APPLICATION OF RESEARCH ON CONSUMER COMPLAINT RATES TO THE ESTIMATION OF THE FINANCIAL IMPACT OF PROSPECTIVE PRODUCT DEFECTS

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ABSTRACT

The complaint rate, which is defined as the proportion of consumers that complain after experiencing a dissatisfying experience, is an important input for determining the financial impact of prospective product defects. A defective product is one that suffers from a specific, significant design or manufacturing defect. We describe an approach for estimating the complaint rate in a hypothetical example involving defective wood preservative used to treat outside decks. It is assumed that the defect will eventually be discovered by at least some consumers. We rely heavily on studies of consumer complaint rates, recall campaign response rates, and class action response rates.

INTRODUCTION

When a manufacturer produces and sells a product, it faces the possibility that the product will be defective and consequently, that it will be liable for financial damages. Therefore, it is vital for a manufacturer to determine its financial exposure arising from prospective product defects. A first approximation of the financial exposure for the firm can be obtained by knowing: 1) the number of products sold; 2) the average cost of repairing or replacing a defective product; 3) the probability of failure (or failure rate); and 4) the complaint rate, i.e., the proportion of consumers with defective products who complain in order to obtain repair, replacement or restitution.

The complaint rate is the most difficult of these four variables for the manufacturer to predict because for a variety of reasons not all consumers with defective products will complain. Ideally, we would have sufficient data available to develop multivariate models to estimate complaint rates by product type, product value, consumer characteristics, and other variables. These data do not yet exist and so we are limited to approximations of the proportion of consumers who are likely to complain about defective products. In order to contribute to our understanding of the factors influencing complaint rates and to provide initial estimates of the proportion of consumers likely to complain about defective products, this research provides a summary of extant literature regarding complaint rates, recall campaign response rates and class action response rates. This information can be used to provide rough but useful estimates of likely complaint rates.

To provide context, the discussion is tied to the following hypothetical situation: A firm manufactures a wood preservative, which is used by builders to treat residential decks. Later it is determined that when applied as recommended by the preservative supplier, the wood preservative does not always protect treated surfaces for as long as the 10-year guarantee. A statistician is hired to analyze data from 1,000 homes that have decks that were treated with the supplier's preservative four or more years ago but are still under warranty. She determines that the failure rate within the warranty period for decks treated with the preservative is 25%, (where failure involves rotting or crumbling wood to the point of entire decks or parts of decks needing to be replaced).

In this situation when homeowners see their decks begin to rot some will complain to the developer or deck builder. The developer may seek recovery from the deck builder subcontractor, who in turn, seeks recovery from the preservative supplier. In this simplified example and consistent with the discussion above, the preservative supplier's financial exposure for replacing or repairing the defective decks can be estimated as the number of decks treated with the preservative multiplied by the average repair cost multiplied by the failure rate multiplied by the complaint rate. For the purposes of this paper, it is assumed that the

probability of product failure is known. It is also assumed that appropriate sales data are available to determine the number of decks treated with the preservative, and the average repair cost per deck. As noted above, the focus of this paper is on the complaint rate, which is the remaining piece of information needed to estimate the preservative supplier's financial exposure.

Of course, this example is highly simplified. It is not unlikely that all three parties, i.e., the developer, deck builder and preservative manufacturer, will incur additional out of pocket expenses in the form of costs for product liability lawsuits, personal injury lawsuits from consumers who fall and indirect costs in the form of negative effects on their reputations due to either or both of negative media coverage or negative word of mouth. Product defects, product liability lawsuits filed by individuals or on behalf of classes and the ensuing negative publicity may essentially ravage entire industries as in the "EIFS" cladding example or severely impact a specific manufacturer as it did with Audi. Both of these cases are discussed later.

The remainder of this paper is organized as follows. Section II discusses the most important factors that are likely to influence the complaint rate while Sections III and IV discuss selected studies of consumer complaint behavior as well as the implications of these studies for the wood preservative example. Sections V to VII consider response rates for recall campaigns and class action suits and how they relate to our wood preservative example. Section VIII discusses the impact of negative publicity on complaint rates, and Section IX offers brief concluding remarks.

Conceptualizing the Factors Influencing Consumer Complaint Rates

At a conceptual level it is likely that a consumer's propensity to complain about a defective product will be influenced by the following five variables: a) expectations regarding the useful life of the product; b) the ability to identify the cause of the product failure; c) the ability to identify the party from which restitution can be obtained; d) the financial loss of the consumer from the product failure versus the cost of complaining; and e) the demographic and socioeconomic characteristics of the consumer. Each is discussed below.

First, as a result of marketer activities and experience, consumers develop expectations about the useful life or products. Warranties and guarantees establish minimal expectations about product life while experience may establish a "typical" (and probably, longer) product life; e.g., consumers expect the useful life of an automobile to be longer than its warranty. In the deck example, it is likely that the complaint rate will be directly related to the number of years the expected or guaranteed life of the deck exceeds the time when the defect occurs (i.e., a disconfirmed expectations assumption). Nonetheless, turnover in home ownership may cloud expectations about the expected life of the deck and decrease the complaint rate.

Second, to the extent the defect is unobservable or there is ambiguity in the ability to identify the cause of the defect, the complaint rate will decrease. In the deck example, "dry rot" may mask the failure and the climate, the amount of traffic on the deck, how the deck is used, and the extent to which consumer performs routine cleaning and maintenance, will all influence whether the consumer perceives the product failure is due to a defect or due to "wear and tear" and contributory negligence and consequently, may influence the complaint rate.

Third, the consumer needs to know how and to whom to complain. If the consumer is a "Do-it-yourselfer" and perceives the deck is defective in some way he must: a) know or be able to determine it is under warranty; b) know or be able to determine the brand of preservative; c) know or be able to determine where the product was purchased; d) be able to show it was applied properly and e) have proof of purchase. If the consumer had the deck built he must: a) know or be able to determine it is under warranty; b) know or be able to determine the name of the builder; and c) be able to locate the builder. The builder may have gone out of business or the business may have changed names. To the extent consumers lack knowledge about the validity of a complaint or about to whom to complain, the lower the complaint rate.

Negative publicity in the form of news stories

about the alleged defect is likely to increase the complaint rate. Not only does such publicity raise awareness of a potential defect, it also provides information that helps consumers identify to whom they should complain and may spawn class action lawsuits that provide another venue for complaints. An example of the effects of negative publicity is the complaints about fiberglass "stucco" cladding applied to residential structures during the late 1980's and 1990's. When not applied correctly the "EIFS" (External Insulation and Finishing Systems) cladding frequently caused rotting of the interior (typically) plywood siding due to accumulated moisture requiring very expensive replacement and repairs. See, for example, Jackman (2001) "$1 Million Awarded for Faux Stucco on Va. House;" Schwolsky (1996) "Troubleshooters Target EIFS;" National Association of Home Builders, (1998) "Caution Advised in Using EIFS Systems" and www.eifsinfo.net and www.EIFSweb.com. The ensuing negative publicity undoubtedly increased the percentages of consumers who had their homes inspected for EIFS-related defects. Furthermore, because of the rotting problems, fiberglass EIFS has virtually been replaced by "hard coat" stucco, a cement based product. Thus, the long-term reputational effects of negative publicity may be very difficult to overcome.

Fourth, it can be expected the larger the consumer's financial loss from the product failure, the more likely the consumer will complain. The total amount of financial losses includes the cost of deck repairs as well as personal injuries from falls or damage to other property because of the deck failure.

Finally, it appears likely that higher SES (socioeconomic status) consumers will be more knowledgeable about the available avenues for complaining and thus, more likely to complain, than will be lower SES consumers. The next section of the manuscript reviews consumer complaint studies and where possible compares the findings to these five factors. We begin with a summary of consumer's overall likelihood of complaining.

REVIEW OF CONSUMER COMPLAINT STUDIES

Table 1 outlines several representative studies that quantify the propensity of consumers to complain when they are dissatisfied. Since we are concerned with estimating the financial liability that a manufacturer may incur because of a defect, we have categorized the studies in terms of the "Overall Propensity" to complain and the "Restitution Propensity" to complain. The "Overall Propensity" heading refers to the percentage of consumers taking any action, public or private, after experiencing dissatisfaction. "Restitution Propensity" to complain includes voicing a complaint to a retailer (or manufacturer), contacting the Better Business Bureau, and hiring a lawyer. We assume that the primary motivation of these complaints is to obtain restitution through a refund, a repair of the defect, replacement of the product or some other form to make the consumer "whole." Private action, conversely, refers to actions such as refusing to buy the product again and spreading negative comments.

"Restitution Propensity" is the probability of complaining publicly when a consumer is dissatisfied with a product or service and as noted above, includes complaining to a retailer or manufacturer or contacting a lawyer for purposes of obtaining restitution. In the wood deck preservative example, if there are a total of 100 people who are dissatisfied with their decks and 40 contact the builder and demanded repair or replacement of the deck, the restitution propensity to complain would equal 40%. Thus, the restitution propensity can be viewed as an estimate of the percentage of defective products (e.g., decks) that may need to be repaired or replaced. By definition, the restitution propensity to complain can never be greater than the overall propensity and is very likely to be lower.

Table 1 indicates that the "overall propensity" to complain ranges from 0% for national newspaper services in Andreassen's (2001) study to more than 96% for credit cards in Hogarth, et al.'s (2001) study. The overall propensity to complain is less than 100% in all of the studies that we have reviewed. Thus, for a given type of product or service, there are always some consumers that do not take action in response to a dissatisfying experience.

Table 1
Studies Assessing a Consumer's Propensity to Take Action if Dissatisfied

Study	Product Class	Overall Complaint Propensity[a]	Restitution Complaint Propensity[b]	Size of Base[c]
Warland, et al. (1975)	General[d]	68.5%	32.0%[e]	425
Day/Landon (1976)	Durables	77.1	34.5[f]	275
	Non-durables	73.5	21.5[f]	275
	Services	84.0	34.5[f]	275
Best/Andreasen (1977)	Car	58.2	46.8[g]	827
	Air Conditioner	56.8	51.4[g]	175
	Washer/Dryer	50.8	44.3[g]	254
	Home Repair	63.1	46.0[g]	537
	Car Repair	61.1	48.4[g]	1277
	Appliance Repair	57.9	51.4[g]	563
Gronhaug/Zaltman (1981)	General	65.9	65.9[h]	1266
Bearden/Mason (1984)	Durables	n/a	64.0	175
	Services	n/a	72.0	292
TARP (1986)	Large Ticket Durable Goods	n/a	40	n/a
	Medium Ticket Durable Goods	n/a	50	n/a
	Large Ticket Services	n/a	63	n/a
	Small Ticket Services	n/a	55	n/a
Bolfing (1989)	Hotel/Motel Services	72.0	48.8	629
Singh (1990)	Grocery Shopping	n/a	76	176
	Automotive Repair	n/a	85	155
	Medical Care	n/a	47	166
Hernandez, et al. (1991)	VCRs	77.8	43.2	424
Kolodinsky (1995)	Automobile Repair	91.0	76.0	122
	Medical Services	78.0	61.0	93
Andreassen (2001)[i]	Fast Food	8.3	n/a	48
	Insurance	59.4	n/a	32
	Postal Services	35.3	n/a	17
	Regional Newspapers	27.6	n/a	76
	National Newspapers	0.0	n/a	55
	Telecommunications	40.0	n/a	15
	Personnel Transportation	10.6	n/a	47
	Bank	41.9	n/a	86
	Service Stations	24.3	n/a	37
	Car Dealers	65.1	n/a	63
	Charters	46.2	n/a	78
	Grocery Chains	26.5	n/a	68
Hogarth, et al. (2001)	Credit cards	96.6	85.5	166

a Propensity to take public or private action if dissatisfied.
b Propensity to complain to obtain restitution if dissatisfied.
c Size of base is the number of dissatisfied consumers in the sample.
d Results were not determined according to specific product classes.
e Figure is for "Complained to store manager, salesman clerk, president of corporation" only.
f Figures are for "I contacted the store to complain" only.
g Figures are for voicing a complaint to a seller (either a local retailer or service outlet, or a manufacturer) only.
h The "overall propensity" and "public propensity" figures are the same because the researchers apparently did not distinguish between "no action" and private action (see footnote 2 of the article for the source of this ambiguity).
i The author does not indicate whether a complaining, dissatisfied customer took public action, private action, or both.

The "restitution propensities" to complain, which are also shown in Table 1, are more difficult to interpret because some of the figures are for any type of action to obtain restitution (e.g. complain to BBB and retailer) while others are probabilities of taking only one specific type of action, (such as complaining to the retailer) so the overall restitution propensity to complain is likely to be underestimated. The data show that the average propensity to take action for the purposes of obtaining restitution is somewhat less than 50% for durable goods (i.e., simple, unweighted mean = 48%) and approximately 60% for services (simple, unweighted mean = 60%). Table 1 also shows that the minimum propensity to complain to obtain restitution when dissatisfied ranges from a minimum of 22% to a maximum of approximately 85% (Singh (1990), automobile repair and Hogarth, Hilgert, Kolodinsky and Lee (2001), credit cards).

The complaint behavior studies also provide findings relevant to four of the five conceptual factors likely to influence complaint behavior: the financial loss to the consumer, ability to identify the cause of the failure, the difficulty of complaining, and consumer demographic and socioeconomic characteristics. None of the studies addressed the issue of the difference between the expected useful life and the time at which the defect appears. The response rate to product recalls, which is discussed subsequently, indirectly addresses this issue.

First, many studies find a positive relationship between complaint propensity and the value of the product or service (e.g., Huang 1994). In addition, researchers have found a positive correlation between propensity to complain and the severity of the problem/magnitude of the loss (e.g., Day and Landon 1977; Hogarth, et al. 2001). Second, other research findings include the fact that the likelihood of complaining increases if the problem is clear-cut rather than a matter of judgment (see *Advertising Age*, June 21, 1976, p. 27). Third, the perceived restraints or unavailability of complaint channels inhibit consumer complaining (see, e.g., Bearden and Mason 1984). Other researchers have noted that the time and expense associated with complaining are significant and that the perceived costs and benefits of complaining, beyond product/service expenditures, are critical components of the complaining process (e.g., Day and Bodur 1978). Consistent with these studies, a more recent study by Kolodinsky (1995) found that time constraints influence complaint rates. She found that hours of market work and the presence of young children decrease the probability of taking any type of complaint action.

Several researchers have found a positive association between complaining behavior and income and occupation level (e.g., Bearden 1983; Bearden and Mason 1984; Day and Landon 1976). The upset/action group also tends to have higher socioeconomic status (see, e.g., Warland, Herrman and Willits,. 1975). Many researchers also note that complainers are younger, in general (e.g., Bearden 1983; Bearden and Mason 1984). One study (Gronhaug 1977) finds, however, that with respect to dissatisfaction with durables and nondurables, the demographic measures possessed no descriptive or explanatory power. Thus, although on balance the majority of studies have found a direct association between socioeconomic status and complaining behavior, the findings are not completely consistent. No study that we are aware of has found an inverse correlation between complaining behavior and socioeconomic status.

IMPLICATIONS OF CONSUMER COMPLAINT STUDIES FOR THE WOOD PRESERVATIVE EXAMPLE

The literature on complaint rates sheds light on two main topics relevant to our wood preservative example. It highlights factors that directly impact complaint rates and it provides estimates of complaint rates. As noted above, the data from Table 1 indicate that estimated propensity to complain to obtain restitution for durables and services ranges from roughly 22% to 85%, with an overall mean of about 50%. Thus, the complaint literature provides a starting point for assessing the expected complaint rate in our deck example, but this estimate must be adjusted to account for the various factors that influence consumer complaints.

The literature indicates that four of the five factors that we conceptualized as influencing complaint behavior are indeed related to complaint rates. That is, the literature supports the conclusion

that the magnitude of the consumer loss or the value of the product is directly related to the propensity to complain. Additionally, the existing literature also by and large supports the conclusion that the complaint rate is directly related to socioeconomic status. Since it can be relatively expensive to replace decks or parts of decks in a given household, we would expect a relatively high proportion of homeowners with defective decks to complain, everything else being the same. This is especially so when considering that homeowners have higher socioeconomic profiles than does the public at large. For example, according to the "American Housing Survey for the United States" conducted by the U.S. Department of Commerce and U.S. Department of Housing and Urban Development in 2003, median household income per year was $41,775, while median household income for *owner occupied units* was $52,803. Thus, two of the factors that are related to complaint behavior are likely to increase the percentage of consumers who would complain about defective decks.

The other two factors, i.e., the ability to identify the cause of the product failure and the ease of complaining, that are related to complaint rates are likely to decrease the complaint rate. As noted above, it has been shown that if the problem is clear-cut (i.e. obvious, clearly identifiable), the complaint rate increases. If the problem is more ambiguous and a matter of judgment, the complaint rate, everything else being equal, declines. In the case of wood preservative, it is reasonable to assume that the problem is at least somewhat ambiguous. Factors such as weather, number of years since the deck was completed, amount and type of use, determining whether the alleged defect is in the lumber itself or the preservative or related to faulty construction, may make the identification of causal factors difficult.

The research also shows that complaint rates are affected by the ease of complaining and the availability of complaint channels. When a dissatisfied consumer has some difficulty determining the appropriate complaint channel, the probability of complaining is reduced. In short, if a homeowner with a defective deck has some difficulty determining how to complain and who to complain to, complaint rates would decrease.

It is clear that the ultimate complaint rate in our wood preservative example is going to be affected by countervailing factors that historically have been shown to be correlated with complaint rates. Considering that some of these countervailing factors were operational in each of the eleven complaint studies and that the propensity to complain to obtain restitution averaged approximately 50% for durables and services, and never fell below 22%, this suggests that the deck construction company and ultimately the wood preservative supplier can expect a complaint rate of no less than 30%. In terms of the earlier example, our hypothetical preservative supplier can expect to have complaints from at least 7.5% (i.e., 25% failure rate x 30% complaint rate) of the homeowners about rotting decks. Estimating the likely upper bound on the complaint rate in the deck example is difficult from the complaint rate studies for one important reason: the complaint rate literature deals primarily with defects that are recognizable within a short period of time after product purchase. For example, Best and Andreasen (1977) focused on appliance repair and car repair, while other studies of specific durables have focused on automobile repair (Singh 1990, Kolodinsky 1995). Recall response rates, which is the subject of our next section, provides some insight into consumer responses when the consumer may not recognize the defect for some time or perhaps not at all. This data supports our estimate of at least a 30% complaint rate and also provides some insight into the upper bound on complaint rates.

REVIEW OF RECALL RESPONSE RATE STUDIES

Murphy and Rubin (1988) collected data on 128 consumer product recalls initiated by the Consumer Product Safety Commission (CPSC) between 1978 and 1983. The dependent variable in their study is the percentage of the outstanding product that is successfully recalled in a campaign. The recall rate, while ranging from 0 to 100%, had a mean of 54.4%. There was a great deal of variation in recall rates; one-third of the sample had recall rates below 20% or above 89%. Murphy and Rubin explain about 90% of the variation in recall rates using six

explanatory variables. These variables are 1) the number of months separating the end of distribution and start of recall; 2) method used to notify consumers; 3) percentage of items in retail inventory; 4) percentage of items in hands of consumers; 5) dummy for repair kit given/sent to consumers to repair the unit; and 6) dummy for item if it is scuba diving or mountain climbing equipment. Variables that were not significant included the number of months the product was distributed before a recall occurred; hazard rating ranking the severity of risk of injury; and product price.

A study by Hoffer, Priutt and Reilly, (1994) examined 108 National Highway Traffic Safety Administration (NHTSA) recalls between 1984 and 1986. The average recall rate after twelve months of initiating a recall campaign was 48.5%. The range was from 6% to 99%. Presumably, nearly 100% of owners are contacted by mail, as automakers are required to contact each state for current registered owners. Only two variables of interest were found to be significant: model year (older vehicles had lower recall response rates) and severity of defect (more severe defects witnessed higher recall response rates). The finding that older vehicles had lower recall response rates suggests that the time path of product failure (and of product ownership) is important.

Another study of NHTSA recalls was completed by Rupp and Taylor (2002) and examined which factors were associated with the highest recall response rates. Their sample included 465 recalls of which 283 appeared in the Wall Street Journal (WSJ) between 1980 and 1998. Although Rupp and Taylor did not provide response rates, their study showed that "high hazard" (i.e., more serious defects) recalls, those which were announced in the WSJ, those involving automobiles manufactured by the "U.S. Big Three," and whether it was the inaugural year of an automobile model were positively related to recall response rates. Whether a vehicle was three or more years older was inversely related to recall response rates. Thus, the Rupp and Taylor's results are consistent with those of Hoffer, et al. (1994) in terms of severity of the defect and vehicle age.

It is helpful to mention a few specific recall campaigns for which data are available. In a CPSC questionnaire, it was found that one company reported a 65% success rate for stoves and an 80% success rate for lawn mowers (McGuire 1974, p.21). In a Sears dishwasher recall, at least 59% of the affected units were repaired (see Diamond and Greyser 1977, p. 2). In the next section, response rates following resolution of class action suits will be discussed.

REVIEW OF RESPONSE RATES FOR CLASS ACTION SUITS

Table 3 presents response rates for various types of class action suits according to Newberg and Conte (1992). It is clear that the type of case and the method of notification impact the response rates. Several important caveats need to be mentioned. First, when class members are notified via mail, the quantity of undeliverables can seriously undermine response rates. For example, in *Liebman v. JW Petersen Coal & Oil Co*, (73 F.R.D. 531) of the initial 27,000 notices sent out, 8,533, or 32%, were undeliverable.

Second, response rates do not always reveal the true picture. That is, since each response may correspond to a different-sized monetary claim, there is a tendency for larger claims to be submitted and for very small claims to be ignored. Two examples help illustrate this point. In *Corona Construction v. Ampress Brick Co*, (376 F. Supp. 598) the notice of settlement was communicated by both publication and direct mailings to 2,400 purchasers. While only 188 claims were filed, they represented 55% of the sales during the damage period. In *Golden v. Gulf & Western Industries, Inc.*, (355 F. Supp. 574) proofs of claim were submitted by about 70% of the shares included in the class of 34,000 stockholders (see Fuchsberg 1973, p. 157). Because larger stockholders were probably more likely to respond than smaller stockholders, the response rate for the class was likely far below 70%.

IMPLICATIONS OF RECALL AND CLASS ACTION SUIT RESPONSE STUDIES FOR THE WOOD PRESERVATIVE EXAMPLE

Recall response rates, which measure the

Table 2
Factors Affecting Complaint Rates and Their Expected Impact on the Wood Preservative Complaint Rate

Factors Affecting Complaint Rates	Expected Impact on Wood Preservative Complaint Rate
Type of Product (Durable, Service)	Positive
Value of Good or Service	Positive
Severity of Problem/Magnitude of Loss	Positive
Nature of Problem (Clear-Cut vs. Ambiguous)	Negative
Ease of Complaining/Availability of Complaint Channels	Negative

Table 3
Response Rates When Common Fund Distributed Pro Rata Among Those Filing Proofs of Claim

Case	Type of Case	Notification	Claims Filed as % of Total Class Members
Antibiotic Antitrust Actions	Antitrust	Mail	8.18
Butkus v. Chicken Unlimited Enters	Antitrust	Mail	24.00
Folding Carton Antitrust Litig	Antitrust	Mail	43.87
Gypsum Cases	Antitrust	Mail and Publication	15.30
Liebman v. JW Petersen Coal & Oil	Antitrust	Mail	34.80
Entin v. Barg	Securities	Mail and Publication	38.84
Seiffer v. Topsy's Intl Inc	Securities	Mail and Publication	43.06
Karan v. Nabisco	Employment	Mail and Publication	52.45
Payne v. Travenol Laboratories	Employment	Mail	41.07
Revor v. Imperial Inventors Intl Inc	Consumer	n/a	48.13
Weston v. Traid Corp	Consumer	n/a	16.67

Source: Newberg, H. and A. Conte, *Newberg on Class Actions*, 3rd ed., vol. 2, 1992.

proportion of outstanding product that is successfully recalled, average around 50%. Note that for the first three factors outlined in Table 2, type of good, value of good or service, and severity of problem, a recall campaign is similar to the defective deck problem faced by a homeowner. In both cases, the product is a durable good, and the defect is not revealed for some period of time. Furthermore, the value of the product and severity of the problem are both, on average, relatively high for recalls and the rotting deck wood situation. It also should be noted that the Hoffer et.al. (1994) study found a positive relationship between the severity of the defect and recall response rates. This finding is

consistent with consumer complaint studies.

The complaint rate for defective decks may be less than the recall response rate due partly to the factors outlined in the last two rows of Table 2: the nature of problem and ease of complaining. In the case of recall campaigns, the problem and its cause are certainly not ambiguous; the problem is clear-cut and typically affects thousands of vehicles in exactly the same way. Compared to a recall campaign, the defective deck problem is more ambiguous. Consequently, one would expect a lower propensity to take public action, everything else being equal. In addition, for recall campaigns, a complaint channel is readily available, making it straightforward to take action. The consumer is notified by the manufacturer and simply has to take the vehicle to a dealer to repair or replace the recalled item. In the case of a rotting deck, the consumer has to initiate the complaint and the complaint channel is not as obvious, which would also tend to reduce the likelihood of complaining.

Another reason that the complaint rate in the defective deck example may be smaller than the average recall response rate is that there is a time lag between the purchase of the deck and the onset and realization of a defect. The recall rate literature found a negative relationship between the age of a vehicle and recall response. Similarly, complaint rates for rotting deck wood might be lower due to the time it takes for the defect to be revealed.

A related issue is the potential for homes to change hands. It has been estimated that houses change hands, on average, every seven to eight years (Engstrom and Huber 1997, p. 100). On the one hand, such turnover may cause the homeowner to be one or more steps removed from deck construction and decrease complaint rates, everything else being equal. On the other hand, turnover often involves inspections, which may lead to the discovery of the defective wood. Because of these two counterbalancing forces, it is difficult to determine the precise effect of turnover on complaint rates.

The response rate in class action suits, based on the figures in Table 3, averages around 35%. Note that this figure is lower than the average response rate of 50% for recalls. There is a straightforward explanation for class action response rates being lower than product recall response rates. Class action suits lack straightforward complaint channels in the following sense: class members need to file proofs of their claim. It may be very difficult to provide the appropriate proof to validate a claim. As a result, it is not surprising that class action response rates appear to be lower than product recall response rates.

All other factors being equal it appears that an upper bound in our hypothetical example for consumer complaints to the preservative supplier will be no more than 50%. The complaint rates for household repair problems, in which defects are more immediately noticeable, are approximately 50%, recall response rates when the consumer is notified of a defect are also 50%, and class action response rates are even lower. Given the inverse impact of elapsed time on the response rates for recalls, and the ambiguous nature of causation regarding a rotting deck, consumer complaints to the developer are likely to be diminished.

THE IMPACT OF NEGATIVE PUBLICITY ON SALES, MARKET SHARE, REPUTATION, AND COMPLAINT RATES

In determining the expected complaint rate, it is important to take into account the potential impact of negative publicity. If a program such as *60 Minutes* (or a local consumer action story) were to have a segment on rotting decks, the complaint rate would be expected to increase substantially. Besides the fact that many more homeowners would check their decks for signs of rotting, homeowners would be much more vigorous in determining the manufacturer and builder and taking action if problems were found. Publicity often generates complaints from consumers who do not even have a significant problem. It is reasonable to expect adverse publicity may come from sources such as an article in *The Wall Street Journal* or in other newspapers or periodicals, a story on *60 Minutes* or *20/20* or local consumer action programs; and class-action attorneys.

Before outlining several examples of the damaging effects of negative publicity, it is helpful to discuss mass media and negative information generally. The following quotation highlights the increasing influence of mass media and negative

information:

> Mass media have made it possible to diffuse negative information quickly to larger audiences. The diffusion of negative information is of particular significance to marketing managers because bad news typically has a higher profile in both print and broadcast media . . . Media observers have noted that the mere mention of an issue on the news makes a story important, possibly memorable, and perhaps worthy of being passed along to others. (Weinberger and Romeo 1989, pp. 44-5)

In short, the influence of mass media has increased dramatically in recent years, becoming a particularly effective conduit for the promulgation of negative information.

There is evidence that even relatively mild negativity can have serious effects. It has been written that most studies conclude that negative information is potent and, in some instances, more influential than positive information (Weinberger and Romeo 1989, p. 45). Researchers in psychology and consumer behavior have suggested that the potential vividness of negative information enhances subsequent recall of the message, while recall of mitigating circumstances is limited. This effect is strengthened by the tendency of mass media and word-of-mouth to be vivid and to avoid detailing circumstantial factors (see Weinberger, et al. 1991, p. 23).

Researchers have also found that the source and credibility of negative information are important. For example, in a study of negative product safety news, Weinberger, Romeo and Piracha (1991) note that television generates the greatest impact on the public and that negative television visuals magnify effects on viewers. Further, they find that a credible source has an immediate and severe effect on sales. There is a great deal of evidence linking adverse publicity to sales and market share declines.

The negative impact of adverse publicity on *future* sales and market share confirms the notion that there will be increased complaint rates on *past* installations of decks. In a sense, the only difference between the impact of publicity on future sales and its impact on complaint rates (arising from past sales) is *how* consumers respond. In the former case, consumers simply shift their purchases away from the company facing the adverse publicity. In the latter case, consumers, who cannot adjust *past* purchases, are likely to complain in response to bad publicity. One well-known example of the impact of adverse publicity follows.

The Audi 5000

The Audi 5000 was introduced in the U.S. in 1978. Beginning in March 1986, Audi started having problems with the 5000 model; the National Highway and Transportation Safety Administration (NHTSA) was petitioned to recall all Audi 5000s with automatic transmission for sudden acceleration syndrome. The model was recalled on March 19, 1986, and Audi's share of its submarket dropped from 14.9% to 10.5% in the months following the announcement.

A key question is whether the recall itself was responsible for the decline or whether adverse publicity was the culprit. Had there been no publicity, potential Audi owners would not have been aware of the problem because only existing owners would be notified by mail. Instead, Audi faced a scathing report on the 5000 model from *60 Minutes* in November 1986. The report included images of death and destruction and also claimed that Audi appeared arrogant by blaming the public for the acceleration problem. In January 1989, NHTSA cleared the Audi 5000 of the responsibility for sudden acceleration syndrome.

Although Audi won in a legal sense, Audi sales were impacted for many years. Audi, which had sold over 74,000 vehicles in the United States in 1985, sold an average of 14,000 cars in the U.S. from 1991-1995 (Beels 1998). Mary Sullivan (1990) completed a rigorous evaluation of the effects of the sudden acceleration controversy on Audi. Her analyses showed that the depreciation rates of Audi models which were not implicated in the controversy also were adversely affected as the Audi 4000 depreciated 9.8% more and the Audi Quattro depreciated 6.8% more than might be expected from 1986 through 1989 (Sullivan 1990, p. 325).

Other Negative Publicity

Martha Stewart's insider trading case provides a more recent and prosaic example of her assumptions about the likely effects of negative publicity. More generally, Peltzman and Jarrell (1985) demonstrated the adverse effects of the public notification of impending investigations by the FTC and other regulatory agencies on stock prices of the named firms. Finally, even erroneous negative publicity can have severe adverse consequences. The 1989 report by *60 Minutes* highlighting a link between Alar and cancer led to a one-third decline in sales of apples and cost the Washington apple industry $130 million in lost sales (see Dodd and Morse 1994, p. 18).

CONCLUSION

The objective of this research was to summarize the available evidence regarding research on consumer complaint rates and recall and class action response rates in order to estimate the likely complaint rate for product defects which are not revealed until after several years of product use. Although as noted in the introduction the data does not yet exist to allow development of a multivariate model to estimate complaint rates by product type, we can begin to develop a rough approximation. Extant research indicates that restitution complaint propensities range between 22% and 85%. Restitution complaint rates are positively related to the initial value of the good, the average cost of repair, the good being either a durable or service, and publicity about the defect. Restitution complaint rates are inversely influenced by the ambiguity of complaint channels and the ambiguity of identifying the cause of the defect. In general, complaint rates are positively related to socioeconomic status of consumers. Based on our reading of these results, we estimate the minimum restitution complaint rate for our deck example is 30%.

Since it is likely there will be a range in the severity of the problem affecting any individual consumer's deck and a range in the time span when the problem is identified, it is clear that not all consumers will complain. Thus, the upper limit on restitution complaints is likely to be much less than 100%. In our opinion, analysis of product recall responses rates and class action lawsuit response rates can be used to estimate an upper limit on the defective deck complaint rate, because typically the product recalls and class action notices are initiated many months or even years after the purchase. Additionally, since recalls typically involve safety issues with a range of severity and class action lawsuits involve consumers who have differing financial incentives to respond, a range in consumer response rates can be expected. These data lead us to estimate that no more than 50% of consumers who have a defective deck will complain publicly.

One important way in which the results from our research can be used is in product defects cases, such as described in the deck example. Damages experts can use these results, adjusted for characteristics of the situation, to estimate a range for compensatory damages. Then, these results can be used both by plaintiffs and defendants to determine reasonable outcomes for proposed settlements. While our range of estimates lacks the statistical rigor (e.g., confidence intervals) one desires it appears to be the best we can do given current limitations in publicly available data.

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