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Functional forms of the satisfaction–loyalty relationship☆

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ABSTRACT

The linear functional form of the effect of customer satisfaction on repurchase intentions may not be adequate under all circumstances; however, we lack a clear understanding of the factors that may drive variation in the functional forms of the satisfaction–loyalty relationship. Building on existing research, the authors consider how the functional form of the effect of satisfaction on repurchase intentions varies across segments formed at the intersection of product categories and customer economic and demographic variables. A comprehensive data set obtained from the sponsors of the Chinese Customer Satisfaction Index provides the input for a flexible cubic regression configuration to model the functional forms. The linear functional form emerges as the most prominent across 972 product–customer segments (51%), followed in frequency by the S-shaped and convex forms and, finally, the inverse S-shape and concave forms. Different product category characteristics, customer economic and demographic variables, and market characteristics moderate the effect of satisfaction on repurchase intentions differently for the linear, quadratic, and cubic terms. This research reveals key resource allocation implications based on the functional forms of the effect of satisfaction on repurchase intentions, as well as strategic segmentation implications related to the varying influence of product category characteristics, customer economic and demographic variables, and market characteristics.

1. Introduction

At the nucleus of contemporary marketing thought lie the notions of segmentation, targeting, and positioning, with their emphasis on the benefits of customer relationship management (e.g., Kotler & Keller, 2006; Kumar, 2008). Marketing academics and practitioners recognize that customers' preferences and responses to marketing instruments (e.g., price promotions) are heterogeneous. However, barring a few exceptions (e.g., Anderson, 1994; Homburg & Giering, 2001; Magi, 2003; Mittal & Kamakura, 2001; Mittal, Kamakura, & Govind, 2004; Ngobo, 1999; Rust, Zahorik, & Keiningham, 1995; Seiders, Voss, Grewal, & Godfrey, 2005; Shankar, Smith, & Rangaswamy, 2003), scholars studying the effect of customer satisfaction on repurchase intentions have not considered how this relationship may vary across product categories or according to customers' economic and demographic variables.

We therefore attempt to address two critical research issues. First, across a broad range of product–customer (PC) segments, we examine the functional form of the relationship between satisfaction and repurchase intentions; in keeping with existing literature (e.g., Homburg, Koschate, & Hoyer, 2005; Mittal & Kamakura, 2001; Ngobo, 1999), we allow for the possibility of linear, concave, convex, S-shaped, or inverse S-shaped forms (see Fig. 1). We specify these PC segments a priori at the intersection of product categories and customer economic and demographic variables. For example, if there are two product categories and two customer economic and demographic variables, each with three levels, we would specify a priori 18 segments (i.e., $2\times3\times3=18$).

Second, we investigate the moderating roles of product category characteristics, customer economic and demographic variables, and market characteristics in the nonlinear relationship between satisfaction and repurchase intentions. Typically, most research has only considered such moderating effects for linear functional forms (e.g., Mittal & Kamakura, 2001, who examined a discrete formulation for nonlinearity); here, we study the effects of the optimal form regardless of its specification (i.e., linear, concave, convex, S-shaped, or inverse S-shaped).

Different functional forms should have different implications for firms' resource allocation decisions, particularly in terms of customer satisfaction management and customer lifetime value (e.g., Anderson, Fornell, & Rust, 1997; Rust et al., 1995; Venkatesan & Kumar, 2004). A linear relationship implies a constant (marginal) return, such that any improvement in satisfaction has the same effect on repurchase intentions. A convex relationship implies increasing returns, such

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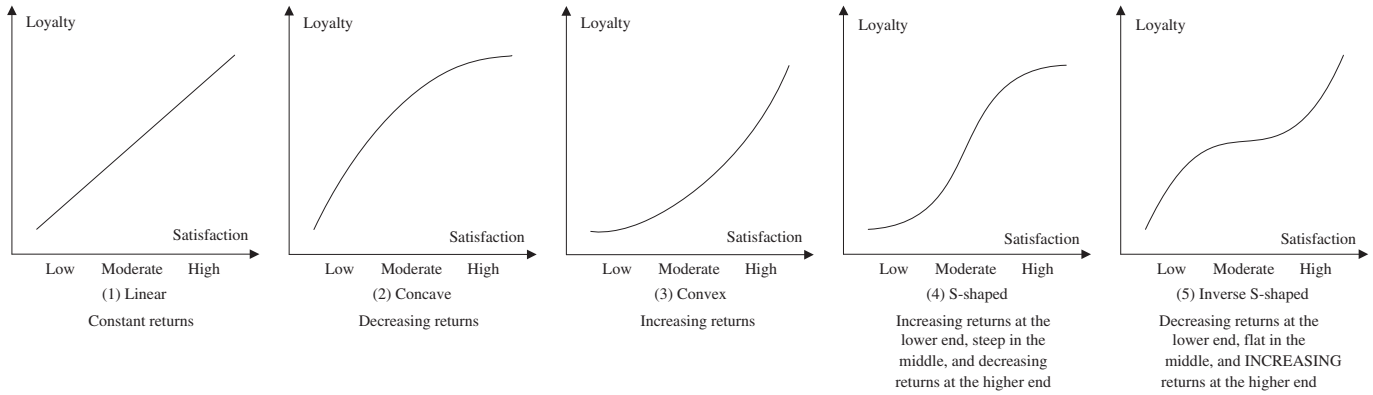


Fig. 1. The functional forms of the satisfaction–loyalty relationship.

that focusing on customers who are more satisfied is a prudent strategy. In contrast, a concave relationship signifies decreasing returns to satisfaction; in such a case, focusing on less satisfied customers is the more effective strategy. An S-shaped relationship suggests a concave relationship (decreasing returns) for customers with high satisfaction but a convex one (increasing returns) for customers who are less satisfied; in this case, the firm should invest in customers with medium levels of satisfaction. Finally, an inverse S-shaped relationship indicates that a convex relationship (increasing returns) exists for highly satisfied customers but a concave one (decreasing returns) emerges for customers with low satisfaction; therefore, a plausible strategy may be to focus on customers with either very low or very high levels of satisfaction.

Marketing scholars have long recognized the heterogeneity of functional forms for the relationship between satisfaction and repurchase intentions (see Table 1)[4]; however, the prevalent practice is to assume, either explicitly or implicitly, a linear relationship (e.g., Fornell, 1992; Homburg & Giering, 2001; Seiders et al., 2005). Empirical research also supports the existence of a linear relationship (e.g., Bearden & Teel, 1983; Fornell, Johnson, Anderson, Cha, & Bryant, 1996; Shankar et al., 2003), although other types of relationships have been documented. For example, Mittal and Kamakura (2001) found increasing returns to satisfaction in the automobile industry when satisfaction increases from moderate to high levels. Homburg et al. (2005) also discovered an inverse S-shaped relationship between satisfaction and customers' willingness to pay. Using survey data from four product categories (i.e., banking, cameras, insurance, and retail), Ngobo (1999) identified a concave relationship for insurance but S-shaped relationships for banking and cameras. Furthermore, Jones and Sasser (1995) observed concave relationships for telephones, airlines, and hospitals but convex relationships for personal computers and automobiles. Finally, Keiningham, Perkins-Munn, and Evans (2003) identified convex and inverse S-shaped relationships in several business-to-business contexts.

In this study, we build on this emerging research by examining how heterogeneity in the functional form of the relationship between satisfaction and repurchase intentions may vary across segments that form at the intersection of product categories and customers' economic and demographic variables. In keeping with existing research that uses customer surveys to study satisfaction (e.g., Seiders et al., 2005), we obtain a comprehensive data set with responses from 146,300 customers across 18 different categories. In this study, we attempt to make two specific contributions.[5] First, we seek to document heterogeneity in satisfaction–loyalty relationship functional forms across 972 sub-data sets (i.e., PC segments) for which we analyze each segment individually. Second, we examine the drivers of the various functional forms by discerning the impact of product category characteristics, customer economic and demographic variables, and market characteristics using a separate hierarchical Bayesian model that pools information across all 972 sub-data sets (i.e., PC segments) into a single estimation procedure.

We organize the remainder of this article as follows: in the following section, we provide a conceptual background and define the research issues that are under investigation. We also discuss the flexible model specification we use to model the functional form of the relationship between satisfaction and repurchase intentions. Next, we present our research methodology and detail the Chinese Customer Satisfaction Index (CCSI) database we use to test our models (in keeping with emerging research in marketing that has used data from China; e.g., Zhou, Yim, & Tse, 2005), together with our measures and model estimation procedures. In presenting our results, we describe the variation in functional forms and document the moderating role of product category characteristics, customer economic and demographic variables, and market characteristics. Specifically, product, customer, and market variables moderate not only the linear effect of satisfaction on repurchase intentions, but also the quadratic and cubic terms.[6] We conclude by discussing the implications of our findings.

2. Conceptual background and research issues

Commercial customer satisfaction surveys show that satisfaction ratings vary with product category characteristics, customer economic and demographic variables, and market characteristics (e.g., Bryant & Cha, 1996; Peterson & Wilson, 1992). For example, Seiders et al. (2005) showed that competition, a market characteristic, moderates the influence of satisfaction on repurchase behavior, and Homburg and Giering (2001) indicated that income, a customer economic variable, moderates the influence of satisfaction on loyalty. Mittal and Kamakura (2001) recommended studying how satisfaction interacts

[4] Repurchase intentions are often used to assess customer loyalty (e.g., Streukens & Ruyter, 2004). However, other measures, such as repurchase behaviors, are also used to assess customer loyalty (e.g., Mittal & Kamakura, 2001 used both repurchase intentions and repurchase behaviors). Therefore, in Table 1, we include research that links satisfaction to broader operationalizations of loyalty (i.e., beyond repurchase intentions).

[5] We thank the sponsors of the Chinese Customer Satisfaction Index for providing us access to this rich data set and to the Chinese experts who afforded us rich contextual insights and helped interpret our findings.

[6] As we subsequently elaborate and consistent with existing literature (e.g., Homburg et al., 2005), we use cubic regression models (linear, squared, and cubic terms) to develop a flexible, nonlinear model of the relationship between satisfaction and repurchase intentions.

Table 1
Satisfaction–loyalty functional forms and moderating factors.

Functional form	Characteristics	Existence	Moderating factors	
			Product category and market characteristics	Customer economic and demographic variables
1	Linear	Ngobo (1999) Streukens and Ruyter (2004)	Anderson (1994) Seiders et al. (2005)[a]	Homburg and Giering (2001) Magi (2003) Seiders et al. (2005)
2	Concave	Jones and Sasser (1995) Ngobo (1999)	None	None[b]
3	Convex	Jones and Sasser (1995) Keiningham et al. (2003)[c]	None	None[b]
4	S-shaped	Ngobo (1999)	None	None[b]
5	Inverse S-shaped	Homburg et al. (2005)[d] Keiningham et al. (2003)[c]	None	None[b]
	Nonlinear (undefined)	Mittal and Kamakura (2001)	None	Mittal and Kamakura (2001)

Notes: This table provides a sample of relevant research, as opposed to being exhaustive.
[a] They examined the marketplace characteristics for different locations of a retail chain.
[b] Mittal and Kamakura (2001) examined the effects in a discrete formulation and found no impact; however, they did not test the effect on specific nonlinear function forms.
[c] They examined share of wallet as a measure of loyalty.
[d] They examined willingness to pay as a measure of loyalty.

with product category characteristics, customer economic and demographic variables, and market characteristics to influence loyalty. As we show in Table 1, various scholars have begun to examine this translation issue, with a focus on how the translation of satisfaction into repurchase intentions varies with product category characteristics, customer economic and demographic variables, and market characteristics variables (e.g., Anderson, 1994; Homburg & Giering, 2001; Magi, 2003).

Not only does the relationship between satisfaction and repurchase intentions vary with product category characteristics, customer economic and demographic variables, and market characteristics variables, but the functional form that relates satisfaction to repurchase intentions also seems to differ across customer segments (or industries; e.g., Jones & Sasser, 1995) that produce linear concave, convex, S-shaped, and inverse S-shaped forms (e.g., Homburg et al., 2005; Mittal & Kamakura, 2001; Ngobo, 1999). However, some gaps in our knowledge remain, as is evident from Table 1. First, researchers have not simultaneously addressed the functional forms of the satisfaction–loyalty relationship or considered functional forms across a large number of PC segments. Second, existing research has overlooked the simultaneous moderating influence of product category characteristics, customer economic and demographic variables, and market characteristic variables and their possible influence on the linear, quadratic, and cubic effects of satisfaction on loyalty.

We discuss these two issues in sequence. First, we present the PC segment perspective to examine how the functional form of the relationship between satisfaction and repurchase intentions differs across these PC segments. Second, we describe the models we use to determine how the relationship between satisfaction and repurchase intentions varies with product category characteristics, customer economic and demographic variables, and market characteristics variables; in the process, we also describe these variables.

2.1. The functional form of the relationship between satisfaction and repurchase intentions

It is well known that customer satisfaction is positively related to desired organizational outcomes, including various measures of loyalty such as repurchase intentions (e.g., Anderson & Mittal, 2000) and repeat purchase behaviors (e.g., Bolton, 1998); this assertion was confirmed by the findings of a recent meta-analysis of customer satisfaction research (Szymanski & Henard, 2001). The importance of the relationship between satisfaction and various aspects of loyalty, including repurchase intentions, has prompted marketing scholars to focus on diverse sets of functional forms (e.g., Anderson & Sullivan, 1993; Mittal, Ross, & Baldasare, 1998). Although the linear functional form has been widely studied (e.g., Anderson, 1994; Seiders et al., 2005), there is growing recognition of the idea that "the satisfaction function is best conceptualized as nonlinear" (Mittal & Kamakura, 2001, p. 133); indeed, numerous researchers have considered other functional forms, such as concave and S-shaped ones (e.g., Agustin & Singh, 2005; Anderson, 1998; Auh & Johnson, 2005; Bowman & Narayandas, 2001; Keiningham et al., 2003; Mittal et al., 1998; Woodruff, Cadotte, & Jenkins, 1983). However, no consensus has emerged regarding which nonlinear functional form best describes the satisfaction–loyalty relationship (for a sample of previously proposed functional forms, see Fig. 1). For example, Mittal and Kamakura (2001) found evidence for increasing returns, Rust et al. (1995) argued that returns were decreasing, and yet others have suggested that the relationship is either inverse S-shaped (e.g., Ngobo, 1999) or S-shaped (e.g., Homburg et al., 2005).

The cubic regression form flexibly captures the myriad of functional forms of the relationship between satisfaction and repurchase intentions (Table 1, Fig. 1). Specifically, we can write the cubic functional form as follows:

$$loy_i = \beta_0 + \beta_1 \times sat_i + \beta_2 \times sat_i^2 + \beta_3 \times sat_i^3 + \varepsilon_i, \quad (1)$$

where the subscript i indicates an individual customer; *loy* refers to loyalty (i.e., repurchase intentions); *sat* indicates satisfaction; ε represents random errors, such that $\varepsilon_i \sim N(0,\sigma^2)$; σ is the standard deviation of homoscedastic normal distributions; and $\beta_k\ \forall k = 0, 1, 2,$ and 3 are the parameters to be estimated.

The pattern of the β coefficients determines the functional form of the relationship between satisfaction and repurchase intentions. That is, if $\beta_k = 0, \forall k = 1, 2, 3$, satisfaction does not influence repurchase intentions; if $\beta_1 > 0$ and $\beta_2 = \beta_3 = 0$, the relationship between satisfaction and repurchase intentions is linear and positive; if $\beta_2 < 0$ and $\beta_3 = 0$, the relationship between satisfaction and repurchase intentions is concave; if $\beta_2 > 0$, and $\beta_3 = 0$, the relationship between satisfaction and repurchase intentions is convex; if $\beta_3 < 0$, the relationship between satisfaction and repurchase intentions is S-shaped; and if $\beta_3 > 0$, the relationship between satisfaction and repurchase intentions is inverse S-shaped.

The flexibility of the cubic functional form in modeling nonlinear relationships is evident. In the cubic polynomial functional form, the additional explanatory power of the higher-order term (i.e., it is

quadratic if the linear term is statistically significant or cubic if the quadratic term is statistically significant) can be strictly evaluated, particularly if we use orthogonal transformations, as we subsequently detail.

From a theoretical standpoint, building on the basic premise that customer satisfaction induces positive impulses based on customers' utility, scholars suggest that customers repeatedly seek products that satisfy them; this phenomenon is manifested in the positive relationship between satisfaction and loyalty (e.g., Fornell, 1992; Fornell et al., 1996; Szymanski & Henard, 2001). However, Woodruff et al. (1983) showed that a zone of indifference also exists in the minds of consumers in terms of performance expectations. Deviations in performance within the zone of indifference do not change the satisfaction–loyalty relationship; however, deviations below or above the zone can dramatically alter it.

Anderson (1998) also recognized this nonlinearity and found support for diminishing returns of the influence of satisfaction on loyalty (i.e., amount of word of mouth), a finding verified by Bowman and Narayandas (2001). The theoretical premise of these studies is that experiences with extreme satisfaction judgments (whether positive or negative) are easily accessible from memory and are diagnostic for customers (e.g., Skowronski & Carlston, 1989). Thus, the accessibility–diagnosticity theory from psychology provides a rationale for a concave satisfaction–loyalty relationship.

In contrast, Agustin and Singh (2005) relied on need-gratification and dual-factor motivation theories to support their arguments for concave and convex satisfaction–loyalty relationships. Building on the premise of relationship marketing in buyer–seller exchanges, Agustin and Singh (2005) classified economic goals, such as achieving given levels of profits, as lower-order needs while classifying relational goals, such as developing social bonds, as higher-order needs. Because satisfaction involves a deviation from customer expectations, when customers seek lower-order economic goals, the satisfaction–loyalty relationship is concave. However, if they pursue higher-order relational goals, the satisfaction–loyalty relationship is convex.

Anderson and Mittal (2000) instead relied on the notion of customer consideration sets to suggest an inverse S-shaped satisfaction–loyalty relationship. Satisfied customers have little motivation to seek alternatives, so their consideration sets contain few of them. As satisfaction increases, the size of the consideration set diminishes, such that satisfaction influences loyalty at an increasing rate. In contrast, as customers experience dissatisfaction, they expand their consideration sets and may even exclude the focal firm/brand from the consideration set at extreme levels. This inverse S-shaped satisfaction–loyalty relationship results in a concave satisfaction–loyalty relationship if the reasoning for extremely satisfied customers does not hold, and a convex one if the logic for extremely dissatisfied customers is not accurate (Anderson & Mittal, 2000; for empirical support for the convex and inverse S-shaped relationships, see Keiningham et al., 2003).

In contrast, in attempting to link customer satisfaction to willingness to pay, Homburg et al. (2005) synthesize relied on disappointment theory (Loomes & Sudgen, 1986) to argue for an inverse S-shaped satisfaction–loyalty relationship. Disappointment theory suggests that, while extreme positive or negative disconfirmations are emotionally charged, the majority of confirmations are nearly emotionless (e.g., Oliver, Rust, & Varki, 1997; Westbrook & Oliver, 1991). Thus, response asymmetry based on the extent to which expectations are met should result in an inverse S-shaped satisfaction–loyalty relationship (e.g., Bell, 1985; Homburg et al., 2005).

Homburg et al. (2005) also relied on prospect theory (Kahneman & Tversky, 1979) to develop the rationale for an opposing S-shaped satisfaction–loyalty relationship. Prospect theory recognizes the importance of a reference point in judgments, such that negative deviations prompt greater penalties than positive ones (Kahneman & Tversky, 1979). Because expected satisfaction should be the reference point for satisfaction judgments, these scholars argued in support of an S-shaped relationship (e.g., Homburg et al., 2005; Ngobo, 1999).

In summary, it appears that the satisfaction–loyalty relationship is both positive (e.g., Fornell, 1992) and nonlinear (e.g., Mittal & Kamakura, 2001). Accessibility–diagnosticity theory (Skowronski & Carlston, 1989) and need–gratification theory pertaining to lower-order economic goals (Agustin & Singh, 2005) suggest a concave relationship. In contrast, need gratification for higher-order relational goals implies a convex satisfaction–loyalty relationship (Agustin & Singh, 2005). The notion of changes in the size of customer consideration sets (Anderson & Mittal, 2000) and insights from disappointment theory (Homburg et al., 2005) provide the rationale for an inverse S-shape; furthermore, prospect theory offers support for an S-shaped satisfaction–loyalty relationship (Homburg et al., 2005).

2.2. Product–customer (PC) segment perspective

To examine the heterogeneity in the relationship between satisfaction and repurchase intentions, we define segments at the intersection of product categories and customer demographics. For example, for two product categories and one customer demographic variable at three levels, we obtain six PC segments (i.e., $2 \times 3 = 6$) and estimate six separate models for the influence of satisfaction on repurchase intentions. Each model may have different nonlinear specifications (i.e., linear, concave, convex, S-shaped, and inverse S-shaped) to accommodate the heterogeneity of functional forms.

2.3. Hypotheses

Our hypotheses focus on how product category characteristics, customer economic and demographic variables, and market characteristic variables influence the linear, quadratic, and cubic effects of satisfaction on loyalty.

2.3.1. Product category characteristics

Consistent with existing literature that suggests that product category characteristics moderate the relationship between satisfaction and repurchase intentions (e.g., Anderson, 1994; Seiders et al., 2005), we consider the moderating roles of (1) purchase importance (e.g., Anderson, 1994) and (2) the hedonic nature of the product (e.g., Mano & Oliver, 1993).

We have relied on classic work by Howard and Sheth (1969) and subsequent theorizations (e.g., Bloch & Richins, 1983) to conceptualize purchase importance as the "relative intensity of motives that govern the buyer's activities relating to given product class relative to other product classes" (Howard, 1974, p. 28). Thus, purchase importance is specific to a product class or category, and we use managerial judgment to assess it (as we subsequently elaborate), similar to Anderson's (1994) conceptualization of product involvement as a product category characteristic. The characteristic varies across product categories but is constant across customers in a given product category.

The time and effort customers spend searching for product information and evaluating alternatives should also increase with purchase importance (e.g., Beatty & Gordon, 1991; Bloch & Richins, 1983). However, customer satisfaction may determine the time and effort these customers expend to search for product information and evaluate alternatives. In particular, when their satisfaction is low, customers should be motivated to search for information and evaluate more alternatives than when their satisfaction is high, regardless of product category purchase importance. However, customers have no reason to search for alternatives if their satisfaction is high, even in a very important product category. At medium levels of customer satisfaction, the motivation to search should depend on the purchase importance of the product category, such that search efforts increase

for more important product categories in comparison with less important categories. Therefore, we suggest:

H1. The positive relationship between customer satisfaction and repurchase intentions decreases in magnitude as purchase importance increases for moderate levels of satisfaction; however, purchase importance does not moderate the relationship between satisfaction and repurchase intentions for low and high levels of satisfaction.

The *hedonic nature* of a product represents the extent to which it is characterized by multisensory, fantasy, and emotive consumption aspects (e.g., Ryan & Deci, 2001), which can influence customer satisfaction (e.g., Mano & Oliver, 1993) and purchase behavior (e.g., Hirschman & Holbrook, 1982). The motivation to study the relationship between the hedonic nature of products and customer satisfaction arises from the recognition that product-elicited emotions also influence customer satisfaction (e.g., Westbrook & Oliver, 1991). Because satisfaction represents a partially emotional response (e.g., Mano & Oliver, 1993), the emotions conjured by the product category should influence the relationship between satisfaction and repurchase intentions.

When satisfaction is at extreme levels (i.e., high or low), the extent to which a given product category induces emotions (i.e., its hedonic nature) should matter less than it does at medium satisfaction levels. When satisfaction is low, a customer likely searches for alternatives, irrespective of his or her emotional attachment to the brand. When satisfaction is high, a status quo bias should take effect, such that inertial forces prevent the consumer from searching for alternatives. In contrast, when satisfaction is at medium levels, customers' desire for alternatives should decline as the hedonic nature of the product increases because of the emotional attachments that hedonic products induce. Thus,

H2. The positive relationship between customer satisfaction and repurchase intentions increases in magnitude as the hedonic nature of the product increases for moderate levels of satisfaction; however, the hedonic nature of the product does not moderate the relationship between satisfaction and repurchase intentions for low or high levels of satisfaction.

2.3.2. Customer economic and demographic variables

Consistent with existing research (e.g., Grewal, Mehta, & Kardes, 2004), we studied the moderating role of customer income, a key customer economic variable, as well as customer gender, age, and education (e.g., Cooil, Keiningham, Aksoy, & Hsu, 2007; Homburg & Giering, 2001; Magi, 2003; Mittal & Kamakura, 2001).

Previous results regarding the moderating role of *income* in the satisfaction–loyalty relationship have been mixed. Homburg and Giering (2001) identified a negative moderating effect on the linear relationship, such that it weakens as customer income increases. In contrast, Seiders et al. (2005) found that income does not influence the effect of satisfaction on repurchase intention, but instead moderates its effect on repurchase visits and spending; for these latter measures of loyalty, the effect increases as income increases.

To the best of our knowledge, studies of income as a moderator involve only the linear relationship between satisfaction and loyalty. Because budget constraints tend to decline with income, dissatisfied customers with higher income can switch to expensive brands if they desire to. However, budget constraints may not matter for extreme levels of satisfaction. At extremely low satisfaction levels, customers switch, regardless of their budget; at extremely high satisfaction levels, they remain persistently loyal. In contrast, budget constraints should be critical at medium levels of satisfaction. Consistent with extant literature on the negative moderating effect of customer income (e.g., Homburg & Giering, 2001), we suggest:

H3. The positive relationship between customer satisfaction and repurchase intentions decreases in magnitude as customer income increases for moderate levels of satisfaction; however, customer income does not moderate the relationship between satisfaction and repurchase intentions for low and high levels of satisfaction.

Researchers consistently identify *gender* differences in the relationship between satisfaction and repurchase intentions (e.g., Krishna, Currim, & Shoemaker, 1991; Li, Sun, & Wilcox, 2005; Slama & Tashchian, 1985); specifically, men generally tend to be more loyal than women at similar levels of satisfaction (Homburg & Giering, 2001; Mittal & Kamakura, 2001). However, in the only study that examined this moderating effect for a nonlinear satisfaction–loyalty relationship, Mittal and Kamakura (2001, p. 140) concluded that the "extent of nonlinearity does not vary on the basis of consumer characteristics," including gender.

With these empirical findings as a backdrop, we rely on a "selectivity hypothesis" from gender research to develop our theoretical reasoning (Meyers-Levy, 1988). Relative to men, women engage in more detailed, elaborate, and comprehensive information processing (e.g., Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991). Given their more elaborate information processing, women should be able to handle complex consideration sets. This elaborate information processing may also enhance women's ability to infer information from their prior consumption experiences. By also considering the empirical finding that men tend to be more loyal than women (Homburg & Giering, 2001; Mittal & Kamakura, 2001), we suggest that when satisfaction is high, women draw clearer and more inferences than men, such that their consideration sets are smaller. Because men's loyalty tends to be higher, at high levels of satisfaction, the interplay with the smaller consideration sets for women likely determines repurchase intentions. However, it is unclear how this interplay may materialize, making it difficult for us to hypothesize accurate differences in repurchase intentions between men and women with high satisfaction. However, for low to medium levels of satisfaction, the size of women's consideration sets should increase to a greater extent than those of men because of the more elaborate processing performed by women. When we combine this consideration set dynamic with the empirical finding that men are more loyal, we posit that the satisfaction–loyalty relationship should be stronger for men than women at low to medium levels of satisfaction. Thus,

H4. Gender moderates the relationship between satisfaction and repurchase intentions, such that the positive relationship has a greater magnitude for men than for women at low to medium levels of satisfaction.

Results regarding the moderating effect of *age* are mixed. Some researchers have found a negative moderating effect, such that the strength of the satisfaction–loyalty relationship decreases with age (Mittal & Kamakura, 2001). Others have reported statistically insignificant (Magi, 2003) or positive moderating effects (Homburg & Giering, 2001). In the only study that considers age and a nonlinear relationship between satisfaction and loyalty, Mittal and Kamakura (2001) reported that the nonlinearity does not vary with age.

Regardless of these previous findings, there are several reasons to believe that age moderates the relationship between satisfaction and repurchase intentions in a nonlinear setting. Older customers tend to be more cautious than younger ones and seek greater certitude before they act (Botwinick, 1973); thus, the transformation of satisfaction into repurchase intentions should be lower for older customers. However, as the level of satisfaction increases, the extent to which customers search for alternatives also should decline. That is, age should reduce the positive effect of satisfaction on repurchase intentions, but the negative moderating effect of age may be smaller when satisfaction is high than when satisfaction is low.

H5. The positive relationship between customer satisfaction and repurchase intentions decreases with customer age; the magnitude of the decrease in repurchase intentions is smaller when satisfaction is high as opposed to low.

For the linear functional form of the satisfaction–loyalty relationship, Mittal and Kamakura (2001) identified a positive moderating effect of *education*, in which the relationship grows stronger as education level increases. However, these authors failed to identify a moderating effect for a nonlinear functional form. The extent to which people search for and process information typically varies with education; as their education increases, so do their abilities to engage in external searches (e.g., Schmidt & Spreng, 1996) and process the collected information (e.g., Schaninger & Sciglimpagalia, 1981). Thus, we consider two possibilities for the moderating effect of education. First, as education increases, the ability to handle complex consideration sets improves. Second, education increases the ability to infer information from past consumption experiences, which would reduce consideration set sizes. Which of these two possibilities, the ability to handle complex consideration sets or the reduction in consideration set sizes, is more salient when satisfaction is low is unclear. However, if satisfaction is high, educated customers should be able to draw clearer and more inferences from their past consumption experiences than less educated customers (e.g., Schaninger & Sciglimpagalia, 1981); thus, their consideration set sizes should be smaller. Accordingly, we hypothesize:

H6. At high levels of satisfaction, the positive relationship between satisfaction and repurchase intentions will be stronger for educated customers than for uneducated customers.

2.3.3. Marketplace characteristics

Because expectations about satisfaction and loyalty are framed by competing firms in an industry, it comes as little surprise that scholars often study the role of *competition* in the relationship between satisfaction and loyalty (e.g., Anderson, 1994; Seiders et al., 2005). Findings pertaining to the moderating role of competition in the satisfaction–loyalty relationship have been mixed, with some authors claiming that competition negatively moderates the satisfaction–loyalty relationship (e.g., Anderson, 1994), while others have suggested that it has no moderating effect (e.g., Seiders et al., 2005). However, all of these investigations specified a linear relationship between satisfaction and loyalty.

If the relationship between satisfaction and repurchase intentions is nonlinear, the moderating role of competition would be more complex than previously thought. In other words, if the relationship between satisfaction and loyalty is linear, quadratic, or cubic, the effect of competition may be a linear, quadratic, or cubic as well. We examine this complex moderating possibility and argue that, though competitive intensity increases the size of customers' consideration sets and larger set sizes indicate more competitive intensity, consideration sets may be smaller when customers' satisfaction levels are high as opposed to low.

H7. As competitive intensity increases, the strength of the positive relationship between satisfaction and repurchase intentions decreases.

2.4. Model specifications

To test our assertions, we resort to two model specifications. First, we estimate the model specified in Eq. (1) separately for each PC segment. For example, if we have two product categories and three customer segments (based on economic and demographic variables), we consider six ($2\times3=6$) PC segments and estimate six models (one for each segment), as in Eq. (1). We represent this configuration in Eq. (2), where $p\times c$ denotes the intersection of product categories (p) and customer economic and demographic variables (c), and $\sigma^2_{p\times c}$ is the homoskedastic PC segment-specific error term variance:

$$loy_i = \beta_{(p\times c)0} + \beta_{(p\times c)1}\times sat_i + \beta_{(p\times c)2}\times sat_i^2 + \beta_{(p\times c)3} \times sat_i^3 + \varepsilon_i,\ \varepsilon_i \sim N\left(0, \sigma^2_{p\times c}\right). \quad (2)$$

Second, we seek to examine the role of product category characteristics, customer economic and demographic variables, and market characteristics in influencing the intercept, linear, quadratic, and cubic term coefficients for the influence of satisfaction on loyalty. To achieve this objective, we re-estimate the PC segments in a single model using a hierarchical Bayesian approach (Eqs. (3)–(5)), in which we specify the mean of $\beta_{(p\times c)k}$ in Eq. (2) as a function of covariates (see Rossi, Allenby, and McCulloch (2005, p. 70–75)):

$$loy_i = \beta_{i0} + \beta_{i1}\times sat_i + \beta_{i2}\times sat_i^2 + \beta_{i3}\times sat_i^3 + \varepsilon_i, \varepsilon_i \sim N\left(0, \sigma^2\right), \quad (3)$$

and

$$\beta_{ik} = \overline{\beta}_{ik} + \xi_k, \xi_k \sim N\left(0, \delta_k^2\right) \forall k = 0, 1, 2, \text{and} 3. \quad (4)$$

We further specify $\overline{\beta}$ as:

$$\overline{\beta}_{ik} = \theta_k + \alpha_{k1}\times imp_{prd[i]} + \alpha_{k2}\times hedo_{prd[i]} + \alpha_{k3}\times comp_{mkt[i]} + \gamma_{k1}\times inc1_i + \gamma_{k2}\times inc2_i + \gamma_{k3}\times sex_i + \gamma_{k4}\times age1_i + \gamma_{k5}\times age2_i + \gamma_{k6}\times edu1_i + \gamma_{k7}\times edu2_i \quad (5)$$

where $imp_{prd[i]}$, and $hedo_{prd[i]}$ represent the product category characteristics (purchase importance and hedonic nature) of the product/service for customer i; $inc1_i$, $inc2_i$, sex_i, $age1_i$, $age2_i$, $edu1_i$, and $edu2_i$ are dummy variables representing the customer's income, gender, age, and education income variables, respectively; $comp_{mkt[i]}$ refers to the market characteristic of competition (see Table 2); θ_k represents the main effect of satisfaction (i.e., the intercept term, linear, quadratic, and cubic terms of satisfaction for $k=0,1,2,3$, respectively); α_{k1} to α_{k3} ($k=0,1,2,3$) are coefficients of product category characteristics and market characteristics; and γ_{k1}–γ_{k7} ($k=0,1,2,3$) are coefficients of individual customer characteristics.

In keeping with standard Bayesian hierarchical modeling (e.g., Rossi et al., 2005), we specify vague priors for the coefficients with the following prior structure: (1) $\left(1/\sigma^2\right) \sim Gamma(.001, .001)$; (2) $\left(1/\delta_k^2\right) \sim Gamma(.001, .001)\ \forall k=0,1,2,3$; (3) $\theta_k \sim N(\overline{\theta}_k, \tau_k^2)$, $\overline{\theta}_k \sim N\left(0, 10^7\right)$, $\left(1/\tau_k^2\right) \sim Gamma(.001, .001), \forall k=0,1,2,3$; (4) $\alpha_{kj} \sim N\left(\overline{\alpha}_{kj}, \eta_{kj}^2\right)$, $\overline{\alpha}_{kj} \sim N\left(0, 10^7\right)$, $\left(1/\eta_{kj}^2\right) \sim Gamma(.001, .001)$, $\forall k=0,1,2,3$, $\forall j=1,2,3$; and (5) $\gamma_{kj} \sim N\left(\overline{\gamma}_{kj}, \phi_{kj}^2\right)$, $\overline{\gamma}_{kj} \sim N\left(0, 10^7\right)$, $\left(1/\phi_{kj}^2\right) \sim Gamma(.001, .001), \forall k=0,1,2,3$, $\forall j=1,2,\ldots,7$.

3. Method

3.1. Research context

We obtained a comprehensive data set from the sponsors of the Chinese Customer Satisfaction Index (CCSI) survey, a nationwide survey performed by the China National Institute of Standardization and Tsinghua University and directly modeled on the American Customer Satisfaction Index (ACSI) of the University of Michigan Business School. The data collection procedures were identical to those used for the ACSI, as documented by Fornell et al. (1996). The survey was designed to gather a nationally-representative sample of

Table 2
Product category and market characteristics.

Product	Category	Purchase	Hedonic	Competition
		Importance (1–5)[a]	Feature (1–5)[a]	(0–1)[b]
1	Air conditioner	3.8	2.6	0.07
2	Computer	4.3	3.2	0.19
3	Mobile phone	4.3	3.1	0.11
4	Refrigerator	3.9	2.4	0.13
5	Telephone	2.8	2.0	0.09
6	TV	4.0	3.4	0.09
7	Washing machine	3.6	2.3	0.13
8	Beer	2.0	3.9	0.05
9	Cashmere	2.7	2.9	0.13
10	Cigarette	2.0	3.7	0.02
11	Detergent	2.4	1.4	0.18
12	Ham	1.9	2.3	0.57
13	Liquid milk	3.0	2.4	0.16
14	Milk powder	3.0	2.2	0.10
15	Shoe leather	3.2	2.6	0.05
16	Toothpaste	2.5	1.6	0.17
17	Wine	2.7	4.1	0.22
18	Mobile service	3.6	2.7	0.49

[a] The purchase importance and hedonic features are measured using five-point scales, where 1 is the lowest level and 5 is the highest level. We surveyed 54 marketing managers and provide mean values for each of the product categories.
[b] Competition is calculated from brand market share data, where 0 is the highest level and 1 is the lowest level.

customers of major companies in a wide variety of industries, including durable products, non-durable products, and services. The data pertain to 146,300 customers who made purchases within 18 different product categories and were selected randomly by telephone number across 50 cities. Participants were required to be adults of at least 18 years of age who had recently purchased or used a focal product. We used responses from 146,300 customers in relation to 18 different product categories: air conditioners (9063 customers), computers (6904 customers), mobile phones (9738 customers), refrigerators (8892 customers), telephones (7789 customers), televisions (9602 customers), washing machines (8656 customers), beer (10,782 customers), cashmere sweaters (7456 customers), cigarettes (12,025 customers), detergent (6970 customers), ham (4498 customers), liquid milk (7801 customers), milk powder (7023 customers), shoe leather (3262 customers), toothpaste (9593 customers), wine (9085 customers), and mobile services (7161 customers).

3.2. Measures and measure validation

We obtain measures of the purchase importance and hedonic nature of the products from a panel of 54 marketing managers (see also Anderson, 1994). To quantify purchase importance, we use a three-item, five-point scale adapted from Van Trijp, Hoyer, and Inman (1996).[7] The scale exhibits good internal consistency (Cronbach's alpha = .77), and we average its items to obtain an aggregate score for each product category. We measure the hedonic nature of each product with a scale anchored at "1 = most practical" and "5 = most hedonic" (Subrahmanyan, 2004). The measure of competition is based on the degree of brand concentration (Anderson, 1994; DeFond & Park, 1999). We calculate the sum of the squared market share (percentage) for the top five brands in each category to represent the degree of brand concentration (competition) in a given category within the Chinese market. We summarize the descriptive statistics for the product category characteristics and market characteristics in Table 2.

The questionnaire employs 10-point scales to assess each respondent's satisfaction and repurchase intentions. Customer satisfaction consists of a four-item measure that closely parallels previous measures (Fornell et al., 1996; Homburg et al., 2005).[8] The satisfaction scale achieves good internal consistency, with a Cronbach's alpha of .91; therefore, for our further analysis, we calculate the satisfaction score as an average of four satisfaction scale items. Our measure of loyalty uses a 10-point scale, on which 1 indicates a low repurchase intention and 10 indicates a high repurchase intention (Anderson & Sullivan, 1993). In Table 3, we summarize the descriptive statistics for key customer economic and demographic variables. As we show in Table 3, these variables result in 54 (3 [income] × 2 [gender] × 3 [age] × 3 [education]) customer segments. Thus, when we cross the 54 customer segments with the 18 product segments (categories), we obtained 972 PC segments.

3.3. Common method bias

Given that the relationship between satisfaction and repurchase intentions and repurchase behavior can differ (e.g., Mittal & Kamakura, 2001) and because we measured satisfaction and repurchase intentions with information gathered from the same respondent, it was critical to test for common method bias issues. Our data collection procedure replicates that of ACSI (Fornell et al., 1996), so the strengths and weaknesses relevant to that approach apply to our data as well. Furthermore, we derive some moderators from sources other than the customer survey (e.g., competition is a secondary data measure, and managers provided the assessments of purchase importance and hedonic nature). Because we model both nonlinear and moderation effects explicitly and naïve consumer conceptualizations do not include nonlinear moderating effects, common method bias should not be an issue. Finally, a Harmon single-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) suggests common method variance is unlikely to be a concern.[9] Regardless, we recognize that the key explanatory variable (satisfaction) and the dependent variable (repurchase intention) come from the same survey, thus representing a limitation of our research.

3.4. Model estimation procedures

In the first model (Eq. (2)) for determining the functional form of the satisfaction–loyalty relationship of 972 PC segments, we use Gibbs sampling to estimate the cubic regression model for each segment separately (e.g., Rossi & Allenby, 2003). Because a cubic regression may be prone to the deleterious effects of multicollinearity (linear, quadratic, and cubic satisfaction terms should correlate), we follow extant research (Homburg et al., 2005) in using orthogonal polynomial variables to instrument the linear, quadratic, and cubic terms of satisfaction using SAS 9.1.3 ORPOL software.[10]

We also use Gibbs sampling to estimate the model in Eqs. (3)–(5) and thus can test for the impact of product characteristics and

[7] We measure purchase importance using three survey items: "The product/service is important to customers (5 = most important; 1 = least important)"; "Customers are interested in the information about this product (5 = most interested; 1 = least interested)"; and "When customers buy this product/service, they choose carefully (5 = most carefully; 1 = least carefully)."

[8] We measure satisfaction with the following survey items: "overall satisfaction," "expectancy disconfirmation (performance that falls short of or exceeds expectations)," "performance versus other product or service in the category," and "performance versus the customer's ideal product or service in the category."

[9] For five items used to measure satisfaction and repurchase intentions, three eigenvalues exceed 1 in an exploratory factor analysis. After extracting two factors (because we have two latent constructs, satisfaction and repurchase intentions), the rotated factor loadings matrix showed that satisfaction items loaded on the first factor and repurchase intentions item loaded on the second factor.

[10] The ORPOL function calculates orthogonal polynomial variables from satisfaction data. These orthogonal polynomial variables are linear combinations of the simple polynomials but are pairwise uncorrelated. Thus, collinearity is completely eliminated.

Table 3
Customer economic and demographic variables.

Income				Gender			Age				Education			
inc1	inc2		%	sex		%	age1	age2		%	edu1	edu2		%
0	0	<20k	40.5	0	Male	54.8	0	0	≤29	30.6	0	0	≤Junior high	21.9
0	1	20k–60k	45.5	1	Female	45.2	0	1	30~54	58.3	0	1	Senior high	35.4
1	0	>60k	14.0				1	0	≥55	11.1	1	0	≥College	42.7

NOTES: The table shows the coding of the demographic variables. For example, inc1 = 0 and inc2 = 0 indicate that a subject's income is less than 20,000 per year (<20 k), and sex = 0 indicates that the respondent's gender is male.

Fifty-four segments are identified based on different combinations of demographic variables:

Segment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
inc1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
inc2	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0
sex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
age1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
age2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
edu1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1
edu2	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0

Segment	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
inc1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
inc2	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0
sex	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
age1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
age2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
edu1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1
edu2	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0

customer economic and demographic variables on the functional form of the satisfaction–loyalty relationship. As shown in Eq. (5), we specify the mean value of the β coefficients as a function of product characteristics and customer economic and demographic variables (see also Rossi et al. (2005)).

4. Results

4.1. Heterogeneity of functional forms

To ensure convergence in our Gibbs sampling model, we use two chains, a burn-in of 25,000 samples per chain, and a sample of an additional 25,000 (1 of 10 in the final sample) runs per chain; we then inspect the Gelman–Rubin statistics (Gelman & Rubin, 1992). The two Markov chains mix easily, and the Gelman–Rubin statistics are close to 1, suggesting that the model converges. In Table 4, we summarize the results for the 972 PC segment units and their inferred functional forms for the relationship between satisfaction and repurchase intentions. Of the 972 PC segments, 51% (498 of 972) are characterized by a linear satisfaction–loyalty functional form, partially supporting the concept of linear as the default functional form. In terms of the frequency of occurrence, the S-shaped functional form (128) and convex functional form (65) followed. Concave and inverse S-shaped functions forms also appear though at much lower frequencies of 16 and 19, respectively. The remaining 246 PC segments exhibit a constant relationship between satisfaction and repurchase intentions (linear, quadratic, and cubic coefficients are not statistically different from 0); upon closer examination, these segments contain substantially fewer observations (i.e., an average of 19 per unit, in comparison to the overall average number of observations per unit, 151).

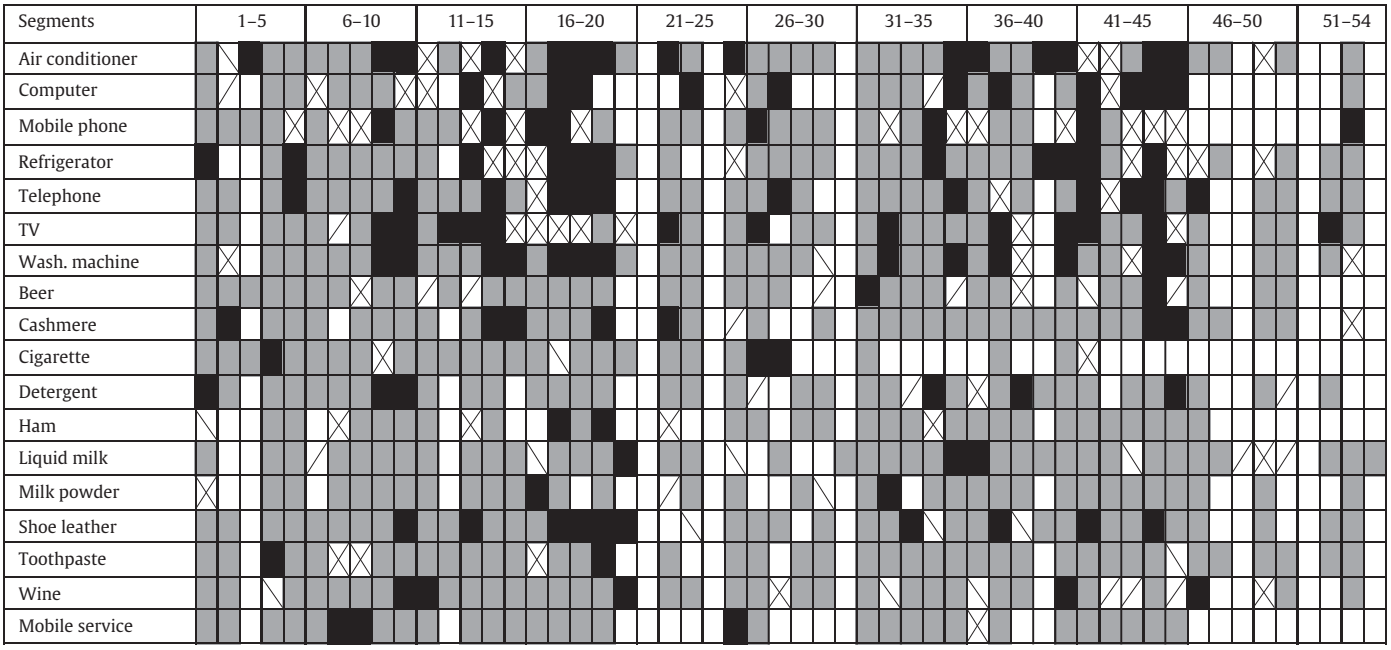
The functional forms in Table 4 clearly present a mosaic. None of the 18 product categories has a same functional form across all customer segments. Only 2 of the 48 customer segments (excluding 3 segments with constant functional forms for all 18 categories and 3 with constant functional forms for 17 categories) exhibit the linear functional form. These findings, in addition to the prevalence of heterogeneity of functional forms, provide unequivocal evidence that the functional form of the relationship between satisfaction and repurchase intentions varies across product categories and customer economic and demographic variables.

4.2. The role of product characteristics, customer economic and demographic variables, and market characteristics

To understand how the functional form of the relationship between satisfaction and repurchase intentions varies based on product category characteristics, customer economic and demographic variables, and market characteristics, we estimate the model specified in Eqs. (3)–(5) using Gibbs sampling and the previously discussed structure. To ensure model convergence, we use two chains: a burn-in of 25,000 samples per chain, and a sample of 25,000 (1 of every 10) additional runs per chain. Furthermore, we again inspect the Gelman–Rubin statistics. The two Markov chains mix easily, and the Gelman–Rubin statistics are close to 1; thus, the model converges again.

In Table 5, we present the parameter estimates from this Bayesian model. The presence of statistically significant coefficients for product category characteristics, customer economic and demographic variables, and market characteristics suggest that these variables influence the functional form of the relationship between satisfaction and repurchase intentions. All of the product category characteristics, customer economic and demographic variables, and market characteristics have a statistically significant influence on the linear term of the relationship between satisfaction and repurchase intentions. The quadratic term, which determines whether the functional form of

Table 4
Empirically derived satisfaction–loyalty functional forms.



Notes: See Table 2 for the segment coding. Blank cells represent a constant satisfaction–loyalty relationship and are likely an artificial result due to insufficient data.

Key:
Linear 498 Concave 16 Convex 65 S-shaped 128 Inverse-S-shaped 19

the relationship between satisfaction and repurchase intentions is concave or convex (i.e., if the cubic term is statistically insignificant), seems to be influenced by purchase importance and the age and education customer demographics. However, age and education do not influence the cubic term; these two variables appear to determine whether the relationship between satisfaction and repurchase intentions is convex (both coefficients are positive).

The two product category characteristics (purchase importance and hedonic nature), the market characteristic of competition, and customer income and age all have statistically significant interactions with the satisfaction cubic term. Thus, these factors appear to determine whether the relationship between satisfaction and repurchase intentions is S-shaped or inverse S-shaped. A hedonic nature or low competition tend to result in an inverse S-shaped functional form (i.e., the coefficients are positive and statistically significant), whereas higher purchase importance, age, and income values prompt an S-shaped functional form (i.e., the coefficients are negative and statistically significant for interaction with the cubic term).

We reorganize the results to provide a graphical view of the overall effect of each factor, considering its potential effects on the intercept, linear, quadratic, and cubic terms. We start with a reference relationship, which we define as the relationship between satisfaction and repurchase intentions for a segment of low-income young men who have little education and purchase in an unimportant product category that is not hedonic but does exhibit the highest levels of competition (i.e., a commodity). In Fig. 2, this reference relationship is essentially linear. Against this reference, we compare graphs that depict the marginal effects of a shift in one variable (e.g., high

Table 5
The influence of product category characteristics, customer economic and demographic variables, and market characteristics on the functional form of the satisfaction–loyalty relationship.

coefficient		$k=0\ (\bar{\beta}_{(p\times c)0})$		$k=1\ (\bar{\beta}_{(p\times c)1})$		$k=2\ (\bar{\beta}_{(p\times c)2})$		$k=3\ (\bar{\beta}_{(p\times c)3})$	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
θ_k	*intercept*	2.966**	0.026	0.390**	0.018	−0.090**	0.017	0.004	0.013
α_{k1}	*imp*	−0.157**	0.006	0.081**	0.003	0.038**	0.003	−0.024**	0.002
α_{k2}	*hedo*	0.018**	0.006	−0.022**	0.004	−0.002	0.004	0.013**	0.004
α_{k3}	*comp*	0.330**	0.035	−0.056**	0.022	0.000	0.020	0.040**	0.019
γ_{k1}	*inc1*	−0.017	0.012	0.039**	0.008	−0.005	0.007	−0.017**	0.006
γ_{k2}	*inc2*	−0.013	0.010	0.028**	0.006	0.000	0.006	−0.012**	0.005
γ_{k3}	*sex*	−0.015	0.009	0.012**	0.005	−0.006	0.004	−0.004	0.004
γ_{k4}	*age1*	−0.061**	0.012	0.027**	0.009	0.020**	0.008	−0.011	0.008
γ_{k5}	*age2*	−0.010	0.010	0.021**	0.006	0.005	0.005	−0.009*	0.005
γ_{k6}	*edu1*	−0.012	0.011	0.047**	0.007	0.022**	0.006	−0.002	0.006
γ_{k7}	*edu2*	−0.001	0.011	0.038**	0.007	0.010	0.006	−0.004	0.006

Notes: 1) *imp*, *hedo*, and *comp* stand for purchase importance, hedonic nature, and competition, respectively. The other acronyms are defined in Table 3.
2) This model is calibrated using the responses from 146,300 customers in relation to 18 product categories.
* Significant at the 0.1 level for a two-tailed test.
** Significant at the 0.05 level for a two-tailed test.

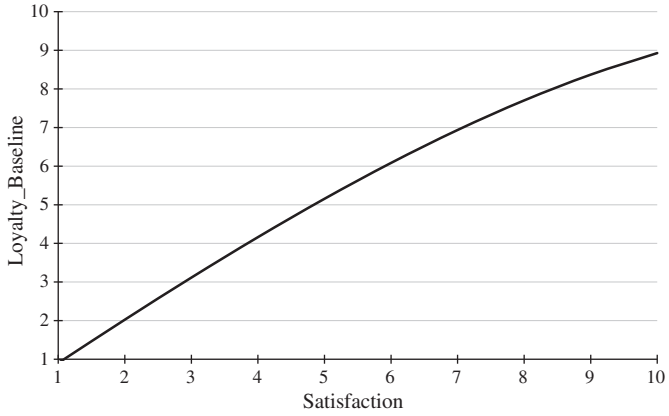


Fig. 2. Reference (baseline) relationship. Notes: This reference relationship features the segment of low-income young men who have low levels of education and purchase in the product category with the lowest purchase importance, lowest hedonic nature, and highest competition (commodity).

income). We present these marginal effect graphs for the product category and market characteristics in Fig. 3 and those for the customer economic and demographic variables in Fig. 4.

4.2.1. Purchase importance

The marginal effect of purchase importance is negative. For a given satisfaction level (e.g., line 1 in Fig. 3a), high purchase importance leads to lower repurchase intentions, all else being equal. This observation is consistent with previous research on the moderating effect of purchase importance in the satisfaction–loyalty relationship (e.g., Anderson, 1994). The graph in Fig. 3a also seems to suggest that this negative effect reaches its peak at medium levels of satisfaction. In H1, we reasoned that purchase importance would be more critical at medium levels of satisfaction, such that as purchase importance increases, repurchase intentions should decrease; our findings support this reasoning.

4.2.2. Hedonic nature

The marginal effect of hedonic nature is positive. For a given satisfaction level, a more hedonic product should lead to higher loyalty (all else being equal). This marginal effect reaches its maximum for a medium satisfaction level in Fig. 3b but disappears completely at high satisfaction levels. In support of our reasoning in H2, the hedonic nature of the product category appears more critical at medium levels of satisfaction, such that as the hedonic nature increases, repurchase intentions also increase.

4.2.3. Competition

The marginal effect of competition shown in Fig. 3c is positive; for a given satisfaction level, lower competition (from 0 toward 1) prompts higher repurchase intentions (all other things being equal). This finding is consistent with our predictions in H7 and with the findings of Anderson (1994). We also find that this moderating effect decreases as satisfaction increases from medium to high. However, the moderating effect is smaller when satisfaction is extremely low, perhaps because dissatisfied customers switch regardless of the level of competition.

4.2.4. Income

According to Homburg and Giering (2001), the marginal effect of income on the rate at which satisfaction translates into repurchase intentions is negative. We find support for this assertion in Fig. 4a, but we also show that the negative marginal effect is more salient when satisfaction is low or moderate, and it disappears at high satisfaction levels. These findings are consistent with H3, in which we asserted that, at moderate levels of satisfaction, the positive relationship between satisfaction and repurchase intentions would decrease in magnitude as customer income increases.

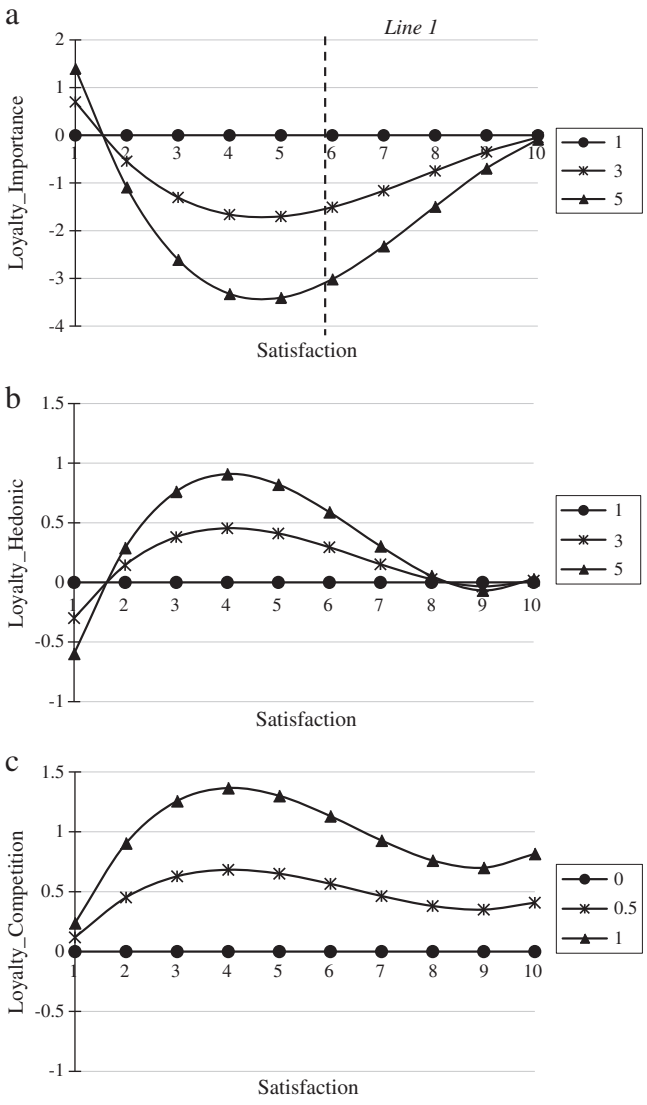


Fig. 3. The marginal effect (cf. reference relationship) of category and market characteristics. (a) Purchase Importance. Notes: The three curves represent different marginal effects of the different levels of purchase importance: 1, 3, and 5 represent different levels, where 1 is the lowest and 5 is the highest. (b) Hedonic Feature. NOTES: The three curves represent different marginal effects of the different levels of hedonic nature: 1, 3, and 5 represent different levels, where 1 is the lowest and 5 is the highest. (c) Competition. Notes: The three curves represent different marginal effects of the different levels of competition: 0, 0.5, and 1 represent the different levels, where 0 is the highest and 1 is the lowest.

4.2.5. Gender

The marginal effect of gender is negative, which implies that men are generally more loyal than women, consistent with H4 and extant research (e.g., Homburg & Giering, 2001; Mittal & Kamakura, 2001). In Fig. 4b, we qualify extant literature in the sense that the satisfaction–loyalty relationship is stronger for men than for women at low to moderate levels of satisfaction; however, the gender difference disappears at high levels of satisfaction, consistent with H4.

4.2.6. Age

According to Fig. 4c, the marginal effect of age is negative, consistent with H5 and the conclusion of Mittal and Kamakura (2001) that age has a negative moderating effect on the satisfaction–loyalty relationship. Furthermore, consistent with our expectations in H5,

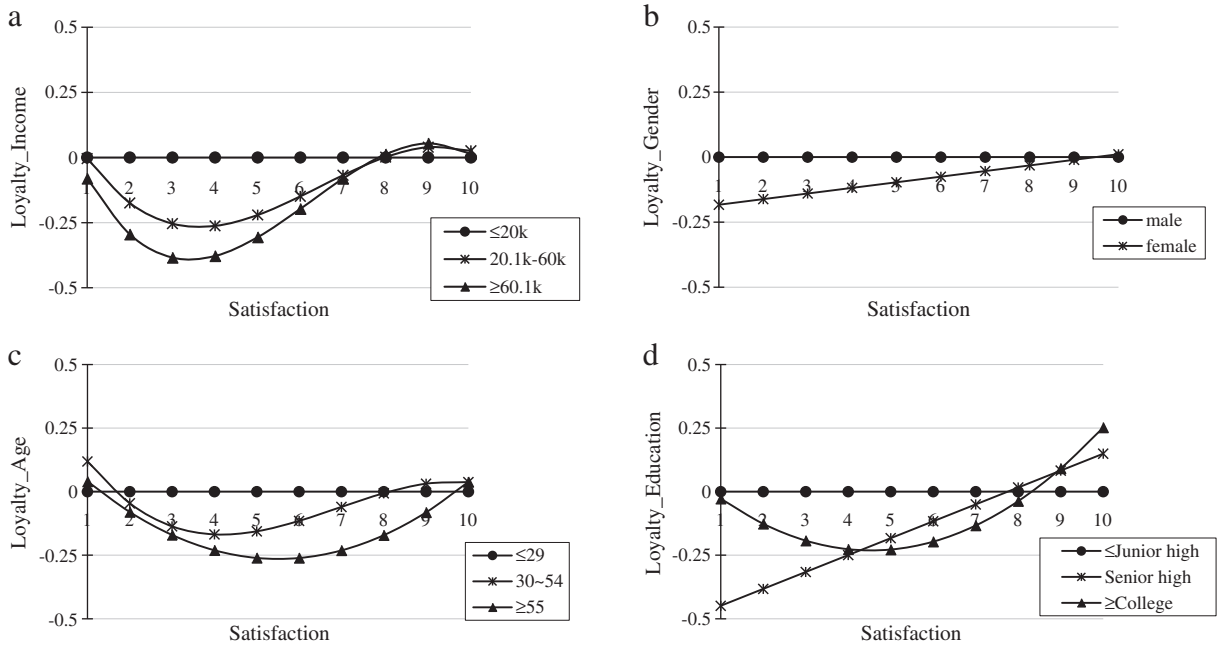


Fig. 4. The marginal effect (cf. reference relationship) of customer characteristics. (a) Income. NOTES: The three curves represent different marginal effects of different levels of income. (b) Gender. NOTES: The two curves represent different marginal effects of different genders. (c) Age. Notes: The three curves represent different marginal effects for age. (d) Education. Notes: The three curves represent different marginal effects of different levels of education.

this marginal effect deceases as satisfaction increases. However, we observe that the moderating effect is small when satisfaction is extremely low, perhaps because at the low end of the satisfaction spectrum customers will switch, regardless of the differential risk tolerances of customers of different ages.

4.2.7. Education

The marginal effect of education appears to be negative except among extremely satisfied customers, where it is positive (see Fig. 4d); the latter finding is consistent with H6. For customers with moderate education levels, the magnitude of the negative marginal effect on the relationship between satisfaction and repurchase intentions reaches its highest point for low levels of satisfaction (i.e., the relationship between satisfaction and loyalty is weakest at low levels of satisfaction for customers with moderate education levels). In contrast, among highly educated customers, the magnitude of the negative marginal effect on the relationship between satisfaction and loyalty is highest for medium levels of satisfaction. Thus, though the findings relate to education are consistent with H6, they seem more nuanced than we predicted based on findings in extant literature.

5. Discussion

In this research, we explore the heterogeneity of the functional forms of the relationship between satisfaction and repurchase intentions; specifically, in addition to the linear form, we also consider concave, convex, S-shaped, and inverse S-shaped functional forms. Although scholars have already investigated nonlinear functional forms of this relationship (e.g., Homburg et al., 2005; Mittal & Kamakura, 2001; for an overview, see Table 1), the linear functional form remains the most commonly studied. Our results show that across 972 PC segments, though the most dominant functional form is linear (51%), there is ample evidence to support the existence of the other forms.

Our theoretical contributions regarding the functional form of the satisfaction–loyalty relationship are twofold. First, our results suggest that the default assumption of a linear functional form of the relationship between satisfaction and repurchase intentions carries some weight. We also concur with the assessment that "the satisfaction function is best conceptualized as nonlinear" (Mittal & Kamakura, 2001, p. 133) because we find many instances in which the linear functional form is not optimal. However, we qualify this assessment by recognizing that the functional form of the satisfaction function must be empirically validated before the moderating effects are incorporated.

Second, we have refined Jones and Sasser's (1995) notion that the functional form of the satisfaction–loyalty relationship varies across industries (or product categories). We find heterogeneity in these functional forms across segments within an industry (see Table 4). Thus, in addition to product categories (industries), segments within product categories that rely on customer economic and demographic variables must be considered to assess the appropriate functional form for the satisfaction–loyalty relationship.

Our study is unique in that we consider the moderating role of product category characteristics, customer economic and demographic variables, and market characteristics not only for the linear effect of satisfaction on loyalty, but also the quadratic and cubic terms. Our results suggest that product and customer variables moderate all types of terms. The marginal curves we plot for these moderators also confirm that models that include only linear moderating effects cannot represent a complete picture. The relationship between satisfaction and repurchase intentions may be linear or nonlinear, and the moderating effects of product and customer variables are extremely complex.

Our results thus can help generalize findings that are documented in prior literature. For example, using three service categories (i.e., dry cleaning, fast food and supermarkets), Streukens and Ruyter (2004) found support for a linear satisfaction–loyalty relationship, as did Ngobo (1999) in retail services. However, all of these services exhibit low purchase importance, low hedonic natures, and moderate competition, characteristics that our model predicts will induce a linear functional form. Ngobo (1999) also found that S-shaped curves describe bank services and cameras; both of these products are high purchase-importance categories that, according to our model, should lead to S-shaped functional forms.

Regarding the moderating roles of product category characteristics, customer economic and demographic variables, and market characteristics for the satisfaction–loyalty relationship, we explicitly develop hypotheses for nonlinear functional forms. In developing these hypotheses, we relied on empirical findings (e.g., Homburg & Giering, 2001) and extant theoretical frameworks (e.g., Meyers-Levy, 1988). From an empirical generalization perspective, we report findings from 18 different product categories and a large number of consumers in China, thus extending research that has largely focused on data from the United States (e.g., Fornell et al., 1996) or Western European countries (e.g., Anderson, Fornell, & Lehmann, 1994).

The primary managerial relevance of our research involves resource allocations. We find that the linear functional form is the most dominant; in most cases (51%), repurchase intentions increase linearly with satisfaction. Therefore, allocating resources to customers at every level of satisfaction is equally important in terms of returns on customer management investments. Two other prevalent functional forms are the S-shaped (128 of 972 PC segments) and convex (65) forms. Managers responsible for S-shaped PC segments (e.g., wine targeting less educated, low-income, middle-aged men; televisions for mid-educated, mid-income, young women) should focus their investments on customers with medium levels of satisfaction, whereas managers accountable for convex PC segments (e.g., mobile phones for highly educated, high-income, middle-aged women; beer for highly educated, mid-income, young men) should focus on more satisfied customers to get the maximum "bang for their buck".

Another managerial implication relates to segmentation. Managers have a considerable number of options, considering the statistically significant influence of product category characteristics, customer economic and demographic variables, and market characteristics on the functional form of the relationship between satisfaction and repurchase intentions (Table 5). For example, if we consider purchase importance (Fig. 3), at medium levels of satisfaction, the relationship between satisfaction and repurchase intentions is weakest for products with the highest levels of purchase importance. In terms of resource allocations for highly important products (e.g., computers, mobile phones; Table 2, Fig. 3), scarce customer-management resources should be allocated to customers who exhibit medium levels of satisfaction because the rate at which repurchase intentions increase with changes in satisfaction is highest at these levels. If managers instead decide to use gender as a basis of segmentation, they should recognize that marginal returns on marketing investments are greater for female customers than for male customers because of the steeper slope of the influence of satisfaction on loyalty among women (Fig. 4). At a high level of satisfaction, no gender differences distinguish these returns. Our model offers similarly rich managerial inferences pertaining to market segmentation and resource allocation decisions for other product category, customer economic and demographic, and market characteristics.

Our findings also suggest several fruitful avenues for further investigation. For example, we do not find many instances of concave or inverse S-shaped functional forms for the relationship between satisfaction and repurchase intentions. Researchers should reexamine this issue using richer data (e.g., additional product categories). Similarly, other product and customer variables may affect the heterogeneity of functional forms for the relationship between satisfaction and repurchase intentions. Researchers could also examine the heterogeneity of functional forms using measures of loyalty other than repurchase intention, perhaps even behavioral measures. The exploration of functional forms that are more complex than the ones we discuss here, such as those that capture asymmetric interaction effects between satisfaction and product/customer variables (e.g., Fornell, Rust, & Dekimpe, 2010), may also be fruitful.

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