by Peter Schuck (1986).
5. See Fama, et. al. (1969).
6. Another large category of product liability suits are asbestos suits, which are listed in the *Wall Street Journal* index under a separate heading. These events raise a different set of complicated issues involving efforts of the asbestos producers to shift the liability burden to their insurers.
7. Standard significance tests are not entirely appropriate since stock returns are symmetric but leptokurtic relative to the normal distribution. Other concerns in the literature pertain to "size effects" and the "January effects." Small firms and trades in January receive higher average adjusted returns. The size effect is not pertinent to our results for individual firms. Moreover, only one event in our sample occurred in January.
8. See Schuck (1986) for further characterization of how this was treated.
9. See Viscusi (1988).

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