NO MERCY FOR PRODUCTS: RECOVERY EFFECTS FOR PRODUCTS AND SERVICES

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ABSTRACT

Despite manufacturers' efforts to implement stringent quality control and monitoring of their production processes, products can still fail. In contrast to the abundant literature on service failures, research on product defects is surprisingly scarce. When there are product failures customers may choose to complain and eventually have their product defect fully fixed. Alternatively, they can decide not to complain, forgoing the opportunity to have their product repaired. In this paper, we examine the impact of not complaining versus complaining, as well as the effect of the outcome of the complaint resolution process (i.e., whether defects are fully fixed or not) on the relationship between the original product manufacturer and the service operation (retailer) responsible for fixing product defects. We demonstrate that for non-complaining customers, the perceptions of product quality and loyalty to the product manufacturer still deteriorate. Further, we confirm support for the well-documented service recovery effect but fail to find the effect for product manufacturers. Even if product defects are completely fixed, customers' perceptions of product quality and loyalty to the product manufacturer are damaged.

Keywords: product defects, product failure, complainers, non-complainers, consumer satisfaction, loyalty

INTRODUCTION

Customers often experience problems with the products they purchase. In the United States (U.S.), over 20 million vehicles were recalled by the automotive industry in 2010, with Toyota alone withdrawing six million cars (Bae and Benítez-Silva 2011). Customers also experience product defects in other industries, which makes recalls an increasing concern for companies (Hora et al. 2011). Yet, product performance is crucial for consumers to assess the quality of the goods they purchase: Reliable, long-lasting, and well-designed products drive consumers' perceptions of quality, and lead eventually to product satisfaction and loyalty (Churchill and Surprenant 1982; Taguchi and Clausing 1990). Manufacturing high quality products that meet customers' performance expectations is therefore essential for any product manufacturer as this leads to customer satisfaction and loyalty, with subsequent positive effects on both sales and profitability (Jacobson and Aaker 1987; Nagar and Rajan 2001).

When products fail to perform adequately, we observe both an increase in operational costs and a subsequent decline in revenues. Replacement and remedying costs and the costs of staff travel are typical charges that occur when customers experience product failures (Nagar and Rajan 2001). In addition to these post-purchase direct costs, product defaults imply the loss of market share, followed by decreasing revenue. Nagar and Rajan (2001) show that product defects have significant negative consequences for product sales and that these effects persist for at least a year. A further adverse effect of product failures is negative word-of-mouth.

From a theoretical point of view, Anderson and Mittal (2000) call for research to gain a better understanding of the relationships between the constructs of the satisfaction profit chain, i.e., product performance, customer satisfaction, loyalty, and profitability. To our surprise, no study to date has investigated the impact of product performance at the lowest bound, i.e., product defects, on marketing constructs such as product quality perception and customer loyalty. This stands in stark contrast to the widespread literature on service failures (e.g., Folkes 1984; Smith and Bolton 1998). Moreover, researchers seem to extend the results from the service failure research to product failures. For instance, Folkes and Kotsos (1986) assume implicitly that the service recovery paradox also holds for products. They state "when complaints about products are handled well, consumers express even more satisfaction with the product than those not experiencing problems" (p. 79). However, given the different nature of products and services, it is still unclear whether the findings concerning service failures can be extended to

product defects. Therefore, this research intends to contribute to the literature by examining the impact of product defects and the subsequent recovery efforts on service satisfaction, product quality perceptions, and loyalty to the service operation and to the manufacturer.

An equally under-researched area in marketing concerns the effects of individuals' complaining behavior on their relationship with the manufacturer and service operation. Most of the existing research on complaints looks at the determinants of complaining (e.g., Heung and Lam 2003; Thøgersen et al. 2009), but only very little research focuses specifically on the effects of complaining versus non-complaining on an existing relationship (Voorhees et al. 2006). In this study, we consider the impact of non-complaining and complaining customers as a response to a product defect in the relationship with the product manufacturer.

Based on the complaining literature initiated by Hirschman (1970) and Fornell and Wernerfeld (1987), we distinguish in our model between customers who experience a product defect but do not complain about it *(non-complainers)*, and customers who complain about product defects to the service operation/retailer *(complainers)*. Among those customers who submit a complaint regarding a product defect, a further distinction is made between customers who had their product defect fully fixed *(complainers' defects fully fixed)*, and customers who had their product defects only partially fixed or not at all *(complainers' defects not fixed).*

Typically, most product manufacturers sell their products through a network of independent retailers, who are in charge of handling the interactions with the end customers. In such a distribution framework, the retailers are usually entrusted by product manufacturers to handle complaints and to conduct the recovery efforts (Verhoef et al. 2007). The automotive industry is a typical example of such a distribution system: Customers are supposed to submit their complaints directly to the dealership where they purchased their car (Verhoef et al. 2007). In this distribution system, it is possible to distinguish between the effects of a product defect in the customers' relationships with the product manufacturer and the retailer, or another intermediary in charge of the recovery effort (Archer and Wesolowsky 1996; Mansfield and Warwick 2002). This study is based on the U.S. automotive industry, in which retailers are independent of the manufacturers, but they are in charge of handling complaints and repairing car defects. After that, we specifically examine the impact of product defects and the subsequent recovery efforts on the customers' relationships with both the car manufacturer and the dealer.

The goal of the paper is to provide answers to the following research questions: (1) What are the effects of product defects on product quality perceptions and loyalty to the product manufacturer? (2) How do these effects vary between non-complaining and complaining customers? (3) How does the quality of the complaint resolution influence both product quality perceptions and loyalty to the product manufacturer? (4) How does the effect of the complaint resolution on the intermediary (car dealer) responsible for complaint handling differ from its effect on the product manufacturer? In the next section, we develop hypotheses to address these research questions.

CONCEPTUAL MODEL AND HYPOTHESES

It is well known in the marketing literature that customers frequently do not voice their disappointment with their purchased products or services. A study by the Technical Assistance Research Program (TARP 1979, p. 10) reports that 31% of the customers do not express their dissatisfaction with poor products and services; in the case of product defects, Thorelli and Puri (1977, p. 135) show that more than one in four (26.4%) customers experiencing product defects do not complain to their dealer or manufacturer. In general no-complaint rates display quite some variation across industries (Andreasen 1988; Kotler 1994; Van Looy et al. 2003). Customers who experience problems with the products or services they purchase but do not complain are a so-called "silent mess" (Hart et al. 1990; Voorhees et al. 2006).

Like Halstead and Page (1992) and Voorhees et al. (2006), we call these customers who experience product defects but do not submit a complaint to the retailer from which they purchased the defective products *"non-complainers."* Non-complainers lose the opportunity to have their purchased products fixed and provide firms with no suggestions on how to improve their manufacturing processes (Boshoff 1997; Voorhees et al. 2006). Harari (1997) even warns firms of the risks of clients' silence: Their inertia when experiencing product defects may be a sign of their propensity to switch to alternative suppliers. Determinants of not complaining have been identified in the literature; namely, the high opportunity costs necessary for taking action, as well as individuals' situational and personality factors (Andreasen 1988; Voorhees et al. 2006; Thøgersen et al. 2009).

The customers' perceptions of product quality can be assessed as the sum of attribute performance (Churchill and Surprenant 1982), with negative performance having a stronger impact than positive performance on overall product quality perceptions (Mittal et al. 1998) Thus, extremely low levels of attribute performance, as in the case of product defects, should severely damage overall product quality perceptions. Therefore, although non-complainers choose not to voice their complaints when they experience product defects, their product quality perceptions should be lower compared to customers who experience no defects. Furthermore, as proposed by Harari (1997), non-complainers should demonstrate less loyalty to the manufacturer compared to customers who experience no product defects. This adverse effect may be even more striking when defects occur in relation to a new and expensive product (e.g., a car), which has been purchased recently and is expected to perform without any problem and to have no defects (Deravaj et al. 2001). Thus, we propose the two following hypotheses:

H1: Non-complainers exhibit lower product quality perceptions than customers who experience no product defects.

H2: Non-complainers exhibit less loyalty to the manufacturer than customers who experience no product defects.

TARP (1979, p. 10) reports that 90% of complaints are addressed to either the retailer or the manufacturer, but only 10% to third parties. Submitting a complaint to the retailer or manufacturer provides the customers with a satisfactory (40%), dissatisfactory (40%) or mixed outcome (10%). In the automotive industry, McNeil and Miller (1980, p. 414) show that in the first year of car ownership, 52.3% of customers experienced no product problems, 34% experienced product defects and had them fixed by the retailer (dealership), while 13.7% complained to the dealer, but ultimately had their product defects only partially fixed or not at all.

A prominent stream of research has looked at the effects of satisfactory recovery in service contexts (e.g., Kelley et al. 1994; Myrden and Kelloway, 2014). To date, it is still disputed whether adequate recovery only reduces the negative impact of the service failure (Boshoff 1997), or whether it recaptures the customers' pre-failure perceptions of satisfaction (Ok et al. 2007). In the automotive industry, Donnevert et al. (2008) have shown that adequate recovery redresses customers' satisfaction with the dealership to the pre-failure level and has a positive impact on their loyalty to the dealership (Mansfield and Warwick 2002). Building on these results, we expect that once product defects are fully fixed, customers display equivalent satisfaction with the service (dealership) compared to consumers who do not experience any product defect. Also, fully fixing complainers' defects should result in comparable loyalty to the retailer as for customers who do not experience any product defect.

H3: Customers whose product defects are fully fixed after complaining exhibit no difference in their service satisfaction compared to customers who do not experience any product defect.

H4: Customers whose product defects are fully fixed after complaining exhibit no difference in their loyalty to the service provider compared to customers who do not experience any product defect.

Alternatively, products may only be partially remedied or not at all. Double deviations (Bitner et al. 1990; Ok et al. 2007) frequently occur with services and strengthen customer dissatisfaction (Hart et al. 1990). Complainers dissatisfied by service recovery exhibit the least loyalty compared to complainers who experience satisfactory recovery and non-complainers (Voorhees et al. 2006). Building on this, we expect that customers who experience product defects and do not get their product defects fully fixed after complaining *(complainers' defects not fixed)* will display the lowest service satisfaction and loyalty to the retailer compared to any other group of customers, i.e., customers who experience no product defects, non-complainers, and complainers' whose defects are fixed. Therefore, we propose:

H5: Customers whose product defects are not fixed after complaining exhibit lower service satisfaction compared to any other group of customers.

H6: Customers whose product defects are not fixed after complaining exhibit less loyalty to the retailer compared to any other group of customers.

Concerning the consumers' perceptions of product quality, we argue that consumers react differently to post-failure experiences with services

and manufactured products. Research has shown consistently that customer satisfaction is usually lower for services than for products. This is because services are typically coproduced with the customer and are based mainly on human interaction. Therefore, it is more difficult to maintain consistent quality levels for services than for manufactured products (Johnson et al. 2002). Failures happen more frequently in the production of services and are more likely to be attributed by the customer to the human element of the service production process (Gustafsson 2009). Therefore, the customer is also more willing to forgive failures in the service delivery process in the case that they are fixed following a complaint. Conversely, a product defect can hardly be attributed to the vagaries of human interaction; rather, a product defect is a consequence of a defective manufacturing process. Indeed, Priluck and Lala (2009) state that "compensation for a defective product does not change the fact that the product is not functional" (p. 44). Hence, the impact of the recovery on the perceptions of quality when product defects are fixed should differ between manufactured products and services. In the case of manufactured products, the perceptions of quality among customers whose product defects are fully repaired should still be lower than for customers who experience no product defects. Thus, complainers whose defects are fully fixed should exhibit more inferior product quality perceptions than customers who experience no product defects. As perceived product quality influences loyalty directly (Devaraj et al. 2001), we also predict that the loyalty to the manufacturer should be lower among complainers who get their product defects fully fixed compared to customers who experience no product defects.

H7: Customers whose product defects are fully fixed after complaining exhibit lower product quality perceptions compared to customers who do not experience any product defect.

H8: Customers whose product defects are fully fixed after complaining exhibit less loyalty to the manufacturer compared to customers who do not experience any product defect.

When a customer complains about product defects but the retailer is unable to fixed them, the customer is left with a defective product. Not only did the product not work in the first place, but the manufacturer's intermediary could not even fix the defects. In a similar way, we propose that a similar double-deviation effect (Bitner et al. 1990; Ok et al. 2007) amplifies the customers' negative perceptions of product quality and substantially decreases loyalty to the product manufacturer. Complainers whose defects are not fixed will exhibit the lowest product quality perceptions and loyalty to the manufacturer compared to the other categories under study, i.e., customers who experience no product defects, non-complainers, and complainers whose defects are completely fixed. Hence:

H9: Customers whose product defects are not fixed after complaining exhibit the lowest product quality perceptions compared to any other group of customers.

H10: Customers whose product defects are not fixed after complaining exhibit the least loyalty to the manufacturer compared to any other group of customers.

Table 1 summarizes the hypotheses and their relationships according the expected effects of each on the customers' perceptions of product quality, their service satisfaction towards the retailer, and loyalty to the retailer or the manufacturer.

TABLE 1: RESEARCH HYPOTHESES

Impact on product quality perceptions
H1: Non-complainers < no product defects.
H7: Product defects fully fixed < no product defects.
H9: Product defects not fixed < any other group of customers.
Impact on service satisfaction
H3: Product defects fully fixed = no product defect.
H5: Product defects not fixed < any other group of customers.
Impact on the loyalty to the retailer
H4: Product defects fully fixed = no product defect.
H6: Product defects not fixed < other groups of customers.
Impact on the loyalty to the manufacturer
H2: Non-complainers < no product defects.
H8: Product defects fully fixed < no product defect.
H10: Product defects not fixed < any other group of customers.

RESEARCH METHOD

To test the hypotheses presented in the previous section, we partnered with a major car manufacturer. This company conducts an annual study through a research agency, which, among other things, asks customers to list the most severe product defect experienced in the past year of car ownership. Each respondent provides a description of product defects. Next, customers are asked whether they complained about the defects they listed to their respective car dealership (retailer). If they report that they did complain, they are asked whether the product defect was completely solved, partially fixed or not fixed at all.

We used a U.S. dataset from a single car brand; all cars were sold in the U.S. through independent retailers across the country. These non-branded dealerships sell cars of different makes and are in charge of handling complaints and repairing defects. We restricted our analysis solely to consumers who had recently purchased a new car as "the [customers'] perception when buying a new vehicle is that it is going to be defect-free" (Devaraj et al. 2001, p. 426). On the other hand, customers who possess old or used cars have different expectations of the product and might be more willing to tolerate some defects. Therefore, we examined customers who had bought a new car and owned it for less than three years (N=1348). Despite restricting our sample to this particular population, only 21.7% of all respondents (N=292) reported details of product defects. Among customers who experienced product defects, approximately 30.1% (N=88) did not complain at all, 30.9% (N=90) complained and had the product defects fully fixed, while 39% (N=114) complained but the problem was only partially resolved or not at all. In this study, 69.9% of the customers who experienced product defects complained to their retailer. Further sampling statistics are reported in Table 2.

As in Van Doorn and Verhoef's (2008) study on critical incidents, we considered experiencing product defects as a single binary category, although they may also differ in severity. Thus, we only distinguished between customers who experienced a product defect or not. Likewise, among customers who experienced product defects, we used binary (dummy) coding to identify each subcategory, i.e., non-complainers, complainers whose defects were fully fixed, and complainers whose defects were only partially fixed or not at all.

TABLE 2: SAMPLE

Total sample size	N= 1348	
Category of customers	No product defect	78.3%
	Non-complainers	6.5%
	Complainers – defects fully fixed	6.7%
	Complainers – defects not fixed	8.5%
Brand Tier	Compact	38%
	Midsize	41.7%
	Large	20.3%
Geographic Location	North Central	8.9%
	Northeast	17.1%
	South	34.6%
	West	39.3%
Gender	Male	64.2%
	Female	35.8%

MEASURES

Measures for the four constructs were selected based on the literature on relationship marketing (Selnes 1993; Smith et al. 1999), as well as for operations management (Archer and Wesolowsky 1996). We used eight items overall to measure the four constructs, i.e., service satisfaction, perceived product quality, loyalty to the dealer, and loyalty to the manufacturer. The sometimes suboptimal choice of rating scales (three and 10 points) and the two-item measures were imposed by the cooperating manufacturer. Nonetheless, these suboptimal measurements are consistent with the literature in the field of complaining and service recovery, such as, for example, in Chelminski and Coulter (2011), Hansen et al. (2011), and Verhoef et al. (2007).

Service satisfaction was measured using two items. First, we asked the customers to rate their overall satisfaction with the service dealer (Mansfield and Warwick 2002). This item was measured with a 10-point scale, ranging from 1 "unacceptable" to 10 "truly exceptional." Respondents were also asked to compare their experience with their expectations using a three-point scale: "below expectations," "met expectations," and "above expectations."

Perceived product quality was measured with two items, based on Garvin's (1984) components of product quality. The respondents were asked to rate the overall quality, reliability and appeal of their vehicle. Both items were measured with a 10-point scale, 1 being "unacceptable" and 10 "truly exceptional."

Loyalty to the retailer was measured using two items enquiring about the likelihood of customers returning to that particular facility for the service for which they paid, and the likelihood that they would recommend the dealership service department to friends, relatives, and colleagues (adapted from Bei and Chiao 2001). Both items were measured on a four-point scale, defined as follows: 1 "I definitely will not"; 2 "I probably will not"; 3 "I probably will"; 4 "I definitely will."

Loyalty to the manufacturer was measured with two items enquiring about the likelihood of customers repurchasing or leasing a vehicle of the same make (adapted from Archer and Wesolowsky 1996), and the likelihood that they would recommend the make of the vehicle to others (Selnes 1993). Again, we used items measured with a four-point scale, defined as follows: 1 "I definitely will not"; 2 "I probably will not"; 3 "I probably will"; 4 "I definitely will."

RESULTS

In a first step, the reliability and validity of the four constructs were assessed through confirmatory factor analysis with Lisrel. The analysis of the model yields a comparative fit index (CFI) of .99, and a root mean square error of approximation (RMSEA) of .068, indicating that the model fits the data well. The chi-square test (χ^2 (13) =47.76 ($p<.00$) χ^2/df = 3.67) shows that the model is within the recommended range: χ^2/df between two and five (Verhoef et al. 2007, p. 105). We illustrate scale reliability, means, standard deviations, and average variance extracted (AVE) in Appendix 1. Composite reliability and the AVE for all measurement scales show sufficient reliability and convergent validity. More specifically, the Cronbach's alpha coefficients range from .78 to .88, and the composite reliability indicators are between .64 and .94, consistent with Bagozzi and Yi (1988). The AVE from all studied scales exceeds the recommended critical value of .5 (Bagozzi and Yi 1988). All item loadings are positive and statistically significant, and item reliability is also high. To assess discriminant validity, we use the Fornell and Larcker (1981) criteria. The results show that all constructs fulfil this criterion and thus discriminant validity is achieved.

In the next step, we tested the research hypotheses (Table 1) with one-way analyses of covariance (ANCOVA) and planned contrasts on the factor scores of the constructs validated above. Four ANCOVA analyses were run, one per dependent variable, i.e., service satisfaction, loyalty to the service, perceived product quality, and loyalty to the product manufacturer. The independent variable (factor) distinguishes four levels of customers: customers with no product defects, non-complainers, complainers who had their product defects fully fixed, and complainers who had their product defects only partially fixed or not at all.

Four covariates—gender, brand tier, number of service visits, lease or purchase—were chosen based on the literature on consumer complaining behavior and research in the automotive industry. The extant literature on consumer complaining behavior shows that gender produces differences in the frequency (Heung and Lam 2003), directness, and character of complaints (Kowalski 1996). Next, in the automotive industry, Verhoef et al. (2007) establish empirically that the effects of dealerships on loyalty to the manufacturer vary according to the brand tier of the cars they sell. We coded the brand model according to the industry classification: "compact," "midsize," and "large." The number of service visits customers made in the past three years with their new car, and whether the car was

on a leasing contract or fully purchased at the time of the survey were used as additional covariates. The Bonferroni procedure was used to control for Type I errors across the three levels of the independent group ($\alpha = 0.05/3 = 0.0166$). ANCOVA assumptions (Tabachnik and Fidell 2012) relating to the independence of covariates and the homogeneity of the regression slopes were also tested. As reported in Appendix 2, the covariates are independent or very poorly correlated (highest correlation coefficient = -.112). Similarly, the homogeneity of the regression slopes is also confirmed (see Appendix 3 for service satisfaction). The results for the remaining variables are equivalent, but not reported for reasons of space. The significance of the ANCOVA testing is reported in the Table 3. Multiple comparisons and mean differences are reported in the text and more detail is given in Appendix 4.

Consistent with the service recovery effect in the literature on service failures (e.g., Ok et al. 2007), we observe that customers who complain about their product defects and have them fully fixed exhibit no significant mean difference (ΔM) in terms of their service satisfaction ($\Delta M = -.138$, $p>0.05$) and loyalty to the retailer ($\Delta M = -.173$, $p>0.05$) compared to customers who do not experience any product defect. Both customer satisfaction and loyalty to the retailer are fully recovered; thus, our results clearly confirm H3 and H4. As proposed in H3 and H4, service satisfaction and loyalty to the retailer on the part of complainers whose defects are fully fixed are not significantly different from customers who do not experience any product defect. These findings confirm previous literature on the recovery effect (Donnevert et al. 2008; Priluck and Lala 2009). Therefore, the service recovery effect applies to the context of services associated with durable goods: When customers complain to the dealership about defects and have their products fixed, their relationship with their dealership is ultimately reestablished.

We can also confirm the double deviation effect (e.g., Bitner et al. 1990), as found in the service literature: Customers who do not have their product defects fixed after complaining exhibit the lowest levels of service satisfaction and the lowest loyalty to the retailer compared to other groups of customers. These findings support H5, the mean difference between customers who do not have their product defects fixed after complaining and all other groups of customers being -.480 ($p<0.001$), and H6 with a mean difference of -.495 ($p<0.001$). These findings also confirm those of Voorhees et al. (2006): Complainers whose defects are not fixed exhibit both the lowest levels of service satisfaction and loyalty to the retailer compared to the other categories of customers. Thus, double deviations also occur when the service failure is associated with a manufactured product, i.e., experiencing a product defect and a recovery failure severely damages customers' relationships with their retailers.

Non-complainers exhibit lower perceived product quality ($\Delta M = -.337$, $p<0.01$) and loyalty to the manufacturer ($\Delta M = -.394$, $p<0.001$) compared to customers who experience no product defect. Thus, hypotheses H1 and H2 are confirmed. Also, even if the product defect is entirely fixed, product quality perceptions ($\Delta M = -.326$, $p<0.01$) and loyalty to the manufacturer ($\Delta M = -.275$, $p<0.05$) are still damaged. This confirms hypotheses H7 and H8. Therefore, fixing product defects successfully does not entirely redress the customers' perceptions of product quality, and the recovery effect from the service failure literature should not be generalized to products. Unlike the findings of TARP (1979), but consistent with Voorhees et al. (2006), complainers whose defects are not fixed exhibit the lowest levels of quality perception ($\Delta M = -.409$, $p<0.001$) and loyalty to the product manufacturer, ($\Delta M = -.538$, $p<0.001$), confirming H9 and H10.

Additional tests were run to investigate differences in terms of perceived product quality and loyalty to the manufacturer between non-complainers and complainers who had their product defects entirely fixed. The results of these tests confirm the findings in most complaint management literature (e.g., TARP 1979; Voorhees et al. 2006), in which non-complainers exhibit lower perceived product quality ($\Delta M = -.293$, $p<0.05$) and loyalty ($\Delta M = -.366$, $p<0.01$) compared to customers satisfied with the outcome of their complaint.

TABLE 3: SIGNIFICANCE OF THE FOUR ANCOVA TESTS

Dependent variable	F-value	Sig.	R^2	Adjusted R^2
Service satisfaction	5.877	.000	.065	.054
Perceived product quality	10.615	.000	.095	.086
Loyalty to the retailer	9.471	.000	.089	.079
Loyalty to the manufacturer	11.338	.000	.102	.093

DISCUSSION

In contrast to the widespread literature on service failures, there is almost no research on product defects and their impact on customer relationships. We built our research on Voorhees et al.'s (2006) study, which investigated the effects of non-complainers and complainers on major marketing constructs. In this paper, we modeled the impact of product defects for a durable and expensive good (i.e., a new car) on customer relationships. When customers experience product defects, their relationship with the product manufacturer and retailer (dealership) deteriorates. As in most manufacturing industries, in the automotive field, manufacturers sell their products through a network of independent retailers, who are in charge of handling complaints and remedying defects. Thus, we examined the effects of product defects on customers' perceptions of product quality and service satisfaction among non-complainers and complainers, both those who had their defects completely fixed and those who did not.

First of all, our results draw attention to the importance of non-complainers. These customers experienced product defects but did not complain to the retailer who sold them a defective product. Therefore, non-complainers lost the opportunity to make their product function properly and provided the manufacturers with no feedback to improve their production processes (Boshoff 1997). As advocated in the literature (e.g., Hart et al. 1990), both manufacturers and service providers (retailers) should encourage customers to voice any problems they encounter with their purchases. Managers should also implement effective complaint-handling measures to collect and process this valuable feedback (Harari 1997). Furthermore, non-complainers exhibited deterioration in both perceived product quality and loyalty to the manufacturer: Hence, experiencing product defects makes them vulnerable to switching to the competition.

We also show that the recovery effects found in research on service failures cannot be transferred to product defects as frequently occurs in the literature (e.g., Folkes and Kotsos 1986). Repairing product defects only returns a customer's relationship with the service provider (retailer) to its pre-failure level. In contrast, even if a product defect is fully fixed, the customers' perceptions of product quality and their loyalty to the manufacturer remain damaged compared to customers who experience no product defects. We attribute these differences between products and services to different expectations. We argue that customers are more willing to forgive service failures as these are more likely to depend on human interaction. In service industries, errors are more likely to be expected and tolerated, especially when they are resolved. On the other hand, products are supposed to perform perfectly immediately after purchase. Thus, experiencing product defects has an irremediable negative impact on the customers' perceptions of product quality, as well as their loyalty to the manufacturer.

In a post hoc analysis, we also found that complainers who had their product defects fully fixed displayed higher product quality perceptions and loyalty to the manufacturer compared to non-complainers. This confirms some of the extant literature, in which complainers who are satisfied with the service recovery are ranked above non-complainers (Voorhees et al. 2006). These results show that even though product quality perceptions and loyalty are not restored to the no-defect level, when the retailers completely remedy defective products, the customers' perceptions of product quality and their loyalty to the manufacturer are higher than in the no-complaint case.

Double deviation effects (e.g., Bitner et al. 1990; Ok et al. 2007) are also confirmed in this study. Customers who did not get their product defects entirely fixed after complaining exhibited the lowest levels of service satisfaction, product quality perceptions, and loyalty to the retailer and the product manufacturer, compared to the other categories of customers. Both product manufacturers and retailers should be highly concerned about the quality of their after-sales maintenance services to avoid considerable damage to the relationship with their customers.

MANAGERIAL RECOMMENDATIONS

In the context of durable goods, making perfectly functioning products is essential to benefit from customers' high perceptions of quality and loyalty (Taguchi and Clausing 1990). Customers expect that an expensive and recently purchased new product, such as a car, should perform well and last for a long time (Devaraj et al. 2001). However, whenever products fail to perform and exhibit defects, both manufacturers and retailers should take action to reduce the adverse effects of these failures on the relationship with their customers.

When products display defects, a large proportion of customers do not voice dissatisfaction to the retailer. In our study of the automotive industry, 30.1% of customers who experienced product defects fell into the category of silent

customers, exhibiting a reduction in perceptions of product quality and loyalty to the manufacturer compared to customers who experienced no product defects. They were more likely to switch to alternative product manufacturers. Both manufacturers and their service providers (retailers) should encourage customers to declare the problems they encounter with their purchases. Managers should also implement effective complaint-handling policies to collect and process valuable feedback (Harari 1997). More importantly, even effective tactics for encouraging and handling complaints are unlikely to activate a large portion of the silent majority of customers who experience defects but do not complain. Therefore, a further step would be to survey customers systematically regarding product defects, through the ownership cycle. A stringent monitoring system would provide the management with a comprehensive view of the defects and problems that customers experience with their products over the ownership period. The information provided by such a monitoring system would yield an undistorted picture of product quality and would allow manufacturers to improve their manufacturing processes. There are types of product defects about which customers are not likely to complain, but which will still damage the relationship (quality perceptions, loyalty) in the long run and will not be detected through standard complaint management systems. Our results on non-complainers show that these can inflict substantial damage on the customer relationship.

In a distribution scheme in which retailers are independent of their suppliers and sell products from different manufacturers, such retail managers should handle complaints carefully. We show in this research that complainers who have their product defects fully fixed exhibit equivalent service satisfaction and loyalty to the retailer as if they had experienced no product defects. Therefore, fixing product defects should not be considered merely as a contractual task undertaken with suppliers. Indeed, fixing product defects represents an excellent opportunity for retailers to remedy having sold a defective product to a customer. Solving product defects is insufficient for full recovery of the customers' perceptions of product quality and loyalty to the manufacturer. Fixing defects only makes complainers' perceptions of product quality and loyalty to the manufacturer higher than those of non-complainers. However, this level is still lower than that of customers who experience no product defects.

Therefore, a concentrated focus by product manufacturers on zero defects and total quality management is warranted. It is not appropriate to generalize the results from service failures to product defects, as has frequently been done in the literature (e.g., Folkes and Kotsos 1986). Our results show that consumers do not forgive product defects even if they are fully fixed, so product manufacturers are well advised to get things right the first time.

On the other hand, when product defects are not fixed properly, the relationship between complainers with both the retailer and the manufacturer are severely damaged. The customers' perceptions of product quality, their service satisfaction, as well as their loyalty to both the manufacturer and retailer, drop substantially. By missing the opportunity to solve defects, both the retailer and manufacturer suffer a deteriorated relationship, which may consequently lead to negative word-of-mouth, decreased sales, and profits.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This study only focused on a single category of products. We used cars as a proxy for durable and expensive products. Replications of this study should be conducted with other product categories, such as major household appliances, computers, etc., to enable the findings presented in this paper to be generalized. The use of data related to a single U.S. car manufacturer may be an additional limitation of this research. We therefore suggest testing our model within alternative distribution contexts. In many other countries, such as the Netherlands (Verhoef et al. 2007), the car industry is based on exclusive distribution (i.e., the dealer sells only one brand). Future research should examine the impact of product defects and the subsequent recovery efforts on the relationships with retailers and manufacturers in brand-exclusive distribution systems.

Another limitation of this study concerns the use of two-item scales for our four dependent variables. As stated before, the two-item constructs and the sometimes unusual scale formats were trade-offs that needed to be made to secure the cooperation of a car manufacturer and thereby gain access to real world data. Even though the two-item constructs are not optimal, the items used were adapted from standard scales, and furthermore, the confirmatory factor analysis of the four constructs showed a good fit. Nonetheless, our literature research also highlighted another promising area for future research. In contrast to the abundant literature on service quality (e.g., Parasuraman et al. 1988; Parasuraman et al. 1991; Srivastava and

Rai, 2013) and its measurement, the literature on measuring perceived product quality is comparatively scarce. While different instruments have been developed and extensively validated to measure service quality (e.g., Babakus and Boller 1992; Cronin and Taylor 1994; Katarachia, 2013), our literature research did not uncover an equally convincing and broadly validated scale for the measurement of product quality. To the best of our knowledge, there is no established measurement instrument that sufficiently captures the multidimensional conceptualization of perceived quality developed in Garvin's (1984) seminal work.

An additional promising path for future studies would be to examine the impact of different types, as well as the frequency and sequence of product defects in consumer relationships. Cars are complex products and customers may experience product defects that are likely to vary in severity. Even in the literature stream of service failures, research on the effects of failure severity of consumer's reactions is scarce (for an exception, see Maxham and Netemeyer 2002). Most of the research that has investigated contingencies moderating the influence of service failures on consumer reactions has focused on consumer attributions (e.g., Folkes 1984; Tsiros et al. 2004). In our study, as in other published research (e.g., Van Doorn and Verhoef 2008), we treat product defects as a "general category, though [they] may differ in terms of content, severity, and sequence" (p. 139). Complaining behavior and its impact on major marketing constructs may depend on the severity and the type of the product defects experienced. For example, there may be defects concerning which consumers rarely complain, but which still damage their relationship with the retailer/manufacturer.

Alternatively, retailers/manufacturers may experience many complaints concerning defects that only have a small damaging impact on customer relationships. Furthermore, the frequency and sequence of product defects may also influence the customers' perceptions of product quality and loyalty to the manufacturer (Edvardsson and Strandvik 2000). Therefore, another promising avenue for further research could be longitudinal studies that investigate the dynamics of customer relationships over time. With very few exceptions, most of the studies on customer relationships, including this study, are what Lewicki et al. (2006) criticize as snapshot studies. However, since the seminal paper of Dwyer et al. (1987), relationships between customers and firms have been conceptualized as dynamic and evolving over time. Longitudinal studies have the potential to deepen our understanding of the evolution of customer relationships over time (see recent papers, such as Palmatier et al. 2013; Haumann et al. 2014), and shed light on the long-term and cumulative effects of product defects. This is especially relevant for durable products with a long ownership cycle.

A final issue that we could not cover in this research concerns the effects of warranty on consumer perceptions. Many car manufacturers nowadays offer long warranties on their cars. Research on warranty has focused on its role as a quality signal and the impact on product choice (Chu and Chintagunta 2011; Etzion and Pe'er 2014). Thus, an interesting research question is whether warranty could mitigate the damaging effects of product defects on customer relationships or whether quality perceptions remain tainted.

In summary, we think that research on product defects, product quality perceptions, and their measurement is surprisingly scarce. As our results show that findings on service failures cannot be extrapolated to product defects, we hope that this study can serve as a starting point to motivate more research in this neglected area.

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Appendix 1: Constructs and Measures

Construct/Item	Mean	Standard deviation	Construct reliability/ standardized loading
Service Satisfaction			0.78
Please rate your overall satisfaction with the service dealer [a]	7.67	2.214	0.94
Please rate your overall experience compared to your expectations [b]	2.21	0.578	0.64
Perceived Product Quality			0.88
Please rate your vehicle's quality and reliability overall [a]	8.09	2.034	0.93
Please rate the overall appeal of your vehicle [a]	8.50	1.722	0.85
Loyalty to the dealer			0.82
How likely are you to purchase/lease from the dealership that most recently serviced your current vehicle? [c]	2.99	0.878	0.77
How likely are you to recommend the dealer that services your vehicle? [c]	3.24	0.835	0.90
Loyalty to the maker			0.81
How likely are you to purchase/lease a vehicle of the same make? [c]	3.07	0.882	0.74
How likely are you to recommend this make of vehicle? [c]	3.29	0.808	0.90

[a] Item measured on a 10-point scale spanning from 1 "unacceptable" to 10 "truly exceptional."
[b] Item measured on a three-point scale: 1 "below expectations," 2 "met expectations," and 3 "above expectations."
[c] Item measured on a four-point scale: 1 "I definitely will not," 2 "I probably will not," 3 "I probably will," and 4 "I definitely will."

Appendix 2: Correlations between covariates of ANCOVA

	1	2	3	4
Brand tier	1			
No. of visits to dealership during the past year	.075**	1		
Purchased or leased vehicle	.006	.042	1	
Gender	-.112**	.027	.011	1

* p<0.05, ** p<0.01

Appendix 3: Homogeneity test of the regression slopes for service satisfaction

	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	46.212 [a]	19	2.432	2.710	.000
Intercept	.006	1	.006	.007	.936
Independent factor: Non-complaining, complaining (defects fully fixed), and complaining (defects only partially fixed or not at all)	3.186	3	1.062	1.183	.315
Gender	.126	1	.126	.141	.708
Brand tier	.362	1	.362	.403	.526
Number of service visits to dealership during the past year	.017	1	.017	.019	.890
Lease or purchase	.190	1	.190	.212	.646
Independent factor * Gender	1.927	3	.642	.716	.543
Independent factor * Brand tier	1.170	3	.390	.435	.728
Independent factor * No. service visits	2.296	3	.765	.853	.465
Independent factor * Lease or purchase	3.950	3	1.317	1.467	.222
Error	519.655	579	.898		
Total	570.400	599			
Corrected total	565.867	598			

(a) R-squared = .082, adjusted R-squared = .052

Appendix 4: Multiple comparisons and mean differences in the ANCOVA tests

	Mean difference	S.E.	95% confidence interval for mean difference
Service satisfaction			
No defects vs. defects fully fixed	-.138#	.125	-.384, .107
Other groups vs. defects not fixed	-.480***	.114	-.705, -.225
Perceived product quality			
No defects vs. non-complainers	-.337**	.108	-.550, -.124
No defects vs. defects fully fixed	-.326**	.107	-.537, -.116
Other groups vs. defects not fixed	-.409***	.099	-.603, -.215
Loyalty to the retailer			
No defects vs. defects fully fixed	-.173#	.113	-.395, .050
Other groups vs. defects not fixed	-.495***	.104	-.699, -.291
Loyalty to the manufacturer			
No defects vs. non-complainers	-.394***	.106	-.603, -.186
No defects vs. defects fully fixed	-.275*	.107	-.484, -.065
Other groups vs. defects not fixed	-.538***	.099	-.731, -.344

n.s., * p < .05, ** p < .01, *** p < .001

No defects: Customers who experience no product defects.
Non-complainers: Customers experiencing product defects but do not complain to the retailer.
Defects fully fixed: Complainers who get their product defects fully fixed.
Defects not fixed: Complainers who get their product defects only partially fixed or not at all.
All groups: Customers who experience no product defects, customers who do not complain to the retailer, and complainers who have their product defects fully fixed.