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The Rationale for Regulation: Shareholder Losses under Various Assumptions about Managerial Cognition

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1. INTRODUCTION

Three types of regulation bolster the incentives for safe design and manufacture provided by the product liability system: (1) direct controls influencing how a product is used, (2) premarket restrictions that affect the characteristics of a product, and (3) recalls made after the product reaches the market.¹ When the costs of an accident or illness are difficult for the courts to measure or entail irreversible and noncompensable losses, and when the dangerous activity can be limited at reasonable expense, direct controls over product use and characteristics are economically justified.² This is the

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1. The common law burdens the firm with a number of costs, including tort actions, if it manufactures unsafe products. The publicity surrounding these actions may result in lost sales, but regulation may be needed as well if tort remedies and market forces fail to provide timely and useful information about product characteristics (Posner). Consumer choice based on feedback from product liability litigation is sometimes hindered by long delays in legal proceedings. In addition, cases settled out of court limit the feedback of relevant information. As a consequence, the government may need to intervene in some areas to provide adequate and independent assessments of product worthiness (Arrow).

2. See Wittman. For example, the courts are not able to measure the costs of an accident accurately, especially when it involves pain, suffering, and potential loss of life, and the relation between speeding or drunken driving and accidents is generally accepted.

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economic rationale for fining speeding drivers, prohibiting drunken driving, or requiring that automobiles have adequate lights and brakes.

The National Highway Traffic Safety Administration (NHTSA), the agency of the Department of Transportation responsible for regulating automobile safety, relies both on premarket regulations and on recalls. To the extent that programs for controlling auto use exist (for example, for road design), they are under the jurisdiction of state and local governments, with the NHTSA providing only general guidance (Crandall, et al.). Weidenbaum is critical of this pattern of regulation, because evidence indicates that more than two-thirds of all accidents are related to driver error and almost one-fifth of all accidents to highway conditions, whereas only a small percentage (about 4 percent) is caused by factors related to the vehicle, with most of these accidents involving defective brakes or bald or underinflated tires. Weidenbaum argues that fatalities would be reduced by better enforcement of such regulations as traffic laws and drunken driving restrictions. Better marking of roads, installation of traffic signs and light poles, and padding of abutments and concrete pillars also may be effective (Miller).

By 1982 the NHTSA had promulgated more than fifty premarket requirements, including regulations for dual braking systems, windshield wipers, seat and shoulder belts, child restraint systems, headrests, and collapsible steering columns.³ These requirements incorporate the costs of safety into the vehicle price.⁴ The number of traffic fatalities stopped rising at a rapid rate after 1965 and leveled off at about 50,000 per year (Meier and Morgan). Fatalities per 100 million vehicle miles also dropped, but with the exception of 1961–65, they had been steadily declining prior to the introduction of the NHTSA's safety requirements (Weidenbaum). The GAO estimates that safety requirements saved 28,000 lives between 1966 and 1970, and another study has attributed a 39 percent decline in fatalities to these regulations (Meier). Fatalities per 100 million vehicle miles were lower in the United States in 1979 than in most industrialized nations. International comparisons of the decrease in the highway death rate per 100 million vehicle miles in the 1968–79 period showed, however, that the United States was not keeping pace with most other industrialized nations (Crandall et al.).

Recalls, in contrast with direct regulation of inputs, but like common law liability, influence the price of the output, thus permitting the market to determine the level of the activity.⁵ Price is affected in two ways. Besides

3. See Greer. Most of these regulations were adopted before 1975.

4. According to engineering estimates, the chance of death or serious injury in the event of a crash is 15 to 30 percent lower because of the mandated safety equipment (Comptroller General). Proponents of premarket restrictions maintain that this increased "survivability" in the event of an accident has resulted in fewer fatalities (NHTSA; Robertson).

5. As Posner (p. 277) states: "To regulate speeding rather than simply impose liability for negligent accidents is to regulate an input (speeding) into an output (accidents), as distinct from simply setting a price for the output (via the imposition of liability) and allowing the level of activity to be determined by demand and supply."

the direct costs associated with a recall, consumers receive information that influences their buying decisions. Thus, by imposing costs on the manufacturer, both directly and through lost sales, recalls should reduce the likelihood that unsafe products will be made, but our findings cast doubt on these conclusions.

Between 1966 and 1982 the NHTSA was involved in the recall of over 82 million American-made vehicles and over 17 million foreign-made vehicles.⁶ Under the National Traffic and Motor Vehicle Act of 1966 (15 USCA Sections 1391-1414), a manufacturer must remedy any known safety-related defect.⁷ Manufacturers may be forced to recall a vehicle if the NHTSA determines that there is a safety-related defect.⁸ Before an NHTSA-ordered recall goes into effect, the agency has to give the manufacturer notice and allow it and other interested parties the opportunity to present their views (Section 1412). A defect must create an "unreasonable" risk of accident or death to be subject to a recall.⁹ As NHTSA determinations are made on a case-by-case basis, there is usually considerable bargaining with the automobile companies about the scope of recalls and the corrective actions required. The NHTSA learns about defects from accident victims and people who suspect that they have bought a defective product. Economic incentives exist for the manufacturers to minimize hazards in order to avoid liability, undue publicity, the costs and embarrassment of a government-ordered recall, and loss of market share.

Peltzman's early (1975) work casts doubt on the efficacy of premarket auto safety restrictions.¹⁰ He points out that premarket regulation focuses on a single input into safety and therefore "may be ineffectual or even harmful" because it reduces the costs of the hazardous activity (for example, fast driving), thereby encouraging people to act more recklessly. He suggests that premarket restrictions increase costs with few compensating benefits. Peltzman's study relies on national annual highway death rates for vehicle occupants and nonoccupants, because more than 20 percent of fatalities from accidents involve such nonoccupants as pedestrians, bicyclists, and motorcyclists, who do not benefit from mandatory safety equipment. He draws on

6. Between 1972 and 1977 more American cars were being recalled than produced (Tobin). Manufacturers initiated over 84 percent of the recalls. The average NHTSA-initiated recall involved about 90,000 vehicles, while the average manufacturer-initiated recall involved about 18,000 vehicles.

7. Before 1974 drivers had to help defray the expenses of a recall. The 1966 act was amended in 1974 to require that all recalled vehicles be repaired free of charge by the manufacturer.

8. Cost-benefit analysis of recalls has not been done on a routine basis. The NHTSA acts as if it must proceed with recalls regardless of the costs. The Reagan administration, on the other hand, holds that recalls have passed beyond "a reasonable cost-effective limit" (Tobin), and it has translated this concern into greater budget cuts for the NHTSA than for similar agencies.

9. The legislative history of the 1966 act is vague in defining what is meant by "unreasonable" risk (Nager), and judicial decisions have given only limited guidance. Generally, "unreasonable risk" is interpreted as cases of repeated failure and major injuries. The NHTSA thus has had considerable discretion in ordering recalls.

10. For critiques of Peltzman's thesis, see Jokschi; Robertson. For his replies see Peltzman (1976; 1977).

a suggestion by Lave and Weber that seat belt regulations are likely to cause drivers to increase their average driving speed. The equipment added to autos by mandated safety requirements reduces the incentive to drive cautiously by lowering the probability of death and serious injury to the driver in the event of a crash. Drivers may be at no greater risk, but nonoccupants who are unprotected by the mandated safety devices are. Premarket requirements, Peltzman argues, result in a substantial increase in the number of deaths to nonoccupants and to an overall rise in the death rate.

Graham and Garber maintain that Peltzman's findings are sensitive to the specifications in his analysis. By changing the specifications in reasonable ways, they reach different conclusions. Their analysis shows that mandated safety regulation averted roughly 10,000 deaths between 1966 and 1972. They conclude that the regulatory experience through 1980 resulted in a 17 to 29 percent reduction in the occupant death rate, that premarket regulation did not induce substantially more dangerous driving habits and pedestrian deaths, but that it may be associated with increased deaths to motorcyclists. In their 1986 analysis, Crandall et al. estimate that the number of lives saved per year is about 30 percent higher than it would have been without premarket requirements. They estimate that, had the safety regulations not been in effect, there would have been an additional 23,400 fatalities annually. Some of this improvement is offset by nonoccupant fatalities, but the effect is not sufficient to offset the large gains in occupant safety. In spite of evidence of gains, the Reagan deregulation effort has involved repeal or modification of rules regarding driver vision, tire rims, brakes, tire pressure, tire safety, and battery safety (Wines).

Whereas Peltzman's early (1975) work questions the efficacy of premarket auto safety restrictions, his recent (1985) work with Jarrel suggests that the recall program constitutes a major deterrent to the production of hazardous vehicles. This is because the capital market "penalizes producers" who make recallable cars, and the penalty it provides is "considerable."¹¹ In major auto recalls the stock market decline in the value of the firm executing the recall is nearly seven times the direct costs of a recall.¹² These losses should seriously deter the production of defective products. Careful reading of Jarrel and Peltzman strongly suggests that their purpose is to argue against the need for premarket regulation. However, the logic of their argument is weak. The major purpose of premarket regulation under the 1966 Motor Vehicle Safety Act is the redesign of the vehicle to reduce deaths and injuries in the

11. Jarrel and Peltzman maintain that "in the simple sense of the market's not internalizing . . . the direct costs, suboptimal deterrence is no problem" (p. 536).

12. Abnormal reductions in stock prices also have been observed following charges of antitrust violations (Ellert); securities and exchange violations (Kellog); Federation Trade Commission enforcement of false and misleading advertising regulations (Peltzman, 1981); complaints of failure to comply with federally imposed price controls (Ruback, 1982); and accusations of bribery, fraud, illegal political contributions, and tax evasion (Strachan, Smith, and Beedles). See Schwert for a summary.

event of an accident. Recalls, by contrast, are almost always concerned with manufacturing defects that might cause accidents. Hence, even if recall activity were perfectly effective to inform managers concerning of the optimal level of care in design and manufacture, the recall program would not address one of the central purposes of the legislation. In this paper, therefore, we focus solely on the recall program rather than comparing the recall program and pre-market regulation.

1.1. ASSUMPTIONS ABOUT MANAGERIAL COGNITION

Many economists accept the classical theory of the firm, which holds that managers are agents for the owners, that they seek to maximize shareholder returns, and that they act with near-perfect knowledge of the stock market effects.¹³ That knowledge would, of course, include knowledge of the effects of recalls on share prices.

Although economists admit that the assumption of near-perfect managerial information may be unrealistic, they maintain that it has predictive power and is true in the aggregate. At a minimum, they use the assumption for lack of a preferable alternative. Behavioralists, on the other hand, question this approach. Many behavioral studies have shown that people fail to act "appropriately," in the rationalist sense, even when faced with simple decisions.¹⁴ Competing assumptions about human behavior will thus affect the plausibility of arguments about the effect of shareholder losses on the production of hazardous vehicles.

We assume that managers are concerned with increasing shareholder wealth and that they therefore will be concerned about the impact of recalls on stock prices. Different managers, however, have different perceptions and estimate stock market responses differently. How market signals are processed is likely to depend on both standard operating procedures and the authority and power of subgroups of managers within the firm (Cyert and March).

There are a number of plausible assumptions about how individual managers or groups of managers would view market impacts. Some managers would be capable of calculating aggregate impacts and would want to use them in their assessment of the market impact. Others would consciously adopt a partially aggregated perspective, because from a rational point of view the magnitude of the stock market response may not be constant over

13. On the issue of managers and investors' wealth see Marris; Cyert and March; Williamson; Friedman; Seitz; Donaldson and Lorsh; and Welch and Pantalone.

14. See Tversky and Kahneman. In particular, the cognitive limitations include the tendency to underestimate errors and unreliability inherent in small samples of data and to judge the probability of events on the basis of the ease of the retrievability of information from memory. Organizational biases, such as standard operating procedures and routines, reinforce these cognitive limitations. (See Cyert and March; Allison; and Nelson and Winter.)

time, across companies, or for a given company over time. Yet others would adopt a partially aggregated perspective because of cognitive limitations.

1.2. THREE PERSPECTIVES

In this paper the stock market deterrent is examined from three perspectives: (1) an aggregate perspective, in which recall responses are combined over time and across companies; (2) a partially aggregated perspective, in which responses are combined by company, time period, or both; and (3) a disaggregated perspective, in which individual recall returns are assessed. The first perspective assumes that the decision maker is rational according to conventional perfect information and economic criteria and that the stock market reaction is constant over time and across companies. The best estimate of the effect of recalls is thus the average effect for recalls for an entire sample.

The second perspective can be based on a perfect information approach with different assumptions about how stationary the process is, or a limited information approach based on assumptions of bounded rationality (Ascher). Assume first that the decision maker is in fact favored with perfect information, wishes to maximize shareholders' wealth, and, of course, has access to the data and methods reported here. Such a decision maker may *not* wish to use the estimates generated in the first prediction for a very simple reason: the magnitude of the stock market response may not be constant over time, across companies, or for a given company over time. Decision makers may decide that only the effects for a particular period or a particular company are relevant and may choose not to pay attention to the larger overall pattern. Their concern, quite appropriately, may be the market response to their company or to their company in a given time period.

The third perspective relies on the limited information or information processing approach. Under bounded rationality assumptions, managers may be aware of, or pay careful attention to, only those instances that are directly relevant to them. Thus, they may perceive the market reaction to only a small set of recalls. Such managers would perceive stock market reactions on a case-by-case basis.¹⁵

Evidence that managers examine stock market data in this manner comes from Fisse and Braithwaite, who found that managers tend to focus on a few isolated incidents. Even financial officers of major firms were limited to isolated analysis of a few events. Ford's financial officer reported that the company's stock price dropped on the day it was acquitted of negligence in the

15. Given the role of corporate organization in focusing clear attention, managers are likely to be concerned with recalls that are closely related to their current role and function. See Simon; Cyert and March.

construction of the Pinto fuel tank, whereas it went up after the announcement of a quarterly loss and a substantial reduction in dividend. Because this manager focused on a few individual cases, he was unable to see the broader picture. The immediate market reaction to announcements about the firm was an unreliable indicator to him of corporate performance that had no bearing on decision making. The evidence gathered by Fisse and Braithwaite supports the most pessimistic assumptions about managerial cognition.

In their analysis of alleged corporate crimes, Strachan, Smith, and Beedles found that over 40 percent of individual abnormal returns were positive. A manager who observed isolated cases without being aware of the aggregate results, therefore, would have a two-in-five chance of coming to the wrong conclusion, that is, that investors actually rewarded questionable practices because of the profit-making potential.

2. ESTIMATING STOCK MARKET REACTIONS

Using a somewhat different methodology and data base, the research reported here replicates the Jarrel and Peltzman analysis. We find similar aggregate results in a two-day period around the recalls, but also that these effects dissipate rapidly. Examining market reactions for ten days following a recall indicates almost no perceivable impact on shareholder wealth. If the effect of recalls on stock prices is as transient as these data suggest, it is doubtful that such effects would deter managers from producing defective vehicles.

Moreover, the stock market reaction varies by time and by company, with most of the effect concentrated in two time periods (1973-74 and 1976-77) and on one company (Chrysler). This suggests, first, that different regulatory regimes have different market effects. When laws are tightened (1973-74) and proconsumer appointments made (1977-78), the market impact is greater. Second, these results suggest that the aggregate results are dominated by the Chrysler experience, but that this experience is unusual because of the heightened risk of bankruptcy that the company faced in the 1970s. Managers, therefore, may conclude that the market impact can be discounted in periods of loose regulatory enforcement or when companies are not in financial difficulty.

The market reaction is even less noticeable if one assumes imperfect information and event-by-event analysis. Managers who pay attention to individual recalls can easily derive misleading impressions of the stock market reactions. By using different assumptions about managerial cognition, we raise doubts in this paper about the ability of shareholder losses to deter the production of defective vehicles adequately.

2.1. METHODS

To estimate the impact of recalls on shareholder wealth, it is necessary to make certain assumptions about the way the market operates. The standard assumption in the finance literature is that the market is fundamentally and informationally efficient, that is, stock prices use all available information, and therefore, reflect an optimal estimate of the net present value of the future cash flows of the firm. Thus, unanticipated announcements or new information should result in nearly instantaneous adjustments in stock prices.

To assess the effect of new information, one must examine the extent to which security prices around the time of an event are "abnormal." Many studies use the capital asset pricing model (CAPM) to control for market wide effects. Brown and Warner (1980; 1985), however, have found that a simpler methodology, mean adjusted returns, "pick up abnormal performance no less frequently," and that risk adjustment procedures do not enhance the power of the tests. The mean adjusted returns method will be used here.¹⁶

The methodology we follow is standard and well described by Brown and Warner (1980; 1985) and in particular by Strachan, Smith, and Beedles, so the basic procedure is discussed only briefly here.¹⁷ For a given portfolio of stocks, the mean adjusted abnormal returns for a given day or set of days (window) are calculated by taking the average return on the stock or portfolio for some previous period (the normal return) and subtracting it from the return(s) on the day(s) of interest to give the abnormal returns. Using an estimate of the variance of returns from the normal return period, one can then test whether the abnormal returns differ significantly from zero with a *t* test.¹⁸ We thus form a series of "portfolios" comprised of the events associated with a managerial perspective, calculate the abnormal returns for that portfolio, and test whether they differ significantly from zero.

We use a normal returns period that starts 244 days before the event and ends sixteen days after it. The returns for fifteen days before and ten days after the event are examined. The day of the event is defined as the day on which its announcement appeared in the *Wall Street Journal* (WSJ). The same procedures that have been applied to portfolios representing various managerial perspectives are applied to individual recalls. For the individual recalls, stock returns on: (1) the day before and the day of the announcement, and (2) the day of the announcement are evaluated. The former method is commonly used because news of the announcement is often public and the market may react before an announcement actually appears in the WSJ (Ruback, 1982; 1983). Care is taken in the use of significance tests. Given the

16. For other examples of the use of this method, see Eades, Hess, and Kim; Alexander, Benson, and Kampmeyer; and Strachan, Smith, and Beedles.

17. For specific equations, see Strachan, Smith, and Beedles.

18. One can do this because stock market returns are approximately normally distributed; see Fama.

size of the sample being investigated in some of these portfolios and the size of effect (one percent or so) being sought, even if an effect were present, it might not be possible to reject the no-effect/null hypothesis (Brown and Warner, 1985).

2.2. SAMPLE

Aggregate abnormal returns for a portfolio of companies consisting of the four major American automobile manufacturers are examined. These estimates are for four periods (1967-68, 1972-73, 1977-78, and 1982-83), because industry conditions vary and investors might reasonably view the impact of recalls differently in these periods. The first period is before the creation of the National Highway Traffic Safety Administration (NHTSA), as the National Traffic and Motor Vehicle Safety Act of 1966 was initially administered by the Federal Highway Administration and the NHTSA was not created until 1970. The second period is prior to the 1974 amendments to the 1966 Safety Act requiring that the auto manufacturers pay for all repairs made during recalls. The third period includes the Carter administration, when the NHTSA, headed by Nader associate Joan Claybrook, vigorously enforced the recall program and recalled more cars than were actually being produced. The final period includes parts of the Reagan administration, when the NHTSA was accused of "lacking purpose," "losing vigor," and "failing to enforce the law" (Claybrook).

This sample is based on all *major* recalls reported in the *WSJ*. Major recalls are defined based on the relative market share of the manufacturers. Thus we assume that for General Motors (GM) a recall involving more than 50,000 cars is major, for Ford a recall involving more than 20,000 cars is major, for Chrysler a recall involving more than 10,000 cars is major, and for American Motors (AMC) a recall involving more than 2,000 cars is major. By using this method, 128 major recalls were identified, of which nine could not be used in the analysis due to errors in the data.

Table 1 presents the cases used in the analysis by manufacturer and time period. The number of major recalls peaked in 1977-78. Ford had the most major recalls both absolutely and in each period excepting 1982-83, when

Table 1. Major Auto Recalls

	1967-68	1972-73	1977-78	1982-83	Totals
AMC	1	1	8	2	12
Chrysler	7	7	8	3	25
Ford	6	8	24	12	50
GM	2	5	7	18	32
Total	16	21	47	35	119

SOURCE: *The Wall Street Journal*.

the number of GM's major recalls escalated. Jarrel and Peltzman also find that Ford had more major recalls than GM, but the margin of difference in their sample—44 for Ford and 41 for GM—is not as large as in ours.

2.3. AGGREGATE RESULTS

The results in table 2 reflect the performance of the portfolio of 119 events on each of the fifteen days preceding and ten days following the recall announcement. As did Jarrel and Peltzman, we found a significant reduction in stock price on the day before and the day of the recall announcement. Our results are also consistent with those of Strachan, Smith, and Beedles and with the efficient markets theory.

Notice, however, that the largest abnormal return, which occurs on day 6, is positive. The positive abnormal returns on days five and six are larger (0.89) than the negative abnormal returns on days minus one and zero (0.72).

Table 2. Abnormal Returns for a Portfolio of 119 Major Recalls

Trading day	Raw return (%)	Abnormal return (%)	Cumulative abnormal return (%)	t-test
-15	-.03	-.05	-.05	-0.28
-14	-.17	-.24	-.29	-1.45
-13	+.19	+.11	-.18	+0.67
-12	+.29	+.21	+.03	+1.24
-11	-.17	-.24	-.21	-1.44
-10	+.17	+.09	-.13	+0.51
-09	+.07	-.01	-.14	-0.06
-08	+.23	+.15	+.01	+0.87
-07	-.09	-.17	-.16	-1.00
-06	+.21	+.13	-.03	+0.76
-05	+.16	+.08	+.05	+0.48
-04	+.13	+.05	+.10	-0.32
-03	+.02	-.05	+.05	-0.32
-02	-.02	-.09	-.04	-.56
-01	-.23	-.31	-.35	-1.81*
00	-.33	-.41	-.76	-2.43*
+01	-.13	-.21	-.97	-1.22
+02	+.02	-.06	-1.03	-0.37
+03	-.09	-.17	-1.20	-1.00
+04	-.10	-.18	-1.38	-1.08
+05	+.34	+.27	-1.12	+1.57
+06	+.70	+.62	-.50	+3.65*
+07	+.28	+.20	-.30	+1.17
+08	+.22	+.14	-.16	+0.83
+09	-.10	-.18	-.34	-1.08
+10	-.17	-.25	-.59	-1.45
Means	+.06	-.02	-0.37	-0.18

Normal return = +.07841%.

Standard deviation = .16881%.

*significant at the .05 level.

This suggests that there may be some "rebound" effect about a week after a recall, a finding which is contrary to Jarrel and Peltzman, who not only maintain that "average CERs are significantly negative for every event window," but that "the average gets larger absolutely as the windows widen" (p. 527).

None of Jarrel's and Peltzman's windows included the sixth day after the event, where we find the largest positive abnormal return. Indeed by day eight the cumulative excess returns are close to zero (-0.16 percent), well within the normal variability of the portfolio. Whether the positive returns on days five to eight reflect substantive market behavior or normal stochastic variation is unclear. If these findings do in fact reflect some sort of market correction, they would seriously reduce, if not eliminate, any deterrent effect from stock market reactions.

2.4. REACTIONS ACROSS TIME AND BY COMPANY

A manager might also consider whether stock market reactions were consistent across time and whether they varied by company. Table 3 presents the results by time period and manufacturer. Looking at the results for all companies averaged over each of the four time periods, we find significant effects only on the day of the *WSJ* recall announcement in two time periods (1972-73 and 1977-78) (see the last two lines in the table). Thus, no time period has significant effects over the entire two-day event window.

This may signify that different regulatory regimes are likely to have different market effects. When laws are tightened (1973-74) and proconsumer appointments are made (1977-78), the market impact will be greater. If managers take this into account in assessing the market deterrent, they will discount the market impact when these conditions do not hold.

We also find that only Chrysler has significant abnormal returns over the entire time series. Although the average returns for the other three companies are negative, none is statistically different. Given the controversy over the correct technique for comparing means with differing standard deviations, a proper test of the differences across companies cannot be executed. Nonetheless, examination of the estimated mean abnormal returns shows substantial differences. Event day means vary from -0.06 percent for GM to -1.09 percent for Chrysler. Estimates of the magnitude vary by a factor of over 18 across companies. Although statistical significance of means can vary with sample size (and such sample sizes vary across companies and time in our data), mean estimates are unbiased, and they display substantial differences across companies.

Mean effects differ substantially by company and time period. Although test statistics are sensitive to sample size, only Ford in 1967-68 and Chrysler in 1972-73 and 1977-78 have significant abnormal returns (at the .05 level

Table 3. Average Daily Abnormal Returns by Year and Company

Company	1967-68 (%)	1972-73 (%)	1977-78 (%)	1982-83 (%)	Totals (%)
AMC					
Day before and day of recall	2.92 (0.82)	.07 (0.03)	.58 (-0.65)	-1.87 (-0.67)	-.45 (-.54)
Day of recall	-.13 (-.04)	.07 (.03)	-.44 (-.49)	-.21 (-.08)	-.33 (-.39)
Chrysler					
Day before and day of recall	.22 (0.30)	-.76 (-0.91)	-1.14 (-2.17)*	-1.60 (-0.74)	-.71 (-1.77)*
Day of recall	.43 (.58)	-1.44 (-1.73)*	-1.75 (-3.35)*	-2.01 (-.93)	-1.09 (-2.72)*
Ford					
Day before and day of recall	-.27 (-0.53)	-.51 (-1.56)	-.03 (-0.12)	-.14 (-0.18)	-.16 (-.69)
Day of recall	-.89 (-1.73)*	-.41 (-.93)	-.31 (-1.36)	.08 (.10)	-.31 (-1.31)
GM					
Day before and day of recall	-.34 (-.28)	-.39 (-.82)	-.37 (-1.11)	-.33 (-.78)	-.35 (-1.25)
Day of recall	.48 (.40)	-.21 (-.43)	+0.00 (+0.00)	-.10 (-.25)	-.06 (-.22)
Total (%)					
Day before and day of recall	.13 (0.31)	-.54 (-1.46)	-.36 (-1.64)	-.46 (-1.19)	
Day of recall	-.09 (-.22)	-.69 (-1.86)*	-.53 (-2.43)*	-.21 (-.55)	

T-tests are in parentheses.

*Significantly negative at the .05 level, one-sided test.

with a one-sided t-test). The effects on the day of the recall for Chrysler vary most from 0.43 percent in the 1967-68 time period to -1.44 percent, -1.75 percent, and -2.01 percent in the subsequent three periods. The magnitude of the market response to one company's (Chrysler's) recalls is much greater than to other companies. These findings suggest that the aggregate effects are dominated by the Chrysler experience. The results for Chrysler could be influenced by the heightened risk of bankruptcy the company faced in the latter periods (see Reich and Donahue). This view is consistent with the very small market reaction to the 1967-68 Chrysler recalls. When Chrysler was in less danger, the market actually showed some gain in stock price on days when recalls were announced. Overall, the results indicate that although a market decline in response to a recall should be expected, the decline is not likely to be large relative to normal price variability unless special conditions, such as the financial problems confronted by Chrysler, prevail.

2.5. INDIVIDUAL RECALLS AND SHAREHOLDER WEALTH

Table 4 summarizes what managers would observe on an event-by-event basis. The results are little different from what one would expect by chance—4.2 percent of the tests where returns are negative are significant at the 0.5 level, and 7.6 percent of the total are significant at the 0.10 level (see the percentages in parentheses). Nearly 40 percent of the cases had positive results.¹⁹ The manager looking at a few cases one at a time would not perceive a substantial pattern of stock price reductions and might misinterpret the results to mean that investors actually rewarded behavior leading to automobile recalls.

Even if a manager saw some pattern of price reductions, inferring the cause would be problematical. On the days on which recalls were announced, the *WSJ* published other stories on the same company in 56 percent of the cases. This helps explain the weak results of the event-by-event analysis and would make it very difficult for a manager to interpret the stock market reaction.

3. DISCUSSION AND IMPLICATIONS

We have replicated the Jarrel and Peltzman automobile recall study using different assumptions about managerial cognition. Although we have found somewhat similar aggregate results, we have shown that these results dissipate rapidly. Moreover, our findings indicate that stock market reactions vary over time and across companies, with minimal reactions for some companies in some time periods and almost no discernible effects with respect to individual recalls. Thus, we would conclude that the deterrent effect that

Table 4. Individual Case Analysis

	Day before and day of the recall	Day of the recall	Total
Total number of cases	119	119	238
Number <.05 significantly <.10 negative	2 (1.7%) 3 (2.5%)	8 (6.7%) 15 (12.6%)	10 (4.2%) 18 (7.6%)
Number <.05 significantly <.10 positive	0 (0%) 3 (2.5%)	3 (2.5%) 6 (5.0%)	3 (1.3%) 9 (3.8%)
Cases with positive returns	39.5%	38.7%	39.1%
Cases with other announcements on day of the recall	56%	56%	56%

Percentages of significant cases are in parentheses.

19. This is very similar to the findings of Strachan, Smith, and Beedles.

Jarrel and Peltzman have detected is not a dependable constraint on managerial action.

Explaining the differences between our study and that of Jarrel and Peltzman is not easy. We have used only slightly different time periods (1967–83 versus 1967–81) and have followed similar procedures, but we have found a different number of events. In the eight years between 1967 and 1983 we detect at least 128 major recalls for all American manufacturers, whereas Jarrel and Peltzman found only 116 in the fifteen years between 1967 and 1981 for the Big Three automobile manufacturers. The two studies also use different procedures for defining abnormal returns, although the Brown and Warner analysis indicates quite strongly that this should not affect the results. Finally, the two studies use slightly different event windows. The exact explanation of the differences between the findings, however, remains unclear. Nonetheless, the fact that we obtain different results using a reasonable methodology casts doubt on the argument that stock market reactions to recalls constitute a serious deterrent. Our findings would apply even if all managers viewed the market in the same way. Because it is reasonable to presume that they do not, it seems highly unlikely that the stock market would dependably encourage managers to take the preventive actions needed to avoid recalls.

REFERENCES

- Alexander, G., G. Benson, and J. Kampmeyer. 1984. "Investigating the Valuation Effects of Announcements of Voluntary Corporate Selloffs," 84 *The Journal of Finance* 488–500.
- Allison, G. 1971. *Essence of Decision*. Boston, Mass.: Little, Brown & Co.
- Arrow, K. 1978. "Organizational Goals and Control Systems: Internal and External Considerations," in L. Preston, ed., *Research in Corporate Social Performance and Policy 1*. Greenwich, Conn.: JAI Press.
- Ascher, W. 1981. "The Forecasting Potential of Complex Models," *Policy Sciences* 499–512.
- Brown, S., and J. Warner. 1980. "Measuring Security Price Performance," 8 *Journal of Financial Economics* 205–58.
- . 1985. "Using Daily Stock Returns: The Case of Event Studies," 14 *Journal of Financial Economics* 3–31.
- Claybrook, J. 1984. *Retreat from Safety*. New York: Pantheon Books.
- Comptroller General. 1976. *Effectiveness, Benefits, and Costs of Federal Safety Standards for Protection of Passenger Car Occupants*. Washington, D.C.: General Accounting Office.
- Crandal, R., H. Gruenspecht, T. Keeler, and L. Lave. 1986. *Regulating the Automobile*. Washington, D.C.: Brookings Institution.
- Cyert, R. and March, J. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, N.J.: Prentice-Hall.

- Donaldson, G., and J. Lorsch. 1983. *Decision Making at the Top*. New York: Basic Books.
- Eades, K., P. Hess, and E. Kim. 1984. "On Interpreting Security Returns During the Ex-Dividend Period," 13 *Journal of Financial Economics* 7-31.
- Ellert, J. 1976. "Mergers, Antitrust Law Enforcement, and Stockholder Returns," 31 *The Journal of Finance*, 715-732.
- Fama, E. 1976. *Foundations of Finance*. New York: Basic Books.
- Fisse, B., and J. Braithwaite. 1983. *The Impact of Publicity on Corporate Offenders*. Albany: State University of New York Press.
- Friedman, M. 1979. "The Social Responsibility of Business Is To Increase Its Profits," *New York Times Magazine*, Sept. 13.
- Graham, J., and S. Garber. 1984. "Evaluating the Effects of Automobile Safety Regulation," 3 *Journal of Policy Analysis and Management*, 206-24.
- Greer, D. 1983. *Business, Government, and Society*. New York: Macmillan.
- Halpern, P. 1979. "The Corvair, the Pinto, and Corporate Behavior," Paper presented at the Symposium on Regulatory Policy, University of Houston, Houston, Texas, November 19.
- Jarrel, L., and S. Peltzman. 1985. "The Impact of Product Recalls on the Wealth of Sellers," 93 *Journal of Political Economy* 512-36.
- Joksch, H. 1976. "Critique of Sam Peltzman's Study," 8 *Accident Analysis and Prevention* 131.
- Kellog, R. 1980. "An Empirical Investigation of Disclosure Error: Civil Damage Lawsuits Under the Federal Securities Laws," Ph.D. diss., University of Rochester, Graduate School of Management.
- Lave, L., and C. Weber. 1970. "A Benefit-Cost Analysis of Auto Safety Features," 2 *Applied Economics* 265-75.
- Marris, R. 1963. "A Model of the Managerial Enterprise," 75 *Quarterly Journal of Economics* 189-209.
- Meir, K., and D. Morgan. 1982. "Citizen Compliance with Public Policy," 35 *Western Political Quarterly* 258-73.
- Miller, R. 1973. "The Nader Files: An Economic Critique," Paper presented at Conference on Government Policy and Business, October 22-28.
- Nager, G. 1981. "Auto Recalls and the Pursuit of Safety," 33 *Stanford Law Review* 301-28.
- NHTSA. 1980. "Study to Determine Why Vehicle Owners Respond to or Ignore Recall Notifications," DOT-HS-805-591, Washington, D.C.
- Nelson, R., and Winter, N. 1982. *An Evolutionary Theory of Economic Change*. Cambridge: Harvard University Press.
- Peltzman, S. 1975. "The Effects of Automobile Safety Regulation," 83 *Journal of Political Economy* 677-725.
- . 1976. "The Effects of Automobile Safety Regulation: A Reply," 8 *Accident Analysis and Prevention* 138-42.
- . 1977. "A Reply," 11 *Journal of Economic Issues* 587-600.
- . 1981. "The Effects of FTC Advertising Regulation," 24 *Journal of Law and Economics* 403-48.
- Posner, R. 1977. *Economic Analysis of Law*. 2d ed. Boston: Little, Brown & Co.
- Reich, R. B., and J. D. Donahue. 1985. *New Deals: The Chrysler Revival and the American System*. New York: Times Books.
- Robertson, L. 1977. "A Critical Analysis of Peltzman's 'The Effects of Automobile Safety Regulation,'" 11 *Journal of Economic Issues* 587-600.
- Ruback, R. 1982. "The Effect of Discretionary Price Control Decisions on Equity Values," 10 *Journal of Financial Economics* 83-106.

- . 1983. "The Cities Service Takeover: A Case Study," *Journal of Finance* 319–30.
- Schwert, G. 1981. "Using Financial Data to Measure the Effects of Regulation," 24 *Journal of Law and Economics* 121–58.
- Seitz, N. 1982. "Shareholder Goals, Firm's Goals, and Firm Financing Decisions," 11 *Financial Management* 20–26.
- Simon, H. 1947. *Administrative Behavior*. New York: Free Press.
- Strachan, J., D. Smith, and W. Beedles. 1983. "The Price Reaction to (Alleged) Corporate Crime," 18 *The Financial Review* 121–32.
- Tobin, R. 1982. "Recalls and the Remediation of Hazardous or Defective Consumer Products," 16 *The Journal of Consumer Affairs* 278–306.
- Tversky, A., and D. Kahneman. 1974. "Judgment under Uncertainty: Heuristics and Biases," 184 *Science* 1124–31.
- Weidenbaum, M. 1986. *Business, Government, and the Public*. 3d ed. Englewood Cliffs, N.J.: Prentice-Hall.
- Welch, J., and C. Pantalone. 1985. "Changing Goals to Increase Stock Price," 6 *Journal of Business Strategy* 74–77.
- Williamson, O. 1964. *The Economics of Discretionary Behavior*. Englewood Cliffs, N.J.: Prentice-Hall.
- Wines, M. 1983. "Reagan's Plan to Relieve Auto Industry of Regulatory Burdens Gets Mixed Grades," 15 *National Journal* 1532–37.
- Wittman, D. 1977. "Prior Regulation versus Post Liability," 6 *Journal of Legal Studies* 1–18.