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Negative Online Consumer Reviews: Can the Impact be Mitigated?

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Abstract

Negative online reviews (NOR) are often inevitable, have a much wider reach, dwell much longer, and threaten product sales. It is therefore necessary to understand how the negative impact can be managed more actively. This study proposes that managing the marketing variables of product information, price, promotion, and product distribution can mitigate the negative impact of NOR. These variables are conceptualized for the e-commerce context. Analysis of objective data on 500 books supports the hypotheses and provides empirical evidence for the relative effectiveness of the variables. In addition to adapting the 4Ps framework of marketing management to the e-commerce context, this study highlights the need and potential to extend theoretical development and research efforts beyond the antecedents and effects of NOR to understand *how* to manage NOR. The findings have practical relevance for e-commerce businesses. Avenues for future research are also identified.

Keywords: Online reviews, marketing variables, e-commerce, product sales

Negative Online Consumer Reviews: Can the Impact be Mitigated?

1. Introduction

Online reviews are positive or negative statements about a product by potential, actual, or former customers, made available to a multitude of people and institutions via the Internet (Hennig-Thurau et al. 2004). Online reviews are increasingly available for a wide range of products due to the pervasiveness of the Internet (Barreto 2014). Like offline word of mouth communications among families and friends, online reviews provide information that can help to reduce uncertainty about products and play a significant role in purchase decision. Recent surveys conducted worldwide showed that more than 70 percent of online shoppers trust reviews and the number has been increasing (e.g., BrightLocal 2014; Dimensional Research 2013; Nielsen 2012). Compared to offline word of mouth, online reviews have a much wider reach and remain accessible for much longer (Dellarocas 2003; Hennig-Thurau et al. 2004). Online reviews are also easier to retransmit to others (Radighieri and Mulder 2014). They therefore deserve specific attention of researchers and practitioners.

Negative online reviews (NOR) have an unfavorable valence (Goyette et al. 2010; Hennig-Thurau et al. 2004) and it is well established that they affect product sales (e.g., Chevalier and Mayzlin 2006; Duan et al. 2009; Ye et al. 2011). Consumer behavior research found strong evidence that negative information has more value to the reader of reviews than positive information (Sen and Lerman 2007). For certain products (e.g., niche products), even one negative review can be detrimental (Zhu and Zhang 2010). Prior studies have examined the antecedents (e.g., Sen and Lerman 2007), effects (e.g., Chevalier and Mayzlin 2006; Duan et al. 2009; Ye et al. 2011), and characteristics of NOR (Cho et al. 2002). They have improved our understanding of the nature of NOR and showed the significance NOR. With the negative impact of NOR well established and the recognition that NOR is inevitable and difficult to control as they can be posted by anyone with Internet access, it has become

necessary to understand whether and how the negative impact can be more actively managed by e-commerce businesses. Focusing on factors that are more tenable to purposeful management, this study investigates the moderating role of product information, price, promotion, and product distribution, identified based on the 4Ps framework of marketing management (McCarthy 1960). As discussed later, these variables affect the role of information gleaned from NOR in purchase decision making and thereby mitigate the negative impact of NOR. Some of these variables, such as price, are assumed to be useful for alleviating the impact of NOR and have been adjusted in practice in response to NOR (e.g., Dellarocas 2003). Yet, theoretical understanding and empirical evidence for their effectiveness remain limited. This study seeks to narrow the gap by addressing the research question: How do product information, price, promotion, and place mitigate the negative impact of NOR on product sales? This study extends prior research by identifying mitigating mechanisms from the seller's perspective.

This study collected objective data from an e-commerce website that allows customers to review products. The results of analysis indicate that enriching product information, offering price discount, and increasing the number of distribution formats effectively mitigate the impact of NOR. Among them, price-related variables have the strongest mitigating impact. However, increasing the number of sellers has insignificant effect. Based on the findings, we suggest that different variables should be combined in mitigating the negative impact. This study extends the theoretical development of NOR by directing research attention from antecedents and effects of NOR to moderators of the negative impact. Focusing on moderators that are tenable to management as done in this study improves the practical relevance of marketing and e-commerce research in general. This study shows that although the generation and valence of online reviews are outside the control of e-commerce businesses, their effects on product sales can be effectively managed.

The contributions of this study are summarized in Table 1.

Table 1. Preview of Study Contributions			
Contribution	State of the Literature and/or Practice	Relevance	
		Theory/Empirics	Practice
1. Extends understanding of NOR by introducing product information, price, promotion, and product distribution as moderators of the negative impact of NOR, based on 4Ps framework of marketing management.	Moderators examined in prior studies are mostly related to the characteristics of shoppers (e.g., Internet experience), product (e.g., popularity), and quality of online reviews (see section 2.2).	✓	
2. Provides theoretical reasoning and empirical evidence for the mitigating effect of marketing variables.	Reducing price is assumed to be effective for mitigating the negative impact of NOR in practice but there is a lack of empirical evidence.	✓	✓
3. Highlights the potential and importance of studying factors that can mitigate the negative impact of NOR, such as relationship marketing and online review system features.	NOR are often inevitable, have a much wider reach, dwell much longer, and are believed to be difficult to control directly.	✓	✓
4. Analyzes objective data to assess the mitigating effect of marketing variables on the relationship between NOR and product sales. The findings also indicate the relative importance of variables.	Prior studies often rely on perceptual measures such as intention to purchase.	✓	

2. Conceptual Background

This section first discusses the nature of NOR. A review of its effects and factors that have been found to moderate the negative impact of NOR are then presented. This is followed by a description of the 4Ps framework of marketing management and the potential of marketing variables in mitigating the negative impact of NOR.

2.1 Nature of Negative Online Review

Through reading online reviews, shoppers can obtain purchase-related information (e.g., price equity), learn about the actual consumption of a product, and observe the buying behavior of their reference groups (Hennig-Thurau and Walsh 2003). Online reviews are valuable in purchase decision making because they help shoppers glean unique information over and above that provided by sellers. Sellers typically supply information such as product attributes, technical specifications, and performance in relation to technical standards. In contrast, online

reviews are often framed around users' perspective and provide information about *actual* product usage (Lee et al. 2008). Online reviews may also reveal information that sellers would hesitate to mention or omit due to space constraint in traditional marketing media.

Online reviews can have a positive or negative valence. In any customer opinion platform, positive and negative online reviews coexist and they have been shown to be separate constructs demonstrating discriminant validity (Goyette et al. 2010). While positive reviews tend to increase prospective customers' anticipation of benefits, NOR induce expectation of risks (Lee et al. 2008). It has been observed that NOR occur three times less than positive reviews (East et al. 2007; Ha 2002) but customers tend to be more affected by NOR (Lee et al. 2009). Online shoppers may consider NOR to be more diagnostic and informative than positive reviews because information about product benefits are typically already available as part of a product's marketing efforts (e.g., in advertisements, product description) (Lee et al. 2008). The bias may be explained by the psychology of negativity effect, which suggests that people weigh negative information more heavily than positive information in the formation of overall evaluation. People also tend to weigh potential costs more heavily than potential gains in decision making under risk (Peeters and Czapinski 1990). Since NOR convey negative information and document unfavorable outcomes experienced by other users, they can increase the perceived risk and potential loss associated with a purchase.

Analyses of NOR show that most of them raise problems related to the product, technology, information, agreement, and settlement (Cho et al. 2002). Issues related to product include poor performance and bad quality. Problems related to technology include slow payment processing and system errors. Inadequate product description and erroneous price are among the complaints related to information. Online shoppers also raise issues related to agreement, such as the lack of conformance to the stated terms and conditions.

Problems related to settlement such as late delivery and tardy after-sale services are also frequently brought up in NOR. It is clear that NOR contain information that can deter online shoppers from purchasing the product and eventually decrease sales. This and other impacts of NOR are reviewed next.

2.2 Effects of Negative Online Review and Moderators

NOR have been found to dampen shoppers' attitude towards the product (Lee et al. 2008; Vermeulen and Seegers 2009). For example, Bambauer-Sachse and Mangold (2011) found that NOR dilute brand equity, which is the perceived value added to a product by its associations with a brand name, design, or symbol which enhances its value beyond functional purposes. Lin et al. (2005) observed that NOR generate negative impressions and causes shoppers to reconsider their purchase decision. Ba and Pavlou (2002) and Hajli et al. (2014) showed that NOR decrease shoppers' trust in product vendors. In general, strong NOR can elicit a conformity effect where shoppers assimilate the negative views about a product and use them in purchase decision making (Lee et al. 2008).

At the aggregate level, the impact of NOR on individual shoppers can translate into declining product sales and even long-term impact such as decrease in stock market returns. For example, focusing on book reviews, Chevalier and Mayzlin (2006) showed that NOR significantly decrease book sales. Likewise, other studies observed that the valence of online reviews is significantly related to movie sales (Duan et al. 2008) and hotel bookings (Ye et al. 2011), indicating that NOR can decrease sales. Luo (2009) found that NOR has a negative impact on cash flow, stock return, and stock volatility and it takes several months for these effects to wear out. Overall, NOR pose significant risks to the bottom line of e-commerce businesses. Since NOR are inevitable, it is necessary to take steps to minimize the negative impact. In this study, we focus on the effect of NOR on product sales instead of individual consequences such as purchase intention because it is the key variable of interest for e-

commerce businesses and it is more directly related to profit.

Prior studies have shown that the impact of NOR may be moderated by characteristics of shopper, product, and quality of online reviews. Customers with more Internet experience have been found to be more strongly influenced by online reviews (Zhu and Zhang 2010). Those with more product expertise also tend to be more affected by the volume of reviews (Park and Kim 2008). Product characteristics such as popularity, brand familiarity, and product type can weaken the impact of NOR. Gu et al. (2012) found that the sales of popular products are less affected by NOR. Duan et al. (2009) even observed that online reviews have no impact on the user adoption of highly popular products. In contrast, for less popular products, shoppers tend to be more strongly influenced by online reviews (Zhu and Zhang 2010). For unknown products, NOR can have the paradoxical effect of improving sales through increasing awareness (Berger et al. 2010). Familiarity with a brand has been found to weaken the impact of NOR such that customers are less likely to change their purchase intention in response to negative review (Chatterjee 2001). The type of product is also a significant moderator, with studies finding that experience goods (Park and Lee 2009) and hedonic products (Sen and Lerman 2007) are less affected by negative reviews. With regard to the characteristics of online reviews, it has been found that the valence of review written by reputable, high-quality reviewers has a significant effect on purchase intention and sales (Hu et al. 2008).

Among the moderating variables identified in prior studies, characteristics of customers and online reviews are difficult, if not impossible, to control and manage by sellers. Product characteristics such as popularity and product type are also difficult to adjust after a product is launched for sale. Compared to these characteristics, variables such as brand familiarity are more tenable to management. Indeed, increasing brand awareness is a key aspect of marketing management (Yoo et al. 2000). This implies that other variables related

to marketing management may also be effective in mitigating the negative impact of NOR. A framework that identifies the key variables related to marketing management is described next.

2.3 4Ps Framework of Marketing Management

Marketing management focuses on satisfying customers within the context of a firm's environment, resources, and objectives by making decisions related to the four variables of product, price, promotion, and place (McCarthy 1960). In online shopping, prospective customers cannot touch or test a product directly. Instead, "product" manifests itself as description of functions, features, usage scenarios, and technical specification (Bakos 2001; Kalyanam and McIntyre 2002). It is crucial to provide adequate and relevant product information to support consumer decision making. "Price" is the amount set by the seller for a product and is to be paid by the buyer (Kalyanam and McIntyre 2002). Online shopping allows efficient price comparison across sellers and pricing is therefore critical to product sales. "Promotion" refers to activities that aim to increase market share. Common promotion activities include price discount and brand advertising. E-commerce technologies enable the automatic collection and analysis of data about customers, which can improve the effectiveness of promotion activities through means such as dynamically adjusting price discount and showing relevant brand information based on browsing history. "Place" focuses on the distribution of a product. E-commerce provides a particularly conducive platform for trading products that can be delivered in the digital format through the Internet, such as books, music, video (Hoffman et al. 1995). The Internet has also greatly increased sellers' reach to shoppers worldwide and vice versa.

The four marketing variables have strong relevance in e-commerce and demonstrate potential in mitigating the negative impact of NOR. For example, as mentioned earlier, problems related to information and settlement (which includes product delivery) are among

the issues commonly raised in NOR (Cho et al. 2002). This indicates that the amount of product information and product distribution (i.e., place) are likely to influence the extent to which shoppers are influenced by NOR. Given a level of NOR, a product with more comprehensive product information may be viewed as less risky to purchase than one with little information. In offline shopping, some of the marketing variables have been found to mitigate the effect of negative word of mouth. For example, it has been shown that consumers are more affected by word of mouth from high-expertise sources when the potential financial loss is high (Wangenheim and Bayón 2004). This implies that price can influence the impact of word of mouth. Prior studies have also observed that promotion through advertising can isolate the effects of negative word of mouth (e.g., Mahajan et al. 1984). In practice, some online sellers adjust prices based on the valence of online reviews (Dellarocas 2003). However, there has been a lack of empirical studies on whether and how the 4Ps effectively mitigate NOR. This study attempts to fill the gap.

3. Research Model and Hypotheses

As discussed earlier, there is strong evidence that NOR has a negative impact on sales. Drawing on the 4Ps framework of marketing management (McCarthy 1960) and prior research on NOR, this study proposes that the negative impact is mitigated by product information, price, promotion, and distribution (i.e., place) (see Figure 1). The hypotheses are detailed next.

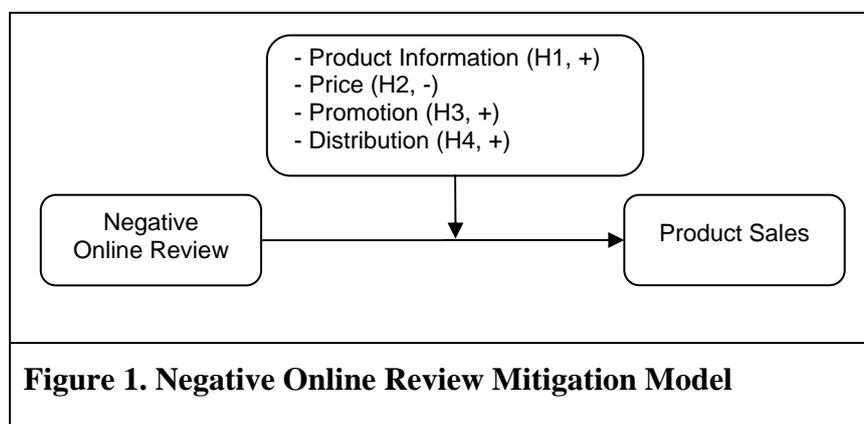


Figure 1. Negative Online Review Mitigation Model

As mentioned earlier, the marketing variable of “product” manifests in online shopping as descriptive product information. Information acquisition is an early influential stage in the purchase decision process. Product information is integrated into consumers’ cognitive structure and reduces uncertainty surrounding the purchase decision, which in turn should lead to a reduction in perceived risk (Murray 1991). Online shopping is mediated by technology and precludes the delivery of sensory information such as touch, smell, and taste. Information presented on the website therefore becomes a critical basis for judgment (Hong et al. 2004). Indeed, online shoppers identified product information as the most important design feature of shopping websites (Lee 2002) and inadequate product information is a problem that is frequently raised in complaints (Cho et al. 2002). Accordingly, we hypothesize that providing detailed and descriptive product information can mitigate the negative impact of NOR by reducing shoppers’ reliance on online reviews as a basis for judgment. When more information is available, shoppers experience less uncertainty and therefore depend less on online reviews to make the purchase decision. They are also better able to form their own judgment of the product and be less affected by NOR. In support, Soll and Larrick (2009) found that in social influence tasks, in which a person forms an initial private judgment, learns the judgment of another person, and then provides a final private judgment, the person tends to be biased toward own judgment.

H1: The negative effect of NOR on product sales is weaker for products with more detailed information.

High-price products are considered to be more risky to purchase because the financial loss incurred when they are unsatisfactory is greater (Chen and Dubinsky 2003). To avoid unfavorable outcomes, online shoppers tend to acquire more information to guide their decision making. In support, Cases (2002) found that online shoppers reduce financial risk by seeking information from website staff or salesperson. Conversely, when product price is low,

there is less financial risk and it is less crucial to make an accurate product judgment. Shoppers tend to expend less cognitive effort in decision making when the potential loss is tolerable (Dowling and Staelin 1994). This implies that when product price is low, online shoppers are likely to be less reliant on online reviews and are less affected by NOR. The impact of any NOR on low-price products should be weaker, because the potential monetary loss associated with purchasing them despite risks associated with NOR is low.

H2: The negative effect of NOR on product sales is weaker for products with a lower price.

Promotions may be price-based (e.g., discount) or non-price-based (e.g., brand, store feature) (Mela et al. 1997). Price-based promotions, also referred to as the economic route of promotion (Raghubir et al. 2004), manifest as reductions to the original price. Price discounts influence consumers' decision making by changing the economic utility associated with the potential gains and losses of a purchase. Price discount serves as a means of adjusting to changes in perceived price premiums. Price premiums are due to differences in product quality or fulfillment characteristics such as product delivery and responsiveness. Price premiums are negatively affected by negative reviews such as abysmal comments that reveal evidence of a seller acting opportunistically and trying to exploit buyers (Pavlou and Dimoka 2006). This implies that price discount can weaken the negative impact of NOR by compensating for the change in price premiums and shoppers for assuming greater risks of purchasing despite NOR. In practice, some e-commerce vendors adjust their prices in response to online reviews (Dellarocas 2003). However, there is still a lack of empirical evidence for the mitigating effect of price discount and this study seeks to fill the gap. Non-price-based promotions, also referred to as the informative route of promotion (Raghubir et al. 2004), influence consumers' beliefs about the brand. Brand serves to relieve the information asymmetry faced by online shoppers by signaling product quality (Ward and Lee 2000). Consumers familiar with a brand develop knowledge structures and expectations about the

brand and its attributes that are less susceptible to change (Sundaram and Webster 1999). When the brand image of a product is positive and strong, NOR is less likely to sway shoppers' belief about product quality and influence their purchase decision. In support, it has been shown that the effect of NOR is weaker for familiar brands (Chatterjee 2001; East et al. 2008).

H3: The negative effect of NOR on product sales is weaker for products with high price discount (H3a) and strong brand promotion (H3b).

In the 4P framework, “place” focuses on the distribution of products, which involves making a product available for use or consumption by buyers directly or indirectly through intermediaries. In online shopping, products may be distributed in physical or electronic formats. For example, tangible products such as clothes must be delivered physically after shoppers place orders online; digital products such as customized outfits for game avatars are always delivered electronically by making them available for use in the buyer's account. Certain products can be distributed both physically and electronically. For example, books have been sold in the form of physical copies as well as in the form of e-books; music can be delivered in compact discs or downloaded instantaneously through the Internet. Other than the format of distribution, the Internet is also a unique distribution channel that shortens the link between suppliers and buyers, allowing more shoppers and suppliers to reach each other more directly (Gallaughier 2002). Shoppers are no longer limited to buying from sellers in their physical vicinity and can instead choose from a greater pool of sellers based on product availability, delivery time, and price. In sum, products can potentially be acquired through more distribution formats and from a greater number of sellers in online shopping and these contribute to the convenience of purchasing and availability of products (Keeney 1999). In line with these, we hypothesize that NOR has a less negative impact on the sales of products with better distribution because the convenience value gained can offset some of the risks

associated with NOR. Given a level of NOR, the product with more distribution formats and more sellers is likely to have better sales due to the ease of accessing and acquiring the product.

H4: The negative effect of NOR on products sales is weaker for products that have more distribution formats (H4a) and more sellers (H4b).

4. Research Method

The proposed model was assessed with data collected from BookStore.com¹, an e-commerce website that sold and shipped books worldwide and allowed consumers to review products. Books are experience goods that require sampling or purchase in order to evaluate product quality. Their quality also depends on subjective attributes that are a matter of personal taste (Mudambi and Schuff 2010). Since shoppers cannot read a book before purchasing it online, they often rely on consumer reviews to make purchase decisions. It is therefore a relevant product category for studying the effect of NOR on product sales.

Data were collected from a single website rather than multiple websites based on the consideration that the unit of analysis is the product rather than website. This design naturally controlled for website variables that may influence product sales, such as website ease of use, website reputation, variety of products, and market share. This design is not uncommon among product-level studies examining the impact of online reviews (e.g., Gunter et al. 2014; Liu 2006; Trusov et al. 2009). Data collection was also constrained by the practical concern of accessing data on product sales – many companies contacted were wary of providing sales data for comparison across websites, even when anonymity and confidentiality were assured. The procedures for data collection and operationalization of constructs will be described next.

4.1 Data Collection

BookStore.com allowed consumers to review books by rating them on a 5-point scale where

¹ BookStore.com is a pseudonym adopted to protect the confidentiality of the company operating the e-commerce website.

“5” is the most favorable rating and “1” and “2” are negative reviews. Using the search and result sorting functions of BookStore.com, a list of English adult fiction books published in 2012 and had at least one negative review was retrieved. Data related to the review ratings, product information, and sales information for the top 500 most reviewed books were then gathered. This resulted in dataset with a sample size of 500.

4.2 Construct Operationalization

The NOR of a book was measured in terms of the proportion of negative reviews, that is, the number of reviews with ratings of “1” and “2” divided by the total number of reviews. This measure is commonly used in prior studies (e.g., Lee et al. 2008). Product information (one of the 4Ps) was measured in terms of the length of the book’s description. Descriptions with higher word count were considered to be more detailed and informative. Price was measured using the original list price. Price discount was operationalized in terms of the proportion of discount. Brand promotion was measured in terms of the reputations of author and publisher, which have a similar effect to brand name in that they serve as indications of a book’s potential quality. On BookStore.com, authors were ranked based on the total sales of all their books. For each book, the publisher’s rank were obtained from Livres Hebdo/Publishers Weekly’s (2014) annual ranking of publishers based on revenue in year 2012. Place (i.e., distribution) was operationalized in terms of the number of distribution formats and number of sellers for the book. On BookStore.com, books could be delivered in the physical, digital text, and digital audio formats and each may be available in the original and abridged versions. Customers also had a choice to purchase from different sellers. Product sales were measured in terms of sales rank, which has been shown to be strongly correlated with actual sales (Chevalier and Goolsbee 2003). Construct operationalizations are summarized in Table 2. Using secondary data from BookStore.com has the advantage of being a more objective approach than alternative approaches such as experiment and survey which relies on

subjective perceptions.

Construct	Variable	Derivation from BookStore.com
NOR	Proportion of negative review	Count of 1-star and 2-star reviews divided by total count of reviews
Product Information	Length of description	Count of words in book description
Price	Original list price	List price
Promotion – Price Discount	Proportion of price discount	(List price – discounted price) divided by list price
Promotion – Brand Promotion	Author’s reputation	Author’s rank
	Publisher’s reputation	Publisher’s rank
Place – Distribution Formats	Number of distribution formats	Count of distribution formats available
Place – Number of Sellers	Number of sellers	Count of number of sellers available
Product Sales	Sales	Sales rank

5. Data Analysis and Results

Descriptive statistics of the sample are presented in Table 3. An average book in the sample had 413 reviews with 13% being negative. The average book was priced at USD15.96 with a 19 percent discount and had about 5 distribution formats from 131 vendors. Correlations among constructs are reported in Table 4.

Characteristic	Minimum	Maximum	Mean	Standard Deviation
Number of reviews	159	2703	413.16	379.42
Proportion of negative review	0.01	0.76	0.13	0.11
Length of description (word count)	0	398	115.59	67.36
List price (USD)	3.68	40	15.96	8.70
Price discount proportion	0	0.66	0.19	0.20
Number of distribution formats	1	6	4.80	1.29
Number of sellers	1	725	130.95	161.49
Sales rank*	2	1114022	123242.79	228.26

n=500; *Lower values indicate more favorable ranks

Table 4. Correlations Among Constructs								
Construct	NOR	Product Information	Price	Price Discount	Author's Rank	Publisher's Rank	Distribution Format	Number of Sellers
Product Information	-0.10							
Price	0.05	0.30						
Price Discount	-0.01	0.46	0.46					
Author's Rank	0.07	-0.17	0.15	-0.05				
Publisher's Rank	-0.05	-0.13	-0.02	-0.19	0.22			
Distribution Format	-0.02	-0.29	-0.09	-0.28	0.12	0.22		
Number of Sellers	0.17	-0.19	-0.01	-0.21	0.09	0.11	0.34	
Product Sales	-0.15	0.01	0.24	0.33	0.27	0.11	0.15	0.06

The hypotheses were tested using moderated regression. All data were standardized prior to analysis. We found that NOR had a negative impact on the sales of a book (see Table 5). As hypothesized, product description (H1), price of a product (H2), promotional discount (H3a), and the number of distribution formats (H4a) significantly mitigated the negative impact. Among them, price and promotional discount had the strongest mitigating impact.

The standardized regression coefficients indicate that for two books with equal proportion of negative reviews, one standard deviation (SD) increase in product description length (67 words) will increase product sales by 0.30 SD (68 places in sales rank); one SD increase in price (USD8.70) will decrease sales by 0.24 SD (55 places in rank); one SD increase in price discount (20% of original price) will increase sales by 0.92 SD (210 places in rank); one SD increase in publishers' rank (12 places in rank) will increase sales by 0.24 SD (55 places in rank); one SD increase in the number of distribution format (1 format) will increase sales by 0.35 SD (80 places in rank).

The hypothesis related to brand promotion (H3b) was partially supported in that publisher's rank significantly mitigated the impact of NOR but author's rank did not. Contrary to hypothesis H4b, the number of sellers did not have a significant moderating

effect. We controlled for the effects of genre, number of months a book had been published, number of authors, number of pages, and shipping weight and found that they did not have a significant effect on book sales. The proposed model had a satisfactory fit ($p < 0.001$) and explained 42 percent of the variance in sales while the model without moderating effects explained 20 percent. As indicated by the variance inflation factor (VIF) statistic which were all below the threshold of 10 (see Table 5), multicollinearity was not an issue in the analysis.

Construct	Variable	Regression Coefficient	T-Value	VIF
NOR	Proportion of negative review	-0.20*	2.03	1.26
Product Information	Length of description	0.00	0.03	1.47
	H1: Length of description * NOR	0.30**	3.16	1.31
Price	Original list price	0.11	0.71	3.40
	H2: List price * NOR	-0.35**	2.86	4.22
Promotion	Proportion of price discount	0.43**	2.75	3.56
	H3a: Proportion of price discount * NOR	0.49**	2.85	4.29
	Author's rank	0.30**	3.16	1.31
	H3b: Author's rank * NOR	-0.05	0.39	2.14
	Publisher's rank	-0.08	0.89	1.24
	H3b: Publisher's rank * NOR	0.32**	2.71	2.04
Place	Number of distribution formats	0.07	0.65	1.55
	H4a: Number of distribution formats * NOR	0.28**	2.52	1.80
	Number of sellers	0.07	0.78	1.31
	H4b: Number of sellers * NOR	0.11	1.13	1.41

*Significant at $p < 0.05$, ** $p < 0.01$; Dependent variable: product sales

The significant moderating effects are plotted in Figure 2. It can be observed that for products with more information, lower price, more price discount, better publisher's rank, and more distribution formats, product sales do not decrease when NOR increases. When NOR is high, products with more information, lower price, more price discount, better publisher's rank, and more distribution formats have better sales. The negative impact of NOR is clearly mitigated by these variables such that product sales are less affected.

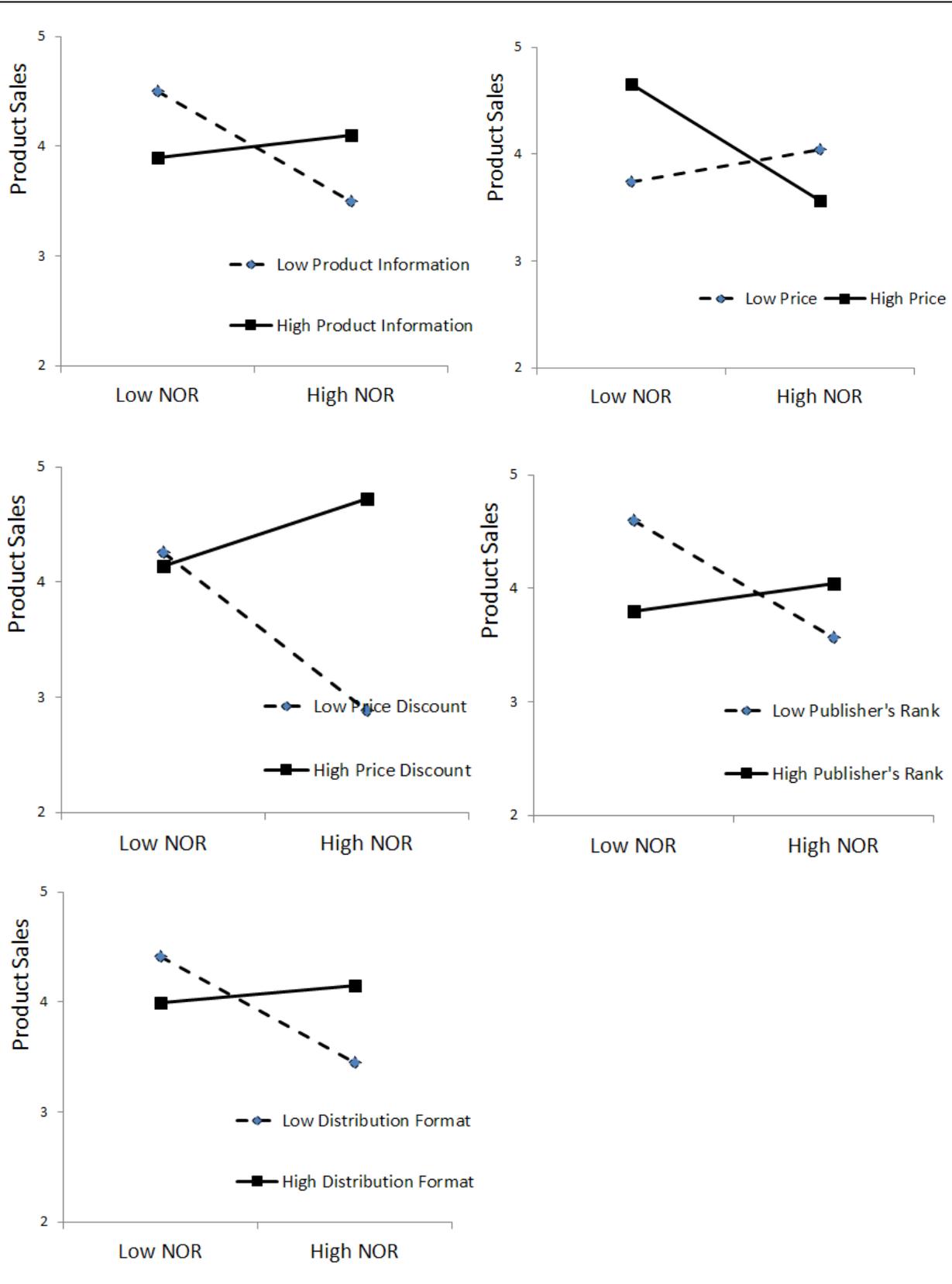


Figure 2. Plots of Moderating Effects

6. Discussion

This study sought to investigate whether and how the negative impact of NOR on product sales is mitigated by the marketing variables of product information, price, promotion, and place. Findings based on data collected from an e-commerce website, BookStore.com, support most of our hypotheses. Plausible explanations for the unexpected findings are discussed next.

We found that author's rank (a measure of brand promotion) did not have a significant moderating effect. One possible explanation is that most authors in our sample authored only one book. Brand may be a good indication of the general quality of the product being considered only when the brand is associated with several other products. In other words, the lack of reliable reference to "other products of the brand" might have limited the effect of author's rank as a brand. Author's rank may not provide information that effectively mitigates the negative impact of NOR when the author has only one or a few books. The significance of publisher's rank as a measure of brand promotion supports this explanation – a publisher typically carries many books. To better ascertain the mitigating effect of brand promotion, other types of products such as music and electronics can be studied in future.

We posited that the number of sellers mitigates the impact of NOR as better distributed products have greater availability and are more accessible by shoppers. However, the hypothesis was not supported. A plausible explanation is that consumer search costs (e.g., time and effort expended in comparing sellers) increase with the number of sellers, which could offset the benefits of having more sellers. Our findings suggest that, compared to the number of sellers, increasing the number of distribution formats is more effective in mitigating the impact of NOR. The implications of these and other findings for theoretical development and practice are discussed next.

6.1 Implications for Theoretical Development and Research

This study shows that the negative impact of NOR is significantly mitigated by factors in the 4Ps framework of marketing management. This is one of the first studies to examine the moderating effect of marketing variables. Empirical evidence based on objective data, which alleviates the need to assume that purchase intention determines actual purchase behavior, provided support for our proposed model. The 4Ps framework stands as the dominant marketing management paradigm focusing on product sales and examining the mitigating effects of the marketing variables is a relevant and necessary first step in extending our understanding of how NOR can be managed. This study demonstrates that the 4Ps framework is applicable to the phenomenon of online reviews. Indeed, online reviews are increasingly seen as influential in marketing communications and could even work as free “sales assistants” to help shoppers identify the products that best match their idiosyncratic usage conditions (Chen and Xie 2008).

The positive findings indicate that there is potential in further investigating other ways of mitigating NOR. An interesting extension of this study is examining the mitigating effect of relationship marketing, which goes beyond 4Ps and involves establishing, developing, and maintaining successful relational exchanges with customers (Palmatier et al. 2006). Relationship marketing seeks to enhance customers’ trust, commitment, relationship satisfaction, and relationship quality. Shoppers who have a strong relationship with the seller may be less affected by NOR. Relationship marketing is increasingly relying on Internet technologies such as instant messaging and social networking. Considering that online reviews are also driven by Internet technologies, there may be exploitable synergy that can mitigate the impact of NOR. For instance, providing the “live chat” function as part of relationship marketing may attenuate the effect of NOR by allowing shoppers to clarify issues raised in NOR and reduce perceived risk of purchase.

6.2 Implications for Practice

The findings suggest several ways for managing NOR in practice. First, providing adequate product information can mitigate the negative impact of NOR by reducing shoppers' reliance on NOR for information. Since product information can be revised almost instantly in the e-commerce context, sellers can improve their product information regularly to address issues raised in NOR. This approach is especially feasible in the e-commerce context where it is much less costly compared to revising printed product description.

Second, our findings indicate that offering price discount is a highly effective way of alleviating the impact of NOR. This provides support for the practice of adjusting prices for products with NOR (Dellarocas 2003). Other than reducing prices directly, other forms of discount such as discount coupons and rebates may be effective as well. It is important to recognize that there is typically a limit to the amount of discount that can be offered due to the need to cover production costs. It is therefore advisable to improve product information and distribution at the same time to manage NOR more effectively.

Third, we found that improving distribution by increasing the number of distribution formats is useful. When plausible, electronic delivery (e.g., downloading via the Internet) should be provided. For products that can only be delivered physically, delivery options such as one-day delivery, gift wrapping, or environment-friendly wrapping may be offered. We found that increasing the number of sellers does not significantly mitigate the impact of NOR. Therefore, sellers should avoid taking this approach and channel resources to other effective approaches to better manage NOR.

6.3 Limitations and Suggestions for Future Research

This study has several limitations that could be addressed in future studies. First, product information (one of the 4Ps) was measured in terms of the count of words in product description. The number of words can indicate the amount of information provided in product

description. Nevertheless, the measure could be further improved by using content analysis to account for the quality of product information. Second, findings of this study are based on a cross-sectional sample of books on one e-commerce website that does not have physical stores and thus may not be generalizable to other products, websites with physical stores, and platforms of reviews such as discussion forums. More studies of different samples and contexts are needed to assess the applicability of the proposed model. For example, for businesses with both online and offline presence, it may be necessary to account for offline sales since it may affect online sales. Third, it has been observed that online book reviews may be manipulated by interested parties such as book authors and publishers through fake reviews (Hu et al. 2012). It may be necessary to develop methods for filtering fake reviews to better clarify the impact of NOR and the mitigating effects of the 4Ps.

Other than addressing the limitations of this study and investigating other factors related to marketing, one interesting avenue for future research is examining whether the effect of NOR is mitigated by online review system features. It has been observed that structural features of a review system, such as character limit and sequencing of positive and negative feedback, can constrain the expression of negative reviews and contribute to positive bias (Askay 2011). Understanding the effect of system design on the negative impact of NOR is a practically relevant line of inquiry that can potentially contribute towards more active management of NOR.

Future research could also examine the effect of NOR by focusing on individual shoppers. For example, comparing buyers and non-buyers may reveal factors that influence their purchase decision in the presence of NOR.

6.4 Conclusion

As online shoppers increasingly rely on reviews as a source of information in purchase decision making, it becomes necessary to develop better understanding and strategies for

managing NOR. It is imperative to shift from studying the causes and effects of NOR to identifying the means for mitigating the negative impact of NOR. This study demonstrated the usefulness of e-commerce websites as a source of objective data for future studies. More importantly, this study showed that the detrimental impact of NOR can be purposefully managed by e-commerce sellers and hopes to serve as a stepping stone for future research on the topic.

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