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Radials, Rollovers and Responsibility: An Examination of the Ford-Firestone Case

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ABSTRACT. In August of 2000, Firestone executives initiated the second largest tire recall in U.S. history. Many of the recalled tires had been installed as original factory equipment on the popular Ford Explorer SUVs. At the time of the recall, the tires and vehicles had been linked to numerous accidents and deaths, most of which occurred when tire blowouts resulted in vehicle rollovers. While Firestone's role in this case has been widely acknowledged, Ford executives have managed to deflect much of the attention away from themselves, mainly by claiming that the Firestone tires were not its product, and therefore not its responsibility. In this paper, we examine the extent to which Ford can be held morally responsible for the incidents at issue. In so doing, we develop an approach for determining when an item is a product in its own right, as opposed to a component of another product. We argue that such an analysis not only provides a better understanding of this case, but also more properly accounts for the extent to which evolutions in technology and business relationships can affect issues of moral responsibility in business contexts.

KEY WORDS: assembler, component, Firestone, Ford, part, partmaker, product safety, products liability, responsibility, sport-utility vehicles, tires

The Anatomy of a tire crisis

On August 9, 2000 executives of the Firestone tire corporation (a subsidiary of Bridgestone Corporation) announced the voluntary recall of an estimated 6.5 million tires – the second largest tire recall in the U.S. to date. The recall included the size P235/75R15 ATX, ATXII and Wilderness AT tires, many of which had been installed as original equipment on Ford's popular Explorer sport-utility vehicles (SUVs).[1] At the time of the announcement, these tires had been linked by the National Highway Traffic Safety Administration (NHTSA) and consumer advocacy groups to 270 complaints, 80 crashes and 46 deaths.[2] Most of these incidents involved Ford Explorers and occurred when tread separation caused blowouts that led to vehicle rollovers. Later, NHSTA would raise its figures to include over 100 deaths and 500 injuries involving such incidents, making this one of the most serious cases of product failure in US history.[3]

For months following the recall, the Firestone AT tires – and the Ford Explorers equipped with them – were widely discussed in the media. The gravity and complexity of the case make it worthy of more academic attention as well. Indeed, the case involves a bewildering tangle of ethical concerns, including questions of corporate responsibility, product safety and liability, corporate governance, government regulation, engeneering ethics, risk allocation, consumer access to product information, and international business practices. One especially interesting theoretical issue raised by this case – and the topic of this paper – is that the same set of accidents has been linked to two corporations, each of which seems to be the maker of a different product. Indeed, much of the debate about this case has been driven by opposing statements, made by Ford and Firestone executives, about *which* product caused the accidents and therefore, *which* company is responsible for the resulting injuries. As the public debate unfolded, the issue was framed around the question of whether Ford shared responsibility for accidents that seemed to be caused primarily by tread separation in Firestone tires. Jacques Nasser, Ford's CEO during this time, denied any responsibility on the part of Ford, and claimed that the problem was ''a Firestone tire issue, not a vehicle

issue''. Our contention will be that the Firestone tires and the Ford Explorer are not as separable as Nasser's comments suggest, and that Ford bears some moral responsibility for the accidents involving Firestone tire-equipped Ford Explorers. While we do not think that enough of the facts are fully settled to determine the precise numerical degree of responsibility that Ford bears, our analysis will suggest that it is similar in both nature and degree to Firestone's responsibility.

The massive and very public recall of the Firestone tires was simply the latest in a series of attempts to respond to a problem that had plagued the Explorer and its tires for years. The Explorer's problems had been discussed in company memos from as early as 1987.[4] Early tests on the Explorer prototype, code-named ''UN46'', indicated stability concerns. The Explorer was, in a word, tippy. The optimal way to address this problem would have been to widen the Explorer's wheel base and/or lower its center of gravity.[5] However, such changes would have delayed production more than the top Ford executives were willing to tolerate. Ford engineers offered a back-up plan: they suggested that the Explorer's stability problems could be partially addressed simply by lowering the tire pressure.[6] Ford chose this fix, and set an inflation pressure of 26 psi.

The tires to be used on Explorer had been designed by Firestone specifically for this vehicle; they were passenger vehicle tires designed to have the look of off-road vehicle tires. An inflation pressure of 26 psi was at the low end of the safety margin of 25-35 psi for such tires, and significantly lower than the 30-35 psi that would normally have been recommended for them.[7] Inflation pressure is one factor that determines how rigid the tire is: the lower the pressure, the more a tire flexes around the sidewalls. The more flexing, the more friction the tire generates, and the greater the friction, the more heat is produced. Thus, lowering the air pressure in the tires, ceteris paribus, increases the amount of heat they generate, and excessive heat damages tires.[8] How much heat is ''excessive''? That depends on the tire. Passenger vehicle tires are rated as A, B, or C according to how vulnerable they are to heat, with C being the most vulnerable, and A being the least. The Firestone AT tires installed on Ford Explorers were rated as C, which is the lowest grade legal for passenger vehicles.[9] In selecting C-rated tires and setting a low inflation pressure for them, Ford was choosing to subject tires that were not especially heat-resistant to conditions that could be expected to generate more heat than normal.

Another factor that can damage a tire is excessive vehicle load. Despite the large size of the Explorer, the recommended payload on the vehicle was a relatively modest 750–1310 lb (depending on model) – a payload that is easy to exceed with several passengers and a modest cargo load. This made it easy to ''overload'' the vehicle, and thus to put even more stress on the tires. Other SUVs had similar payloads, but used either larger (and thus more heat resistant) tires or recommended higher inflation pressures (or both) in order to provide an additional safety margin for over-loaded vehicles.[10]

If the Firestone tires had been of higher quality, these factors might not have caused significant problems. However, from an early date, Ford had reason to suspect that the Firestone AT tires may have been of questionable quality. As early as 1989, Ford had the results of independent tests performed on the tires at its request by the independent Arvin/Calspan testing company that showed that ''certain Firestone tires being considered for use on the Explorer ''showed a severe tread package'' separation from the tire carcass at 29 psi of pressure''.[11] However, Firestone disputed the realism of these tests and claimed that it had secured more satisfactory results from its own in-house tests done under different test conditions. Firestone claimed that even at the lower pressures Ford was then considering, ''we don't think it will be a problem.''[12]

Evidently, Firestone's assurances were good enough for Ford. Ford went ahead with its decision to use the Firestone tires on the Explorer, and to set the tire pressure to 26 psi.[13] The Explorer was introduced to the American market in 1990. The first tread separation lawsuit against Ford and Firestone was filed shortly thereafter, in February 1991. But worse problems were to come. Soon after the first Explorers went to market, tests showed that the Explorer's fuel economy was less than satisfactory. In part this was a result of the lowered inflation pressures adopted to deal with the Explorer's stability problem. The fix Ford chose was to decrease the ''rolling resistance'' (roughly, the ''squishiness'') of Explorer's tires. Three modifications to the tires could produce this result: the inflation pressure could be increased, the tires could be made to in-

corporate special materials that would lower the rolling resistance, or the tires could be made lighter. The first method was unacceptable, since it would undo the fix that was made to address the Explorer's stability problems. The second method interfered with the tire traction in an unacceptable way. That left only one option: to make the tires lighter. On Ford's instructions, Firestone reduced the weight of the tires by about 10% in 1994. The weight reduction involved several modifications to the tire, some of which involved removing material from its components.[14]

By the mid-1990s both Ford and Firestone had already quietly settled lawsuits over accidents related to Explorer and its tires.[15] But after the 1994 weight reduction in the Firestone tires, the problems with the Firestone-Explorer combination increased rapidly.[16] A pattern of accidents emerged in which the tire's tread literally peeled away from the tire body, causing the Explorer to become incontrollable and often to roll over–frequently with tragic results. Victims sued both Ford and Firestone. These lawsuits, along with internal company documents, indicate that both companies were well aware of, and attempting to deal quietly with, many of the problems with the Explorer-Firestone AT combination long before they came to public attention.[17] Out of court settlements and confidentiality agreements were the order of the day.

For some time, this campaign of secrecy was quite successful: It was only in 1998, after State Farm Insurance Company reported to NHTSA data concerning the abnormal rate of accidents resulting from Firestone-equipped Ford Explorers that the issue became an item of interest to NHTSA. NHTSA did not open a formal investigation probe until May 2000. Why this is so remains a difficult question since, as was pointed out at the Senate Committee on Commerce, Science, and Transportation hearing on the recall, by 1998 NHTSA had received 21 damage claim reports on Firestone radial failures (the majority on Ford Explorers) dating back to 1992, and NHTSA ''often opens a defect investigation on as few as two complaints''.[18] Part of the problem, as several participants in the hearings testified, was that NHTSA had been stripped of resources over the years and also lacked the kind of authority necessary to investigate with any real degree of effectiveness. As Chairman John McCain put it, ''currently, NHTSA plays the role of a toothless and declawed cat in a game of cat and mouse with automakers''.[19] While NHTSA was investigating whether to investigate, Ford began tire replacement programs in Saudi Arabia in 1999, and in Venezuela in 2000, after similar patterns of accidents emerged in these countries.[20] Unfortunately, NHTSA had no authority to request recall information from foreign countries, and Ford did not volunteer it.[21]

At the time of this writing, absolute proof about what caused these accidents has yet to be established. However, a large body of evidence strongly suggests that several factors interacted to produce the deadly accidents. Tire experts have pointed to possible design flaws in the tires, to defects or weaknesses stemming from materials and processes used in their production, and to possible manufacturing irregularities at the Decatur, Illinois Firestone plant that produced most of the tires that failed.[22] However, whatever weaknesses or flaws may have existed in the tires, it is almost certain that the stability problems in the Explorers also played a crucial role in the accidents: the lower tire pressures which were Ford's chosen method for coping with these stability problems almost certainly exacerbated whatever flaws or weaknesses existed in the tires themselves. It is worth noting that, between 1996 and 1998, Ford had been buying some tires for Explorer from Goodyear. (To its credit, Goodyear discontinued this relationship because it felt that it could no longer meet the specifications and price demanded by Ford and still live up to its own quality standards.[23]) The Goodyear tires, when equipped on Explorers and inflated to the same low pressures as the Firestones, performed somewhat better than the Firestone AT tires.[24] This suggests that the Firestone tires were not as ''robust'' as those made by Goodyear. On the other hand, the Firestone tires apparently suffered a greater failure rate from tread separation, when mounted on Ford Explorers than on other vehicles.[25] These facts strongly suggest that there was some sort of underlying weakness in the Firestone AT tires – a weakness not present in Goodyear tires made to similar specifications – that increased their propensity for tread separation, but that this propensity was significantly exacerbated when the tires were installed on Ford Explorers.

Furthermore, stability problems displayed by SUVs in general and by Ford Explorers in particular

also seem to have exacerbated this problem.[26] In general, SUVs are far more likely than other passenger vehicles to be involved in rollover accidents. Indeed, at the Joint Congressional Hearing on the Ford/Firestone recall, committee member Peter Deutsch remarked that "SUVs, by definition, have a rollover problem".[27] In some respects, then, general design features of SUVs seem to have contributed to the *kind* of accidents—the dangerous vehicle rollover–that often resulted from tread separation on Explorer. Other data suggest that problems resulting from the particular combination of tire failures and rollovers are more pronounced in the case of the Ford Explorer. For instance, a study of NHTSA's database focusing on over 3500 reports of tire failures found that the rollover-to-tire-failure rate on the Ford Explorers was 13% as compared to a rate of only 3% for all other SUVs and light trucks.[28] Another study by the *Washington Post* of accident data from Florida found that "no other SUV has an equipment problem as strongly related to accidents as the Explorer's blowout problem", and that the Explorer was "53% more likely to roll than other compact SUVs when an equipment failure, such as a blowout, occurred".[29]

Finally, although we will not discuss driver negligence in any detail, it is certainly worth noting that failures by drivers to maintain their tires properly and to drive responsibly may have contributed to some of the accidents.

Responding to the crisis: Ford and Firestone react

As the public learned the extent of the problems with Firestone-equipped Explorers, Ford and Firestone responded by attempting to divert blame from their own companies. Masatoshi Ono, then CEO of Firestone, responded to the Houston television station KHOU's report on the accidents by suggesting that they could be attributed to driver error and poor tire maintenance by consumers.[30] Throughout the early stages of the media coverage of the Ford–Firestone tire crisis, Ono's defense of Firestone involved a persistent denial that the tires were defective or that the company was at fault for the accidents. Even when Firestone's own internal investigation found evidence of material and design irregularities in the AT tires, Firestone attempted to shift much of the blame onto Ford for recommending inappropriately low air pressure for the tires, and continued to stress the role of consumer maintenance.[31] Ford's CEO at the time, Jacques Nasser, maintained from the very beginning that the problem was Firestone's fault. Nasser forcefully asserted that the cause of the accidents had nothing to do with the auto-maker, stating that "this is a Firestone tire issue, not a vehicle issue".[32]

In the court of public opinion, Ford faired much better than Firestone. Firestone's initial attempts to blame the victims, along with its failure to respond quickly to the problems in the first place, did not endear it to the public. Ford, however, was relatively successful in deflecting public attention toward Firestone. Public opinion surveys indicate that the crisis affected confidence in Firestone much more than it affectd Ford. While 81% of those surveyed in one poll held Firestone responsible for the accidents, only 8.5% held Ford responsible. And while nearly 65% of respondents indicated that the incidents would influence their decision to buy Firestone products, only 35% indicated that they would influence their decision to purchase Ford products.[33] This data suggests that the public largely accepted Ford's claim that it is not to blame for failures of Firestone tires installed on its vehicles, or for the resulting accidents.

Whose product? Which company?

Nasser's claim that "it's a tire problem and not a vehicle problem" suggests that the Firestone tires are an independent product distinct from the Ford Explorers on which they were installed. After all, one would never say, for instance, that something is "an engine problem and not a vehicle problem" since an engine problem *is* a vehicle problem. To say that something is a tire problem rather than a vehicle problem suggests that the *Explorer* is *Ford's* product, while the *tires* are *Firestone's* product. This suggestion merits closer examination.

It is important to keep in mind that Ford did more than simply sell the Firestone AT tires. It dictated – and indeed revised – many of the specifications that Firestone used in designing the tires, and it determined the air pressure to which they were to be inflated. Indeed, the design of the Firestone AT was a "cooperative effort" between Ford and Fire-

stone.[34] That Ford and Firestone would undertake such a cooperative effort should be undertaken is not surprising, given the complexities of the engineering processes involved in designing both tires and vehicles. It is even less suprising given the deep and long-lasting business relationship between Ford and Firestone. This relationship was based on a history of strong personal and family relationships dating back to 1908, when Harvey Firestone supplied Henry Ford with tires for his new Model T. The business relationship was further cemented by friendships among members of these two families. Henry and Harvey's grandchildren – William Clay Ford and Martha Parke Firestone – married in 1947. Ford Chairman William Clay Ford Jr. is a descendant of the founders of both companies.

Given the history of the two companies and the involvement of Ford in the specification of the design parameters of the Firestone AT tires, it would be misleading to characterize Ford as a mere middleperson (or ''conduit'') for tires which Firestone designed and manufactured completely on its own. While these corporations are distinct entities, they had complex relationship with each other.

One way to characterize the relationship between the two companies would be to see Firestone as a component-part supplier to Ford. The tires would then be seen as a component part in the finished product – namely the complete, ready-to-drive Ford Explorer. On the other hand, we could see Ford as a mere conduit or middleperson for Firestone. Viewed from this perspective, Ford would be the manufacturer of a product (the Explorer sans tires) that requires another separate product – a set of tires – before it can be used. On this view, Ford arranges to sell consumers a set of Firestone tires along with its own product, namely the Explorer. This way of seeing things would put Ford in the role of a mere retailer of tires, but a producer of vehicles.

The difference between these two ways of viewing the relationship between Ford and Firestone may seem merely semantic or trivial, but it turns out to have profound moral and legal implications.

Assembler or retailer: The moral dimensions

We are generally inclined to place greater moral responsibility for defects in a product on its manufacturer than on its seller. This intuitive distinction has a solid foundation in well-established approaches to moral responsibility. Deontological approaches to moral responsibility typically adopt some version of Kant's famous ''ought implies can'' principle, which holds that one can only be morally obligated to do something that one is capable of doing.[35] Accordingly, the deontological approach typically sees it as being improper to hold an entity morally responsible for something that it could not have avoided. Since a mere seller does not create a product, it lacks any direct control over whether it is defective. For this reason, a deontological approach to responsibility will typically regard it as unreasonable to hold sellers morally responsible for the existence of defects in products.[36] Of course, a seller may be responsible for the transfer of a defective product to a consumer (since it could in principle test the products it sells and refuse to sell any defective or untested products). However, the manufacturer is also responsible for a similar transfer of a defective good – the manufacturer transfers it into the ''stream of commerce'' with the intention that it eventually reach a consumer. Thus, whatever responsibility the seller might have for transferring a defective product to someone else, the producer has the responsibility for a similar transfer in addition to the responsibility for having produced the defective product in the first place.

A utilitarian approach to moral responsibility would seen to require placing moral responsibility, where it will do the greatest good. Typically, this means locating responsibility at the point at which it will have the greatest effect on reducing harmful behaviors without imposing excessive costs on society. The utilitarian approach to responsibility, like the deontological approach, favors locating moral responsibility for the existence of product defects on the producers rather than the (mere) sellers. Doing so gives producers a strong incentive to adopt production processes that will result in the safest products possible. No entity is typically better placed to detect and prevent defects than the producer, and so typically no entity will be able to detect and prevent such defects at a lower cost. Of course it may be physically possible for a seller to detect defects or to influence producers to make safer products. However, these methods of detecting and preventing of defects will generally be less efficient than having the producer detect and prevent defects. Since costs of detecting and preventing defects will be passed on to consumers,

the lower these costs are, the better the outcome is for society as a whole.

Thus, both major theoretical approaches to moral responsibility agree with a general rule that the entity that exercised control over the process by which the product came into being is the proper entity to hold morally responsible for any initial defects in the product. It appears, then, that the common intuition that retailers are not morally responsible for the mere existence of manufacturing or design defects in the products they sell (unless, perhaps, they had more influence over their creation than a mere seller typically does) has a solid foundation in well-established philosophical approaches to moral responsibility. Both approaches support the intuition that manufacturers are the primary bearers of moral responsibility for the existence of (initial) product defects, and that it is unreasonable to require mere sellers to take moral responsibility for the mere existence of defects that they have no practical way to discover or prevent.

Clearly there is substantial philosophical rationale for holding that creating a product creates a stronger obligation than merely selling it. Producing a product makes the manufacturer causally responsible for the existence of the product, while merely selling a product makes the seller causally responsible only for the transfer of the product from one person to another. In effect, responsibility tracks control: the entity that controlled the creation of the product bears moral responsibility for whatever initial defects exist in it or whatever harms might result from its recommended use.

Notice that this analysis does not change simply because the producer creates the new product by using components supplied by some other company. Because it is creating a new product, and not merely passing on the items produced by the other company, it has taken on causal responsibility for the existence of something new, namely the new composite product. Since moral responsibility tracks causal responsibility, it follows that a manufacturer retains a significant degree of moral responsibility for the composition of a product even when it employs components supplied by another company. Such a company retains control over whether these components are included in the product that it is calling into existence and with that control comes responsibility.[37]

A brief look at the legal background

While the focus of this paper is on moral rather than legal responsibility, the legal and moral issues in the Ford–Firestone controversy are so tightly interwoven that it is not possible to discuss one without at least some discussion of the other. Accordingly, we offer here a brief discussion of the legal doctrines that form the background of the Ford–Firestone controversy.

Products liability law can be seen as a compromise between several different moral ideas about the appropriate way to address harms arising from defective products.[38] Some of these ideas are purely utilitarian, and reflect the goal of achieving an incentive and compensation structure that most efficiently balances the costs and benefits of preventing and addressing harms resulting from defective products. Some are deontological in character, and are concerned with making a wrongdoer pay restitution for the harmful results of actions for which s/he is morally culpable. Some are based on considerations of justice, and are concerned with determining the fairest means of paying the costs of injuries resulting from defective products.[39]

These three basic moral concerns – utility, deontological conceptions of moral responsibility, and justice – provide a kind of moral underpinning for products liability law. However, they do not always point in the same direction, and throughout the history of American products liability law, the balance of emphasis has shifted back and forth between them. Thus, e.g. during the late 1800s, the prevailing legal doctrines prevented a person injured by a defective product from collecting compensation from a party with whom s/he did not have an explicit contractual relationship.[40] The rationale for this so-called ''privity barrier'' was that allowing injured parties to sue parties with whom they had no contractual relationship (''privity'') would lead to a profusion of lawsuits that would have a pernicious effect on the developing free enterprise system from which society as a whole was thought to benefit. This doctrine gave manufacturers an incentive to sell through retailers, and thus to develop the kinds of retail distribution networks that are a hallmark of the modern economy. Yet as these networks developed, and as products became more complex and difficult to inspect, the privity barrier seemed increasingly

arbitrary and unfair to consumers. For a consumer injured by a defective product bought from a non-manufacturing retailer would typically go uncompensated (unless the seller had offered a warranty), but a consumer injured by a defective product bought directly from a manufacturer could receive compensation.

This apparent unfairness contributed to the gradual eroding of the privity doctrine. In its ruling on the landmark 1916 case of *MacPherson v Buick Motor Co.* (217 N.Y. 382, 111 N. E. 1050), a New York court more or less abolished the ''privity barrier''. The case is interestingly similar to the Ford–Firestone case: Buick contracted with a supplier to produce wooden wheels for its automobiles; rot in one of them caused it to fail, which caused an accident. In rejecting Buick's argument that the problem was a ''wheel problem and not a vehicle problem'', Justice Cardozo wrote that ''the defendant was not absolved from a duty of inspection because it bought the wheels from a reputable manufacturer. It was not merely a dealer in automobiles. It was a manufacturer of automobiles. It was responsible for the finished product. It was not at liberty to put the finished product on the market without subjecting the component parts to ordinary and simple tests. . .''[41]

The *MacPherson* ruling was soon adopted in most U.S. jurisdictions, and this provided injured consumers with a much greater chance of receiving compensation from the manufacturers of the products whose defects caused their injuries. However, the injured consumer usually still had to prove not only that the product was defective, but that the defect resulted from manufacturer negligence.[42] Many people still regarded it as unfair that a defective product might cause an injury for which the victim might go uncompensated simply because the manufacturer had made an unsuccessful effort to manufacture the product carefully.

This perception of unfairness was one of the main justifications for the new doctrine of products liability, known as strict liability in tort, which was introduced in a series of decisions, the most important of which were the 1944 California case of *Escola V. Coca Cola Bottling Co. of Fresno* (24 Cal.2d 453, 150 P.2d 436), the 1960 New Jersey case of *Henningson v. Bloomfield Motors, Inc.* (32 N. J. 358, 161 A.2d 69), and the 1963 California case of *Greenman V. Yuba Power Products, Inc.* (59 Cal.2d 57, 377 P.2d 897). The doctrine of strict liability that these decisions introduced was soon adopted by other courts, and is now recognized, in some form or another, by virtually all U.S. courts. The idea of strict liability is that the maker of a product is legally liable for any injury resulting from a manufacturing defect in its product, regardless of how careful it was in producing the product.[43]

This doctrine was introduced in part as an explicit response to considerations of distributive justice. Basically, the idea is that when a person is injured by a defective product, *someone* will have to bear the costs, and it seems most fair that the party profiting from the production of the defective product should be the one to do so.[44] Utilitarian considerations were also advanced in support of strict liability: holding manufacturers strictly liable for injuries resulting from defective products provides them with an incentive not only to exercise enough care to avoid a finding of negligence, but also to invest in the development of new technologies to make products ever more safe and reliable.[45]

Let us turn now to more specific legal issues relevant to the Ford–Firestone controversy. Of particular importance is the legal liability of manufacturers (often called ''assemblers'') of products that include component parts made by other companies (often called ''partmakers''). Even when a component was made by the partmaker in such a way as to contain a defect before it ever reached the control of the assembler, the assembler can still be held at least partially liable for accidents resulting from the defects in that component.[46] However, in such a case the maker of the defective component is typically also held at least partly liable.[47]

The situation is somewhat more complicated when a non-manufacturing (''mere'') retailer sells a defective product.[48] From the time when strict liability was first introduced, courts in influential states (such as California) have held that the same strict liability for defective products that applies to the maker of the product also applies to its seller.[49] This doctrine has become sufficiently standard that both the second and third Restatements of Torts cite it as the prevailing law. Subjecting mere sellers to strict liability can arguably be justified in terms of social utility (since it provides incentives for sellers to take a greater interest in product safety) and distributive

justice (since it seems more fair for a seller to bear the costs associated with defective products than for the injured consumer to do so). However, there has been a growing movement to limit the legal liability of non-manufacturing sellers. Some courts have simply refused to hold non-manufacturing sellers liable for defects that existed in products at the time they were delivered from the manufacturer.[50] In addition, many jurisdictions have "shield laws" that prevent a plaintiff from suing a mere retailer for defects in a product that it did not produce when the manufacturer is available to be sued instead.[51] And even in jurisdictions where it is possible to sue a mere retailer of a defective product, it is normally possible for the retailer to recover from the manufacturer whatever damages it had to pay to the plaintiff.[52] So in most jurisdictions, the manufacturer is the main target for injured plaintiffs, while retailers are generally able either to avoid legal liability for defective products that they did not create or to shift the costs of compensating injured consumers back to the manufacturer of the defective product that caused the injury.[53]

These developments seem to reflect the intuitions underlying the deontological approach to moral responsibility discussed earlier. The non-manufacturing seller, after all, does not create the defect that causes the injury, and it seems to violate deontological conceptions of responsibility to hold a party morally responsible for the existence of a hazard that it did not create. The creation of a product gives the manufacturer a moral connection to it that is much more intimate than the connection that a mere seller has to the product. The manufacturer of a defective product creates a hazard that did not exist previously. The seller merely moves it from place to place. While this latter action may be the basis for *some* moral responsibility for the seller, it seems reasonable that it would be significantly less than the moral responsibility that attaches to the entity which not only first places a hazard into the stream of commerce that leads to the consumer but also creates the hazard in the first place. This, at any rate, seems to be the moral rationale for the current legal trend of placing primary legal responsibility for defective products mainly on their manufacturers rather than on their sellers. (Ford's attempt to portray the tires and the vehicles as separate products, and thus to portray itself as a mere retailer for the tires, seems to be an attempt to tap into this line of thought).

Thus, we can see that products liability law reflects — though not always perfectly — moral ideas about fairness, the efficient balancing of socially beneficial goals, and moral culpability. Since these ideas sometimes conflict with one another, and since its evolution has been influenced by precedent, political factors, and specific legislative enactments, products liability law will sometimes assign legal responsibility in ways that may not exactly match either our moral intuitions or the implications of a particular philosophical approach to moral responsibility. Nevertheless, there are significant connections between legal conceptions responsibility and moral conceptions of responsibility, and much of our analysis of the moral dimensions of this case is likely to apply to at least some of its legal dimensions.

Retailers versus assemblers: How to tell the difference

It appears, then, to make a significant difference to both moral and legal responsibility whether Ford was merely a retailer for tires or whether it was the assembler of a composite product consisting of the Explorer and its tires. Of course, even if we decide that tires should be viewed as a component of the Ford Explorer, this would not absolve Firestone from responsibility for defects that might exist in those tires. For if — as the evidence suggests — the tires were of lower quality and strength than they could and should have been, then Firestone should bear the moral and legal consequences. So the question is not whether Firestone should be absolved of responsibility for whatever defects may have been present in the tires. Rather, it is whether Ford should bear a kind and amount of moral and legal responsibility that is similar to that which Firestone should bear. The preceding discussion suggests that that a proper determination of Ford's moral, and perhaps legal, responsibility will depend partly on whether the tires are best seen as a separate product "bundled" with the Explorer, or as a component of the vehicle. If the former, then Ford merely moved a hazard from one party to another; if the latter, then

Ford, as manufacturer of a complex product which includes the tires, helped to produce a hazard as well.

Traditionally a set of tires has been viewed as a separate product, ''bundled'' or sold along with the vehicle, in much the same way that a battery might be packaged with a flashlight. The practice of having separate warranties for tires seems to reflect this understanding: if the tire is a separate product, it makes perfect sense for its maker, the tire company, to provide the car buyer with a separate warranty for it. Thus, while the tire came with the car and was indeed mounted onto the car, it has been regarded as a separate product in its own right. However, we contend that the new realities of tire and vehicle manufacturing render this view untenable, that advances in technology have changed the relationship between a vehicle and its tires, and that these changes may require us to modify our initial intuitions about who is responsible for their safety.[54]

Our analysis of the relationship between tires and the vehicle will proceed by analogy. We will examine what we take to be two clear cases, one in which an item is clearly a component of another product, and the other in which it is not. We will attempt to isolate those factors most salient in determining whether an item is a component or a separate product. We will then use these factors to attempt to determine whether the Explorer's tires are best seen as components of the Ford Explorer or as separate products.

Our two clear cases will be the head gasket in the engine of a car, and the batteries in an ordinary, non-disposable flashlight. Notice that in both cases, we have one item that must be installed in a second item in order for that second item to function in the normal way. However, there is an important difference. The head gasket seems to be a clear case of a product that is so integrated into the ''main'' product (the car or, perhaps, its engine) that it seems obvious that it is a part or component of the other product. We take it that the flashlight battery is not a true component of the flashlight in the same way that the gasket is a component of the engine. Even if the batteries came with the flashlight, they seem to be a distinct product in a way that the head gasket is not. Intuitively, a defect in the head gasket seems to be a defect in the engine, whereas a defect in a flashlight battery does not seem to be a defect in the flashlight. For example, we would generally not say ''The engine is fine; it's just got a bad head gasket'', though we often do say ''The flashlight is fine; it's just got bad batteries''.

Of course, the head gasket is a product of the company that makes it. There is, of course, a sense of the word ''product'' that applies to any item that is produced. But an item is a component part of another product if it is integrated into the larger product in such a way that from the consumer's point of view it no longer makes sense to regard it as a separate product. From the point of view of the car buyer, the head gasket is so fully integrated into the vehicle that it does not properly count as a separate product at all, but rather as a component of another product. In a sense, the car buyer is not a consumer of the head gasket per se. Rather, she is a consumer of the larger product into which the head gasket is integrated.

So the head gasket seems to be a component of the car in a way that the flashlight battery is not a component of the flashlight. But what does this difference amount to? We see three factors as being most salient in our commonsense judgment that the head gasket is so integrated into the vehicle as to be a component part of it, whereas the flashlight battery remains a separate and distinct product in its own right.

First, the flashlight battery is interchangeable in a way that a head gasket is not. Many different companies make flashlight batteries, and any one of them that is the right size can be used in the flashlight.[55] In addition, the batteries that power the flashlight can be used in a wide range of products having very few features in common. Thus, I can easily take the batteries out of my flashlight and use them to power a radio or a novelty talking fish, or a small electric fan, or any of a vast array of very different products that take the same size battery as my flashlight. By contrast, head gaskets are not interchangeable in this way. While replacement gaskets may be made by other companies besides the one that initially supplied the gasket to the auto maker, each gasket is specifically engineered for a particular car engine. For instance, one cannot take the head gasket from a Honda Accord and put it into a Ford Taurus, even if the engines in the two cars are very similar in size. The criterion of interchangeability versus specialization seems relevant, then, to the question of whether an item is a separate product or a component of some other, more complex product.

Second, replacing the flashlight battery requires no specialized knowledge. The batteries are easily removed and replaced by the consumer. The consumer is expected to change the batteries herself, in fact. By contrast, few consumers have the skills necessary to change their own head gaskets, and the acquisition of such skills is no trivial matter. In fact, the automobile manufacturer typically encourages consumers *not* to replace their own head gaskets. Instead, most car-makers have a certification system for identifying personnel with the proper aptitude for such jobs, and training programs to teach those skills. Ease of replacement, then, seems to be a second factor that is relevant to the question of whether we have a component that is integrated into another product, or whether we have two separate products merely bundled together.

Third, a head gasket is designed to fit the engine, but the flashlight is typically designed to fit the battery. One would normally design a flashlight to take one of the several standard sizes of battery. Thus, one would decide whether one was designing a small, easily carried penlight, or a large, bright, durable flashlight suitable for security guards. This choice would dictate which *size* of battery one's new flashlight would use, but by and large, one would typically design a flashlight to take *some* standard sized battery.[56] There is simply a standard, pre-existing, range of battery types available that the engineers of (non-disposable) flashlights can make use of when designing their product. On the other hand, with many automotive parts like the head gasket, the order of design runs the other direction, so to speak, with the component being designed specifically for the product in which it will be used. One does not design an engine specifically to fit a certain, pre-existing head gasket. Rather, the engine is designed first, and its design dictates the design of the gasket. The fact that an engineer designs an item to fit into the larger product she is designing is a strong indication that the item is a component of the larger product, even if it is eventually supplied by an outside company. In other words, the extent to which the design of item X is dictated by how it functions in the design of item Y helps to determine the extent to which X is a component integrated into Y.

So we have identified three main factors that distinguish the clear case of a head gasket, which is clearly a component of the vehicle, from the case of the battery, which is clearly a separate product that might nevertheless be "bundled" and sold with a flashlight. The first is a relative specialization. The second is ease of replacement. The third is what we might call the direction of the "engineering fit" between the item and the larger product – the item's design is dictated by the design of the product with which it is to be used.

It is important to note that all three of these factors admit of degrees. First, an item may be more or less specialized, depending on how many other manufacturers make a suitable replacement. An item made exclusively by one manufacturer is more specialized, and thus less interchangeable, than one made by a number of different manufacturers. Similarly, an item that can be installed on a larger number of different products is less specialized than one that can be installed on a smaller number of other products. Second, the ease of replacement is likewise a matter of degrees. At one extreme, it may require specialized equipment and proprietary information available only to persons licensed by the manufacturer of the larger product. A less extreme case would be an item that the average person cannot replace, but which can be replaced by someone who has above average mechanical skill and experience. Finally, the extent to which the design of the part is driven by the design of the larger product is a matter of degrees as well. The greater the number, extent, and importance of the constraints placed on the item by the design of the larger product, the more the item is integrated as a component of the larger product.

The fact that each of these factors admits of degrees implies that the property of being a component also admits of degrees. This is less counterintuitive than it may at first sound, if we think in terms of the notion of integration, which is a concept that does seem to admit of degrees. To be a component is to be integrated into a larger product and integration admits of degrees. Thus, an item is a component of another product to the degree that it is integrated into that other product, where integration is defined in terms of the three factors we have discussed above – factors which admit of degrees. This conclusion has an important implication, namely that there can be intermediate cases, in which an item is what we might call a "quasi-component". A quasi-compo-

nent is not a separate product, although it is less fully integrated into the more complex product than a ''full'' component like a head gasket.

Interestingly, modern vehicle tires seem to be just such an intermediate case. They are not separate products in the way that a battery is separate from a flashlight, but they are not as fully integrated into the vehicle as a head gasket is. In terms of interchangeability, modern vehicle tires seem to lie about midway between flashlight batteries and head gaskets. They are still interchangeable with tires of a specific type made by other companies (for example, one could replace Firestone tires on an Explorer with similar tires made by Goodyear). But they are rather more specialized than flashlight batteries, and they are significantly more specialized now than they were thirty years ago. For many vehicles, it is not enough simply to walk into a tire store requesting a set of, say, 16-inch tires. To maintain the proper performance characteristics of the vehicle, it is often necessary to choose from a much more limited range of replacements.

Similarly, in terms of ease of replacement, tires lie somewhere between flashlight batteries and head gaskets. Like flashlight batteries, vehicle tires do require replacement. And unlike a head gasket, replacing tires does not require a major disassembly of the vehicle. But on the other hand, tires are rather unlike flashlight batteries in that very few consumers mount and balance their own tires. To be sure, the task does not require training or knowledge that is proprietary to the vehicle manufacturer or that is very much more demanding than changing spark plugs. The main barrier, it turns out, is equipment. But while the equipment needed to mount and balance tires is certainly out of reach of the average amateur mechanic, is not out of the price range of vast numbers of small businesses and tire replacement franchises.

In terms of engineering direction of fit, tires again constitute an intermediate case. It is increasingly common for a vehicle manufacturer to contract with a tire maker to provide original equipment tires designed to fit the specifications of a particular vehicle. The case of the Ford Explorer, in fact, illustrates this development quite nicely. As we noted earlier, Ford provided specifications to Firestone and approved the final design of the Firestone AT tires that were to be original equipment on the Explorer. Internal documents and depositions from engineers at Ford and Firestone show that the engineers who designed the Explorer exerted an important influence over the design of the tires. Certainly the designer of an ordinary flashlight would not normally expect to exert that same level of influence over the design of the batteries to be supplied with it.

In fact, Ford's own engineers seem to have treated the tires as a component of the complex vehicle they were designing. Ford's engineers used tire inflation pressure as a variable available for manipulation in their attempts to address Explorer's stability problems. Later, engineers instructed Firestone to make the tires lighter in order to improve Explorer's fuel efficiency. Thus Ford's engineers did not treat the tires as an independent product whose nature was already given, as batteries are for the ordinary producers of flashlights, but as one element among others in the overall system of the vehicle that they were designing. This suggests that, wittingly or not, Ford was integrating the tires more fully into the vehicles they were producing. By these actions, Ford was helping to turn what may have once been a separate product into an item that was at least a quasi-component of the vehicle they were producing. Ford's activities here are a part of a larger trend toward treating tires as an integral part of the ever more complex vehicles on which they are mounted. As vehicles become more complex and carefully engineered this trend is probably inevitable. In fact General Motors recently became the first U.S. automaker to provide its own warranty for tires installed on its vehicles.[57]

Moral responsibility for component parts: A deeper analysis

It appears, then, that we should reject Nasser's claim that the Firestone AT tires are a completely separate product from the Ford Explorer. The reality is that they are at least a quasi-component of a very complex product of which Ford's engineers were the designers, and which was assembled by Ford. In other words, the tires were, in very important respects, far more than mere separate products ''bundled'' or sold along with the Explorer. If this is

correct, then any analysis of Ford's responsibility for the defective tires requires an account of the responsibility of an assembler for defects in components supplied by another company.

We take it that if a company produces a product, then it has a duty to ensure that it is free from dangerous defects. Now, it seems clear that an assembler retains an over-arching moral responsibility for the product as a whole – a responsibility that is more than the sum of the responsibilities for each individual component. One aspect of this over-arching responsibility involves the assembly process. This "assembly responsibility" for the actual putting together of the components and raw materials to form the composite product is distinct from the responsibility that the component makers have for making safe and non-defective components.

The assembler also normally bears responsibility for the design of the composite product. This "design responsibility" is also distinct from the responsibility of the partmakers for making safe and non-defective components; it is the responsibility for designing a safe and non-defective composite product into which those components will be integrated.

When a company undertakes to design and assemble a product, it undertakes a duty to carry out these processes in a manner that does not make the final product defective or unreasonably dangerous. Clearly, if things go wrong in the design or assembly of the composite product, the assembler is responsible morally, and more than likely legally as well.[58] In the absence of a valid exculpatory excuse, such a company has violated the duty to carry out those processes for which it is responsible in a manner which does not introduce dangerous defects into the final product.[59]

Both the design and assembly responsibilities of assemblers are widely recognized in discussions of responsibility for product safety in the legal and business ethics literature. But what is less often noted, but equally implied by the assembler's over-arching responsibility for the composite product, is a responsibility for the *choice* of components and suppliers thereof. The assembler has ultimate responsibility for the safety of the composite product. The composite product *is* the assembler's product, and the assembler is just as fully responsible for it as any producer is for the safety of its product. Part of what the assembler does in producing the composite product is to choose appropriate components and to determine how they are to be integrated with other components and raw materials to form the composite product. Call this third aspect of assembler responsibility "component selection responsibility". The over-arching duty to carry out design and production processes in a manner that does not introduce defects into the final product implies that the assembler, in undertaking to select components to be assembled, also undertakes a duty to choose appropriate components and raw materials from which to produce a composite product that is safe for consumers.

To examine our claim that there is a duty of this sort, consider a clear case in which an assembler violates it. Suppose an assembler of airplanes has contracted to purchase fuel tanks from the lowest bidder. The lowest bidder, let us say, turns out to be a cut-rate metal fabrication company with well-documented and well-publicized quality-control problems. Suppose that some of the fuel tanks supplied to the airplane assembler turn out to be defective, and that these defects lead to tragic accidents. Although it is unquestionable that the tank supplier acted wrongly in failing to correct known quality-control problems and consequently producing defective products, does that mean that the airplane assembler is in the clear, morally speaking? It seems quite obvious that the answer is no. The airplane assembler may be able to sub-contract with another company to supply parts, but it cannot sub-contract its ultimate moral responsibility for creating a safe product from whatever parts it chooses to use. Indeed, in the case before us, the assembler seems to have acted downright negligently, since it attempted to cut costs by using a cut-rate supplier that it knew (or should have known) produced low-quality components.

We assume that the aircraft assembler has clearly violated some duty. But what duty did the assembler violate? It did not violate any duty to design or assemble safe composite products. For, ex hypothesi, nothing went wrong in the design or assembly processes. What the assembler did was to act negligently in its *choice of components*. The fact that it seems clearly wrong for the assembler to have acted in this way supports the claim that assemblers have at least a duty to exercise care in choosing components

to use in their composite products. We conclude that an assembler has a moral duty to its customers to avoid using defective components in its products, even when they are supplied by other companies. This is the duty that the company using cut-rate fuel tanks has breached, and it seems to be the source of our intuitive judgment that such a company has acted immorally despite the fact that it produced no defective tanks. What it did produce was a defective airplane, and since the defect in the tanks became a defect in the airplanes in which the tanks were installed, the airplane assembler is guilty of producing defective airplanes. Because the components will become part of the larger product of the assembler, the assembler's duty to produce a safe product creates a duty to avoid using defective components, even when they are supplied by other companies that have their own obligations to avoid producing defective components.[60] Because this duty derives from the assembler's duty to ensure the safety of its own product, it cannot be shifted to the supplier.

The case of the airplane assembler illustrates the most straightforward way for an assembler to violate its duty to choose appropriate components. There are, however, other ways in which an assembler can violate this same duty. Instead of choosing a component that it has reason to believe is *already* defective, an assembler can negligently choose a component that may be reasonably expected to *become* defective under the conditions in which the assembler proposes to use it. For example, suppose that an assembler of jet engines decides to cut costs by using bolts that were made for the less harsh conditions of piston-driven engines. The bolts, let us say, are perfectly adequate for use in a piston-driven engine. Let us assume that conditions in a jet engine are such that they are likely to weaken anything less than very heavy duty bolt made specifically for those conditions. Although there may be nothing technically wrong with either the design or assembly of the jet engine or the bolts, when the one is installed in the other, the bolts may become defective and fail. Now in such a case the assembler has not violated its design-related duty, nor its assembly-related duty, for ex hypothesi, there has been no problem in either the design or the assembly of the engine. Nor has it chosen a component that is already defective. Instead, the assembler has chosen a component that it should have known would be likely to become defective when used in the proposed way.

Finally, we can imagine a more complicated kind of case that is a mixture of the two others. In this kind of case, a dangerous situation arises because of a combination of morally dubious decisions by the assembler and a component that contains latent defects or weaknesses. Suppose that Bill's Balloon Works is manufacturing a passenger balloon. BBW anticipates that the balloon will be used to give short balloon rides to passengers, and that in most cases, the balloon's gondola will be filled to capacity. To secure the gondola to the balloon, BBW purchases lengths of rope from a rope-maker. Suppose that each length of rope will have to carry 490 lb of weight when the balloon is loaded to capacity (which BBW anticipates will be most of the time). Suppose that the rope supplier has two grades of heavy-duty rope. Grade A is rated to 1000 lb, and grade B is rated to 500 lb. Suppose that Grade A is much more expensive. Suppose that BBW opts for grade B to cut costs and increase its profit margin.

Here BBW chooses to use a component at the very edge of the parameters set forth by the component maker. Now suppose that the grade B rope that BBW purchased and used to secure the gondola turns out to have a very slight weakness. Such a weakness may never have posed a problem if the rope had usually carried only 350 lb, with only an occasional load of 490 lb. However, at an almost constant load of 490 lb, the undetected weakness causes the rope to break. Morally speaking, who is at fault?

Certainly the rope manufacturer must bear significant moral (and, no doubt, legal) blame. After all, it supplied a rope that was defective even when used within its stated specifications. However, we think that it is clear that BBW's conduct has *also* been morally blameworthy, in much the same way and to much the same degree. BBW *knew* that it was not going to use the rope for loads in the midrange of the specifications, but rather at the very outer edge of what the rope maker was willing to rate it. BBW should also know that *if* there is any underlying weakness in the rope, using it at the edge of its rated capacity might well exacerbate it.[61]

We contend that the assembler's duty to create a safe product includes a duty to take special care when using components in ways that could exac-

erbate any underlying weaknesses that might exist undetected by the component part maker. The most straightforward way to discharge this duty would be to simply avoid such unusually harsh uses of a component. Alternately, the assembler could undertake to have additional testing done to make sure that the component is free of weaknesses that, though tolerable in some uses of the component, could lead to tragic component failure when the component is used in the way the assembler is considering. BBW neglected this duty when it decided to use a component in a way that pushed the limits of its safety rating and which could be expected to exacerbate any latent undetected defects, when it could have used a much safer component instead. BBW has chosen to use the rope in a way that could be reasonably foreseen to exacerbate any latent undetected defects that may exist in it. Whether or not one would want to hold an assembler strictly liable for component defects that it had no practical way of knowing about, it certainly does seem reasonable to hold the assembler liable for actions that it knows or should know will exacerbate any latent, minor defects or weaknesses that might have gone unnoticed during testing predicated on a less harsh set of operating conditions. In short, while we certainly do not deny that the component maker has the obligation to ensure that its products are safe and free from defects, we contend that a manufacturer who makes use of component parts supplied by another company has a moral duty to guard against possible defects in component parts *especially when they are being used in ways that are out of the norm, and that can be reasonably expected to exacerbate any underlying weaknesses or defects that may not be apparent or dangerous when the part is used in a more standard way.*[62]

Meanwhile, back at Ford

There is significant evidence that Ford behaved in a manner similar to the balloon maker in our example. It is clear from our earlier discussion of the history of the Explorer that the tires were not simply an ''extra'' that was added to an already existing product. Rather, they were designed specifically for the Explorer, and their performance characteristics were an important set of variables that were taken into account and manipulated by the engineers who were designing the complex system that comprised the Explorer and its tires. By integrating the tires into the design of the Explorer, Ford acquired a moral obligation to take into account not only how the tires would affect the characteristics of the larger system, but also how the characteristics of the larger system (which included factors such as inflation pressure and payload) would affect the tires.

Ford's decision to use only C-rated tires (the lowest rating for temperature allowed for passenger vehicles), and its decision to lower the recommended inflation pressure of these already low-quality tires from 35 or 30 to 26 psi, were similar to BBW's decision to use the lower grade of rope and to subject it to especially harsh operating conditions.[63] Given the relatively light (and thus likely to be exceeded) payload limits of the Explorer, which would exacerbate the stress put on the tires, the decision by Ford to recommend a tire pressure that was at the very low end of the safe zone set by Firestone created a greater moral obligation for Ford to make sure that the tires would remain safe under these new, harsher operating conditions. Ford seems clearly to have shirked this responsibility, especially since it knew that, according to its own specifications, the tires already had the lowest ratings for speed and temperature allowed by the Department of Transportation's Federal Motor Vehicle Safety Standard 109,[64] and that independent testing data indicated that those tires may have been even less ''robust'' than their low ratings indicated. The fact that Ford later required Firestone to make the tires lighter, when it should have been requiring them to make the tires stronger, makes Ford's conduct even more ethically questionable.

Whether or not the Firestone tires were defective in and of themselves is a difficult question, in part because our ordinary understanding of the concept of a ''defect'' is not well-suited to situations involving differences between small failure rates. Every product could be improved, and no product can ever be expected to be perfect. In practice, determining whether a product is defective often amounts to determining whether the product exhibits failures above what is considered a normal or acceptable rate.[65] The failure rates of Firestone tires on Ford Explorers were certainly abnormally high. Whether or not the underlying weaknesses that caused the Firestone tires to fail at such a rate when subjected to

the harsh conditions and low safety margings associated with Explorer constitute a true defect may be a matter of semantics. What seems clear, however, is that Ford's behavior made matters worse.

We have argued that Ford's suggestion that it is a mere retailer for tires is untenable. While the Explorer's tires fall into an intermediate category between a clear case of a separate product and a clear case of a component, they were sufficiently integrated into the design of the Explorer that Ford acquired a responsibility for them that is different from and greater than that of a mere retailer. We have argued that the duty to produce safe products implies a duty for assemblers to choose non-defective components (and quasi-components), and to use them in ways that will not render them dangerous or defective. We contend that even if there was an underlying weakness in the Firestone tires, Ford is still at least partly to blame because of its decision to use the tires in a way that it knew would tend to exacerbate any such weaknesses. In making this decision, Ford treated the tires as an integral part of the complex system that they were designing. Tragically, Ford's attempt to fix a problem with one aspect of the system seems to have contributed to the premature failure of another part of that system.

Notes

[1] "Firestone Tires Recalled", *CNNfn*, August 9, 2000, http://cnnfn.cnn.com/2000/08/09/news/. Unless otherwise indicated, when we say "Firestone AT tires" throughout this paper, we will be referring to these tires, and we will refer to Bridgestone-Firestone simply as "Firestone".

[2] Ibid.

[3] Sara Nathan, "Tires Linked to 29 More Deaths", *USA Today*, December 7, 2000, p. 3B. A chronology of the Ford/Firestone tire crisis, NHTSA data, and depositions of Firestone and Ford engineers can be found at the *Public Citizen* web site, http://www.citizen.org/index.cfm. Much of this material has also been compiled by Tab Turner in "Tires: Ford/Firestone – A Status Report", (Association for Trial Lawyers of America, July 2001). Keith Bradsher's *High and Mighty: SUVs – The World's Most Dangerous Vehicles and How They Got That Way* (New York: Public Affairs, 2002) provides a narrative of the design process that led to the Explorer. A complete database of consumer complaints related to Firestone tire failures and Ford Explorer rollovers, and other useful information, can be found at the NHTSA web site at http://www.nhtsa.dot.gov/. Much of the information related to the recall is also detailed in the report of the *Joint Hearing before the Subcommittees on Commerce, Trade, and Consumer Protection and Oversight and Investigations of the Committee on Energy and Commerce of the House of Representatives* on "Ford Motor Company's Recall of Certain Firestone Tires", June 19, 2001 (No. 107-45). This is available at http://energycommerce.house.gov/107/action/107-45.pdf, and hereafter will be referred to as "Joint Hearing".

[4] See Tuner, op. cit., John Greenwald, "Inside the Ford/Firestone Fight", (*Time* May 9, 2001), http://www.time.com/time/business/articles/0,8599,128198,00.html.), James Healey and Sara Nathan, "Further Scrutiny Puts Ford in the Hot Seat", (*USA Today*, September 21, 2000), "Report: Ford Passed Up Improvement", (*Yahoo! News*, October 18, 2000, http://dailynews.yahoo.com/h/ap/20001018/bs/). and *Public Citizen*, op.cit.

[5] Ford widened the wheelbase of the 2002 model four-door Explorer by two inches; however, Jaques Nasser denied that this was to improve safety (Interview for PBS Frontline documentary, "Rollover: The Hidden History of the SUV", airdate, February 21, 2002).

[6] John Greenwald, "Tired of Each Other", *Time*, June 4, 2001, pp. 51–56.

[7] "Ford Pressed on Testing", *CNNfn*, September 21, 2000, http://cnnfn.com/2000/09/21/companies/ford_hearing/, and John Greenwald, "Inside the Ford/Firestone Fight" op.cit.

[8] For a good account of the physics of tire pressure and how it affects performance see C. Johnson, "The Physics of SUV Rollover Accidents", at http://mb-soft.com/public/rollover.html.

[9] For information on tire ratings and tire testing, see Ralph Vartabedian, "Getting a Grip on Tire Ratings is No Easy Task", *LA Times*, September 20, 2000, http://www.latimes.com/cgi-bin/print.cgi. See also Joint Hearing, op. cit., p. 67.

[10] See, "Firestone Tires: A Heavy Load", at *ConsumerAffairs.Com*, August 22, 2000, http://www.consumeraffairs.com/news/firestone_load.html. This article points out that, for instance, while the Chevy Blazer, which had a similar payload, used the same tire sizes, the manufacturer recommended inflating the tires to 35 Psi. Likewise, the Honda Passport and Nissan Pathfinder had similar payloads, but whereas they recommended the same inflation pressure as Ford, they also used larger tires on 16-inch diameter wheels, increasing the tire's capacity. Likewise, during the Joint Hearing before Congress (op. cit., p. 21), it was pointed out that Thomas Bogmann,

Ford's own quality control officer, testified that all Firestone Wilderness AT 15-inch tires were not "robust against variations in inflation pressure and in operating condition, load and speed".

[11] According to internal Ford documents, this test was performed by the Arvin Calspan tire research facility, an independent testing company. The result was that out of 17 tires tested, three showed tread separation problems. These results were reported by George A. Tapia to James Avouris at Ford in a 1989 letter. This letter was an exhibit in the deposition of James P. Gardner, a retired engineer from Firestone, in *Bailey versus Ford Motor Company, Bridgestone/Firestone, Tradewind Ford Sales, and Crosstown Ford Sales,* available at www.citizen.org and is also referenced and quoted in several other sources, including "Chronology of Firestone/Ford Knowledge of Tire Safety Defect", (public Citizen), Turner, op. cit., and was presented at the Joint Hearing (op. cit.).

[12] See Keith Bradsher, "Documents on Design of Explorer Reveal a Series of Compromises", *New York Times*, December 7, 2000, pp. A1 and C6, Greenwald, op. cit., and *Public Citizen*, op. cit. Claims concerning competing tests results were brought by both Ford and Firestone at the Joint Hearing before Congress, op. cit. Committee members rebuked both Ford and Firestone for presenting test results that were largely self-serving. In relation to Ford's test claims, it was noted that "the committee's review of the actual Ford tests raises important questions about whether comparable tests were, in fact, run" and that "similar questions arise with respect to the largest testing procedure utilized by Ford, its rig tests ... the way these rig tests results were presented to the committee could be considered misleading" (p. 11).

[13] John Greenwald, "Inside the Ford/Firestone Fight", op. cit., p. 4.

[14] See Joint Hearing, op. cit., p. 13 and Turner, op. cit.

[15] For a history of the lawsuits on this matter, see Turner, op. cit. and *Public Citizen*, op. cit.

[16] Thomas Fogarty, "Can Courts' Cloak of Secrecy Be Deadly? Judicial Orders Protecting Companies Kept Tire Case Quiet", *USA Today*. October 16, 2000, pp. 1–2B.

[17] See, for instance, Matthew Stannard, "Ford, Firestone Knew Tires Were Bad, Suit Alleges", *San Francisco Chronicle*, August 30, 2000. See also the sources listed in note 5. An anonymous referee suggested that management disarray at both Firestone and at Ford may have prevented some of the information available to engineers, lawyers, and others from reaching the top executives in a manner that allowed them to consistently track the problems. Although this speculation might explain the failures of upper management to take quicker action, it does not thereby excuse it. In addition, as Clarence Ditlow made clear at the Senate Hearing on the Ford/Firestone tire recall Ford executives were clearly not only aware of the problem by 1999, when they were recalling tires in other countries, but were even debating their obligation to make this information public. Ditlow provided evidence, in the form of an internal Ford memo, "showing that both Ford and Firestone (were) concerned about the duty to report this to NHTSA", even though they failed to ultimately do so: see "Statement of Clarence Ditlow, Center for Auto Safety Before the Senate Committee on Commerce, Science and Transportation", September 12, 2000, http://commerce.senate.gov/hearings/0912dit.pdf, p. 2.

[18] Ditlow, "Statement before Senate Committee on Commerce, Science and Transportation", op. cit., p. 7. See also, James Healey, "Firestone Leaves an Indelible Mark", *USA Today*, December 26, 2000, p. 2B.

[19] "Statement of Chairman John McCain, Ford/Firestone Tire Recall Hearing", September 12, 2000, http://commerce.senate.gov/hearings/0912mcc.pdf.

[20] Information on the dates of Ford's recalls in these countries can be found at Public Citizen, op. cit as well as in Turner, op. cit., See also Karen Miller, "Memo: Ford Had Wrong Tires in Mideast", *Yahoo! Business News*, October 19, 2000. http://dailynews.yahoo.com/h/ap/20001016/bs/, and Alfonso Chardy, "Venezuela Inquiry: Firestone, Ford Hid Tire Flaws", *The Miami Herald*. October 8, 2000.

[21] See the statements of Sue Bailey, the Administrator of NHTSA, before the Senate Committee hearing, http://commerce.senate.gov/hearings/0912bai.pdf, particularly p. 3. See also the discussion of NHTSA's role in the House Joint Committee Hearing, op. cit.

[22] Turner, op. cit.; see also Lawrence Ulrich, *Detroit Free Press*, September 25, 2000.

[23] See James Grimaldi and Frank Swoboda, "Ford Offers Tire Data Comparison", *The Washington Post*, September 18, 2000, p. A10. At the Joint Hearing, committee members noted that the choice to stop using Goodyear tires appeared to be based primarily on cost concerns, and Jacques Nasser echoed this response in his comments, though the specific nature of the reasoning behind the decision to stop using Goodyear tires remains somewhat opaque.

[24] There is, however, evidence that Explorers had a higher rate of tire-related accidents than other SUVs, regardless of whether the vehicles were equipped with Firestone or Goodyear tires. This evidence comes from an analysis done by *The Washington Post*, the results of which were reported by Consumer Affairs at http://www.consumeraffairs.com/news. ford_exp_roll.html.

[25] For instance, at the Joint Committee hearing, it was pointed out "that the same tires used on the Ford

Explorer are also used as original equipment on the Ford Rangers ... (and) the owners of vehicles other than Explorers have virtually no problems with tread separation, leading to rollovers'', p. 52. John Lampe of Firestone presented similar data at the hearing to show that ''real world claims data provide further evidence (that) ... there were six times as many tread separation claims for the Ford Explorer, within the replacement tire population that included other vehicles, than there were for other vehicles'', p. 92. While Firestone's data may be based on somewhat misleading comparisons, there does seem to be a consensus that there were more tread-separation problems with the tires on the Explorer than on other vehicles.

[26] It is worth mentioning that the Ford Explorer appears to fall in about the middle range in terms of stability when compared to all SUVs. In fact, a number of other SUVs and cars had higher vehicle driver death rates than the Ford Explorer. For some of these statistics, see James R Healey, ''Crash Study Ranks Deadly Vehicles'', *USA Today,* October 18, 2000, p. 3B. See also Jennifer Bott, ''The Big Blowout: Maneuvering By Bridgestone/Firestone, Ford May Have Made a Bad Situtation Worse'', Auto.com, October 5, 2000 and John Greenwald, op. cit. Nonetheless, the Explorer did have an abnormally high rate of rollover accidents resulting from tire failure when compared to other SUVs and to other passenger vehicles in general. Further, a Safetyforum.com analysis of NHTSA's database showed that a rollover-to-tire-failure rate of 13% on the Ford Explorer compared to a 5% rate for other Ford light trucks and SUVs and a 3% rate for all other SUVs and light trucks. See http:www.safetyforum.com/news/010521.html.

[27] Joint Hearing, op. cit., p. 13.

[28] See the Safetyforum.com Analysis ''Ford Explorers Roll Over 4 times More Often Than Other SUVs When Tires Fail'', May 21,2001 at http://www.safetyforum.com/news/010521.html, and the NHTSA information cited at ''Ford Explorer Rollover Legal Actions & Recall Information'', on *http://www.fordexplorerrollover.com/*.

[29] See the *Consumer Affairs* report ''Explorer More Likely to Roll Regardless of Tire Type'', October 9, 2000, at *http://www.consumeraffairs.com/news/ford_ exp_roll.html.*

[30] ''Firestone Letter to Belo & KHOU Executives'', February 10, 2000. htttp://www.khou.com/news/stories/1290.html.

[31] Janet Fix, ''Conflict Preceded Firestone Recall'', *Auto.com*, September 26, 2000. *http://www.auto.com/autonews/tire26_20000926.htm*.

[32] These comments, made during a televised Congressional hearing, were widely reported in the media. See, for example, Earle Eldridge and Thomas Fogarty, ''Firestone Puts 'Best Theory' Forward'', *USA Today*, September 13,2000.

[33] Jennifer Bott, op. cit.

[34] Thomas D. Baughman, Engineering Director, Ford Truck Operations, in a deposition on December 21, 2000.

[35] By ''deontological approaches'' we mean approaches to responsibility that focus on what we might call intrinsic moral culpability or guilt of the agent being praised or blamed.

[36] A large seller might be able to affect product quality by refusing to deal with manufacturers who do not maintain adequate quality controls. If so, a deontological approach might hold the seller partly responsible for defective products, but presumably such responsibility will still be less than the responsibility of the manufacturer, since the manufacturer is able to exert direct control over the production process, while the seller can exercise only indirect control. Notice that testing by sellers will often be unfeasible because it would require resources that sellers lack, or procedures that would destroy the marketability of the items tested.

[37] None of this is meant to deny the obvious fact that a supplier of a defective component is also morally culpable for the existence of that defect. However, because the components are going into a product that the manufacturing company creates, the manufacturer's responsibility for the safety of the overall product creates a responsibility to ensure that all of the components of the product are safe – including any components made by outside companies. If such a component is defective, then both companies have violated their duty to produce safe products.

[38] The discussion in the next several paragraphs draws heavily from David Owen, M. Stuart Madden, and Mary Davis, *Madden & Owen on Products Liability*, (St. Paul, MN: WestGroup, 2000) volume 2, the American Law Institute's *Restatement of the Law Third – Torts*, and Jerry J. Phillips, *Products Liability in a Nutshell*, 5 ed. (St. Paul, MN: WestGroup, 1998).

[39] We draw here in part on Edward J. Kionka, *Torts in a Nutshell (St Paul Minn.: West Group, 1999)*, as well as on Owen, Madden, and Davis, op. cit. and Phillips, op. cit.

[40] *Winterbottom v. Wright* (10 M. & W. 109); this British case was cited approvingly in the 1852 New York case of *Thomas v Winchester.*

[41] *MacPherson*, p. 394f. Cardozo notes, ''The obligation to inspect must vary with the nature of the thing to be inspected. The more probable that danger, the greater the need of caution''.

[42] This discussion oversimplifies matters somewhat, since the injured consumer could in many cases also sue under a theory of breach of warranty, and in many cases

warranty was held to be implied unless explicitly disclaimed by the manufacturer. While this alternative did increase the options of injured consumers, it still had some drawbacks.

[43] Somewhat different rules are often applied to defects in the design of a product.

[44] Producers would then recoup the costs by building them into the product's price. In theory, this process would internalize the cost of injuries into the price of products, with more dangerous products having a larger "liability premium" built into their prices. See Guido Calabresi and Jon T. Hirschoff, "Toward a Test for Strict Liability in Torts" (*Yale University Law Journal* 81 [1972]), and John B. Attanasio, "The Principle of Aggregate Autonomy and the Calabresian Approach to 'Products Liability" (*Virginia Law Review* 74 [1988]).

[45] Strict products liability was controversial when it was first introduced, and to some extent it remains so today. See for example, William L. Prosser, "The Assault on the Citadel" *Yale Law Journal*, 1099 (1960), and Sidley and Austin, "The Need for Legislative Reform of the Tort System" 10 *Hamline Law Review* 2 (1987).

[46] The general legal principle that an assembler cannot delegate its responsibility to produce a safe product to its suppliers goes back at least as far as *MacPherson*, and has been generally accepted by US courts. See *American Jurisprudence*, Second Edition, Products Liability (National Legal Research Group, 2002), sections 334, 335.

[47] Ibid., Section 140. In most such cases, both the component part maker and the assembler are co-defendants. In some cases, the assembler is sued separately and then sues the component part maker in a separate action. Either way, the court will at some point determine how to divide the burden of the damages awarded to the plaintiff between the assembler and the partmaker. A number of different rules – which vary from jurisdiction to jurisdiction–govern how this happens. Most require that partmaker and assembler share the burden, either equally or on the basis of comparative fault (see Richard D. Cunningham, "Apportionment Between Partmakers and Assemblers in Strict Liability", *The University of Chicago Law Review*, 49 [1982] pp. 544–563).

[48] See Frank Cavico, "The Strict Liability of Retailers, Wholesalers, and Distributors of Defective Products" 12 *Nova Law Review* 213 (1987). The next paragraph also draws on this.

[49] See *Vandermark v. Ford Motor Co.* (61 Cal. 2d 256).

[50] Courts have refused to impose strict liability on mere retailers in Arkansas, Georgia, Louisiana, Mississippi, Ohio, and Oregon (Cavico, op. cit., note 73). The opinion in the 1970 Michigan case of *Shirley v. Drackett Products Company* (26 Mich.App. 644), notes that "As a general rule, a vendor who distributes a product acquired in the open market is not liable for its negligent manufacture". Michigan law is especially significant because some of the potential legal actions against Ford could take place under Michigan law (see Elizabeth Cabreser, William Bernstein, and Dawn Barrios, "New Issues and Key Rulings in the Certification, Trial, Settlement, and Appeal of Class Actions" [ABA Center for Continuing Legal Education, National Institute, October/November 2001], pp. 57ff).

[51] Cavico lists Arizona, Arkansas, Tennessee, North Carolina, Kentucky, Nebraska, South Dakota, Illinois, Minnesota, Washington, Colorado, Ohio, and Idaho as having statutes giving at least some protection from liability to non-manufacturing sellers. (See Cavico, op. cit., pages 237–239.) In 1995, Michigan enacted such a shield law, which provides that "In a product liability action, a seller other than a manufacturer is not liable for harm allegedly caused by the product unless either of the following is true: (a) The seller failed to exercise reasonable care ... (b) The seller made an express warranty as to the product ..." *Michigan Compiled Laws*, 600.2947(6) (Public Act 249 of 1995).

[52] This is true in the influential states of California and New York (see Cavico, op. cit., 223).

[53] See Madden and Owen, pp. 335 and 351. Cavico, citing a 1977 Insurance Services Office Product Liability Closed Claim Survey, writes that "product sellers account for less than 5% of product liability payments because they are successful in shifting the cost of liability to manufacturers". See Cavico, op. cit., note 44.

[54] Technological advances often significantly alter the relevant possibilities within a social context in such a way as to complicate the nature of the moral and legal concepts that were previously used in those contexts. For instance, the rise of computers and recent advances in biotechnology require us to revisit the moral and legal issues surrounding intellectual property.

[55] By contrast, the specialized batteries that are used in some electronic devices, such as cellular phones, laptop computers, etc., are more integrated into the respective devices, and consequently we are more likely to regard them as components of larger products.

[56] In comparison, non-replaceable batteries used in disposable flashlights could, for all the consumer might care, be of any novel size or configuration. Such a battery is integrated into the flashlight in a way that the replaceable battery is not.

[57] See Lawrence Ulrich, op. cit. Ironically, Ford is preparing to follow suit. See *Automotive Fleet*, January 3, 2001.

[58] When the assembler's activities create a dangerous or defective product from a component that was non-defective as supplied by the supplier, courts generally hold

that the supplier is not at fault. See, for example, *City Of Franklin V. Badger Ford Truck Sales* (58 Wis. 2d 641) and *Lee v. Butcher Boy* (169 Cal. App. 3d. 215). See Donald R. Parshall, ''For Want of A Nail: Component Supplier Products Liability'' (American Bar Association, SPG Brief 48, 2001.)

[59] The legal doctrine of strict liability is, in effect, the rejection of any such excuses as being legally exculpatory. Morally speaking, however, one or more of the normally exculpatory reasons may be valid. Thus, if it was not the case that an entity did know or should have known that it was violating or was in danger of violating such a duty, then the entity may have a valid exculpatory excuse for having violated the duty. Given the various red flags presented to Ford, we are skeptical as to whether Ford had any valid exculpatory excuse of this sort.

[60] For our present purposes, we will simply draw the weakest conclusion from the example, namely that a company which ''assembles'' a product from other components has a duty to choose components that are safe for the uses it proposes to make of them.

[61] This claim does not necessarily imply that BBW would be at fault if it had only used the rope to carry, say 200 or 300 lb and it still failed. That question seems more controversial.

[62] Because the component is integrated into the composite product (and not merely sold along with it), the assembler's choices must address how the component will interact with the other components of the composite product. When a mere quasi-component is integrated in a similar way, similar decisions must be made, *even if other criteria render the item a quasi-component rather than a fully integrated ''true'' component*. These decisions are qualitatively different from the decisions that a mere retailer must make, and the assembler's responsibility for making them well is the source of a qualitatively different kind of responsibility from that of a mere retailer.

[63] We have been careful not to deny that consumer misuse – e.g. failing to properly maintain their tires, overloading vehicles, and reckless driving – may make them at least partially responsibility for certain accidents. However, we contend that most forms of driver misuse were foreseeable, especially for vehicles deliberately marketed as especially rugged and capable.

[64] See Ralph Vartabedian, op. cit.

[65] Recall that the vast majority of the Firestone tires in question never. Ulrich (op. cit.) estimates that less than 1 per 10,0000 of the Firestone AT tires failed.

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