The Nonlinear Effects of Satisfaction Rating and Seller Reputation on Consumer Repurchase Behavior: An Empirical Investigation

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***Abstract*—This paper studies the nonlinear effects of consumers' satisfaction ratings and seller reputation on consumers' repurchase behavior. This paper is unique from two perspectives: (1) it studies consumers' repurchase behavior rather than consumers' repurchase intention; (2) it hypothesizes nonlinear effects rather than linear effects. To verify our theoretical hypotheses, we collect actual transaction data and conduct a two step analysis. Our findings and the implications are discussed.**

Keywords-satisfaction rating; seller reputation; repurchase behavior; nonlinear effects; online marketplace

I. INTRODUCTION

In the conventional marketplace, consumer retention has been illustrated as a critical issue [13]. In the online marketplace, consumer retention is also important. However, in the online marketplace, consumers have low search costs and can switch among different sellers just by "clicks" [7]. Therefore, it becomes more critical for practitioners to know the factors which may influence consumers' repurchase behavior in the online marketplace.

A lot of studies examined the factors which may affect consumers' "repurchase behavior" [9, 15, 16]. One weakness is that, most studies used survey or experiments, and study repurchase intention rather than repurchase behavior [9, 15, 16]. However, repurchase intention does not guarantee repurchase behavior. In online marketplace, consumers may have high repurchase intention from a certain seller, but they are also easily attracted by other sellers in just a few "clicks" distance. There is a gap between the requirement of the knowledge about consumers' repurchase behavior and the knowledge we have possessed. Mittal and Kamakura [12] have found a significant effect of consumers' satisfaction ratings on their repurchase behavior in conventional marketplace. Following it, we also verify the effect of consumers' satisfaction ratings on their repurchase behavior in this study. Another weakness is that these studies commonly hypothesize linear relationships between the repurchase intention and its factors (i.e. satisfaction rating and seller reputation) [9, 15, 16]. However, according to the literature [5, 11], the effects of satisfaction and seller reputation on repurchase behavior may be nonlinear. In this study, we hypothesize nonlinear relationships, and try to depict the effect functions of satisfaction rating and seller reputation on consumers' repurchase behavior in detail. To achieve the research goals, we collect transaction archive data from a famous online marketplace.

This paper is organized as follows. Section II reviews literature and proposes our hypotheses. Section III introduces the research methodology, including data collection process and data analysis methods. Section IV presents the data analysis results. Finally, section V concludes the paper by a discussion about the implications and future research directions.

II. THEORETICAL BACKGROUND

A. Customer Retention in the Online Marketplace

The transactions in the online marketplace are commonly "one-shot" transactions, i.e. each pair of seller and consumer are totally strangers before their transactions, and they have little chance to transact again [14]. Before the first transactions, consumers and sellers have to establish trust relationships, which may cost efforts from both consumers and sellers.

B. Repurchase Behavior

The relationship between satisfaction rating and repurchase intention may be different with the relationship between satisfaction rating and repurchase behavior [12]. Sellers ultimately are interested in repurchase behavior and not just intentions. Therefore, it is quite meaningful to study repurchase behavior rather than just repurchase intentions.. Following Mittal and Kamakura's study [12], we examine the effect of satisfaction rating on repurchase retention in this study.

C. Satisfaction Rating

Existing research has found that consumers' satisfaction ratings are positively connected with their repurchase intention

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[16]. Therefore, satisfaction rating is also likely to positively connect with repurchase behavior. We hypothesize that,

Hypothesis 1a: The relationship between satisfaction rating and repurchase behavior is positive.

Consumers are more likely to repurchase only if their satisfaction reaches some threshold value [5]. Therefore, we hypothesize that,

Hypothesis 1b: The relationship between satisfaction rating and repurchase behavior is convex.

Resnick and Zeckhauser [14] Yoo et al.[17] analyzed comments of neutral ratings and negative ratings, and concluded that neutral ratings represents slight problems such as bad communication and shipping lately, while negative ratings represents serious problems such as seller never send the item, sending damaged or faked items. According to these research findings, we hypothesize that,

Hypothesis 1c: The effect of the neutral rating on repurchase behavior is more close to the negative rating, rather than the positive rating.

D. Seller Reputation

Researchers have found that consumers are more likely to bid on goods from high reputation sellers in the online auction marketplace, for the reason of high seller trustworthiness and reliable goods quality [4]. Therefore, we hypothesize that,

Hypothesis 2a: The relationship between seller reputation and repurchase behavior is positive.

According to informational cascades theory [3], the volume of seller trustworthiness information in the first several pieces of seller reputation comments should be more than the information in the following additional reputation comments. Researchers also have found that seller reputation has a diminishing effect on transaction outcomes, i.e. the marginal returns of reputation score are decreasing [8, 10, 11], thus they commonly adopted a logarithm transformation of reputation score in their models [1, 2, 6, 18].

Hypothesis 2b: The relationship between seller reputation and repurchase behavior is concave.

III. METHODOLOGY

A. Data Collection

We used field data collected from Taobao to verify our hypotheses. The online transaction platform and the reputation system of Taobao are similar to other prevalent online marketplaces, such as eBay. These representative characteristics of Taobao make our findings easy to be implied and generalized to other online marketplaces.

We randomly collected full transaction history of sellers in "cell phone and accessories" category from the Taobao website, and then picked out all the "first" transactions between each pair of seller and consumer. We collected detailed transaction data of these "first" transactions, including the consumers' satisfaction ratings, *SAT*, and the total value of the goods, *VAL*. We calculated each seller's reputation score, *REP,* based on the seller's previous transaction history and Taobao rules. After then, we searched all the transactions after the "first" transaction to find out whether the consumer has repurchased. We defined a dichotomous variable, *HAS*: let *HAS*=1 if the consumer has repurchased, and *HAS=0* if the consumer has not repurchased. We also calculated the length of the duration, *DUR,* between the "first" transaction and the seller's latest transaction. The descriptions of variables we collected are illustrated in Table I.

B. Analysis Method

We examine the data via two steps. In the first step, we use a multiple regression analysis to examine the relationships between the factors (e.g., satisfaction rating and seller reputation) and whether the consumer has repurchased (*HAS*). Because the dependent variable *HAS* is a dichotomous variable, we use logit regression to analyze the data. Following the suggestions in the literature, we used the logarithm transformation of seller reputation in the logit regression model.

In the second step, we split the dataset to sub datasets according to satisfaction ratings and seller reputation, to further examine the relationships in detail. We compare the repurchase rates in each sub dataset to see whether they are significantly different.

TABLE I. VARIABLE DESCRIPTIONS

Variables	Descriptions
HAS	A dichotomous variable which indicates whether a consumer has repurchased from a seller in the duration from the date of their very first transaction to the date of the seller's latest transaction.
SAT	Consumer's satisfaction rating. The value could be 1 (positive), 0 (neutral) and -1 (negative).
REP	Seller's reputation score at the time of each transaction. The value is calculated based on the full history of each seller.
VAL	Total value of the goods in the transaction.
DUR	Time period from the date of a consumer's very first transaction with a seller to the date of the seller's latest transaction.

IV. DATA ANALYSIS

A. Step 1: Regression Results

Table II illustrates our regression results. We find the regression coefficients of consumers' satisfaction ratings (*SAT*) is significantly positive (0.664 and 0.609, $p<0.01$). This indicates that consumers' satisfaction ratings have positive impacts on their repurchase behavior. Therefore, **hypothesis 1a** is supported. We find the regression coefficient of seller reputation (*REP*) is significantly positive (0.411 and 0.390, $p<0.01$). This finding indicates that seller reputation has a significant positive effect on repurchase behavior. Thus, **hypothesis 2a** is also supported. We find the regression coefficient of squared *SAT* is significantly positive (0.211, $p<0.01$), which means the effect function of consumer satisfaction rating on repurchase behavior is convex. Therefore,

hypothesis 1b is supported. However, we find the regression coefficient of squared *REP* is also significantly positive (0.114, $p<0.01$), which means the effect function of seller reputation on repurchase behavior is also convex. In other words, **hypothesis 2b** is rejected.

TABLE II. LOGIT REGRESSION RESULTS

Variables	Coefficients	Coefficients
C	-2.368***	-2.613***
DUR	0.317***	0.326***
VAL	-0.033	-0.011
SAT	0.664***	0.609***
*SAT*SAT*		0.211***
REP	0.411***	0.390***
*REP*REP*		0.114***
McFadden R^2	0.044	0.048
LR statistic	994.482***	1071.359***

Notes: Dependent variable is dichotomous variable HAS

*** means significance at 0.01 level (double tailed).

B. *Step2: Futher Analysis*

To get more insightful empirical findings and verify **hypothesis 1c**, we further analyzed the data.

We classified seller reputation as "low", "middle" and "high" according to Taobao rules. On Taobao, a seller's reputation level is marked by "hearts" when his/her reputation score is less than 250, by "diamonds" when his/her reputation score is between 250 and 10,000, and by "crowns" when his/her reputation score is more than 10,000. Accordingly, we classify reputation level as low, middle and high when seller's reputation score is less than 250, between 250 and 10,000, and more than 10,000. "Low" reputation sellers account for 15%; "middle" reputation sellers account for 60%; and "high" reputation sellers account for 25%.

We divided the dataset to sub datasets in two dimensions: seller reputation (low, middle and high) and consumer satisfaction rating (positive, neutral and negative). Totally we have 3*3=9 sub datasets. We calculated the average repurchase rate in each sub dataset, and illustrate the results in the first panel of Table III. We also plot the repurchase rates in figure 1.

First, we find that consumers' repurchase rate in the case of negative satisfaction rating and in the case of neutral satisfaction rating are much more similar, compared with the repurchase rate in the case of positive satisfaction rating. As illustrated by each line in figure 1, there is little increase of repurchase rate from the case of negative satisfaction rating to neutral satisfaction rating, but a sharp increase from the case of neutral satisfaction rating to positive satisfaction rating. To verify whether these increases are significant, we conducted a Tamhane's T2 test. Tamhane's T2 is a conservative pairwise comparisons test based on a t test, and is designed for the case when the variances are unequal. The comparison results are listed in the second panel of Table III. As illustrated in the panel, only 1 of 3 pairs of repurchase rates in negative and neutral satisfaction rating cases are significantly different. However, 2 of 3 pairs of repurchase rates in neutral and positive satisfaction rating cases are significantly different. Moreover, even when both of the two comparisons are significant, the differences between positive and neutral cases are larger than the differences between neutral and negative cases. Therefore, **hypothesis 1c** is supported. Moreover, this finding also confirms **hypothesis 1b**.

TABLE III. REPURCHASE RATES

Satisfaction Rating	Seller Reputation		
	Low	Middle	High
Negative	0.034	0.037	0.138
Neutral	0.043	0.057	0.176
Positive	0.158	0.148	0.191

Seller Reputation	Satisfaction Rating		
	Neutral-Negative	Positive-Neutral	Positive-Negative
Low		0.117*	0.132*
Middle	0.020*	0.091*	0.111*
High			0.053*

Satisfaction Rating	Seller Reputation		
	Middle-Low	High-Middle	High-Low
Negative		0.101*	0.113*
Neutral		0.119*	0.135*
Positive		0.043*	0.033*

Notes: * means significant at 0.05 level (double tailed).

Blank cell indicates non-significant difference.

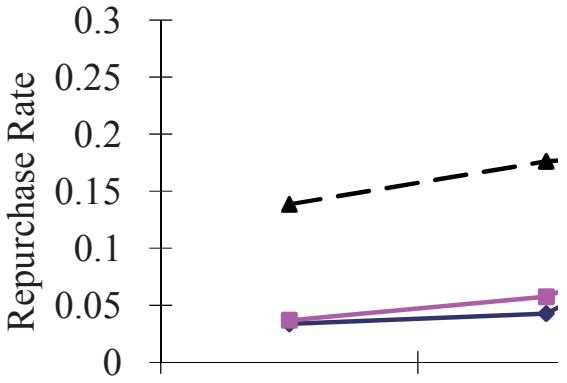

Figure 1. Repurchase Rates

Second, we find that the impact of seller reputation on consumers' repurchase rate is nearly indifferent when the seller reputation is low (low 15%) and middle (16%~75%). As illustrated in figure 1, the difference between the lines which represent low seller reputation and middle seller reputation is small, compared with the difference between the lines which represent middle seller reputation and high seller reputation. We also conducted a Tamhane's T2 test, and listed the comparison results in the third panel of Table III. As illustrated in the panel, all pairs of repurchase rates in low and middle

seller reputation cases are not significantly different. However, all the pairs of repurchase rates in middle and high seller reputation cases are significantly different. This finding indicates that, the relationship between seller reputation and repurchase behavior is concave rather than convex. In other words, the effect of seller reputation on repurchase behavior increases significantly when seller reputation is in top 15%. This finding rejects **hypothesis 2b** again.

V. DISCUSSIONS

This study has several key findings: First, the effect of satisfaction ratings on repurchase behavior is positive and convex. In detail, the effect of positive satisfaction rating on repurchase behavior is significantly higher than neutral and negative ratings. Second, the effect of seller reputation on repurchase behavior is also positive and convex. Moreover, the effect of seller reputation on repurchase behavior significantly increases when the seller reputation reaches top 15%.

A. Implications

Our findings have the following theoretical contributions: First, there were also several researchers who have claimed that neutral ratings may have negative impacts on consumer's intention to purchase [14]. In this study, we found that neutral ratings may also have negative impacts on consumers repurchase behavior. Our findings confirmed these conclusions in the literature. Our findings may help researchers understanding the effects of satisfaction ratings, especially neutral ratings, on repurchase behavior. Second, researchers have found that seller reputation has a diminishing effect on transaction outcomes [8, 10, 11]. However, our findings show that, low and middle seller reputation have similar effects on consumers' repurchase rate, when only high seller reputation may have strong positive effect. The inconsistency between our finding and the previous findings may be caused by the competence between sellers. When consider the impact of the reputation score of a single seller, it may have diminishing marginal effect. However, when considering the reputation scores of a group of sellers, the attractive sellers may be those whose reputation scores are in top positions. Therefore, it is possible that the impact of reputation score on consumers' repurchase rate has an S-shape, i.e. the marginal impact of reputation score firstly decrease, and then increase when the seller becomes "high reputation" seller. Moreover, we may also suggest that researchers should not only consider the absolute value of reputation score, but also consider the relative rank of seller reputation.

Our findings are also meaningful to practitioners. First, our findings suggest that neutral ratings actually do harm to consumers' repurchase behavior. Sellers should pay attention to the consumers who post neutral ratings, and try to remedy the problems in the transactions. Second, our findings indicate that consumers' repurchase rates are significantly high only when sellers' reputation score is in the top 15%. Our findings encourage sellers to increase their reputation score to retain their consumers.

B. Future Research

In this study, we examined the effects of satisfaction rating and seller reputation on consumers' repurchase behavior. In future, more factors should be involved and studied. Moreover, future studies can verify the effects of these factors on both repurchase intention and repurchase behavior, and compare the differences between repurchase intention and repurchase behavior.

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