Electronic Commerce Research and Applications 17 (2016) 87–98

Contents lists available at ScienceDirect

Electronic Commerce Research and Applications

journal homepage: www.elsevier.com/locate/ecra

An analysis of popularity information effects: Field experiments in an online marketplace

Byungjoon Yoo [a], Seongmin Jeon [b,*], Tongyo Han [c]

[a] College of Business Administration, Seoul National University, Republic of Korea
[b] College of Business, Gachon University, Republic of Korea
[c] Korea Information Society Development Institute, Republic of Korea

ARTICLE INFO

Article history:
Received 3 April 2014
Received in revised form 25 March 2016
Accepted 25 March 2016
Available online 26 March 2016

Keywords:
E-commerce
Field experiment
Hit list
Popularity information

ABSTRACT

Popularity information is identified as one of the important factors for businesses in the online marketplace and is normally expected to strengthen sales performance. At the same time, the effects of popularity information are found to vary across product types. In this study, we attempt to identify the effects of popularity information on product sales through an analysis of the subgroups of category and price. Two sequential field experiments in an online apparel store on Alibaba's Tmall, the most dominant online brand marketplace in China, are conducted to capture the causal effects of the popularity information on sales. After observing the possible existence of popularity information effects through a pilot test of 17 products, we conduct the main experiment with 290 products, recording the daily sales for each by posting selected products on the hit list. The difference-in-differences method and propensity score matching are used to analyze the effects. The results show that once the products are displayed on the hit list, product sales increase by an average of 1.3 units per day. One subgroup of the niche product category is found to be influenced more significantly by hit list information than are other subgroups in the broad appeal category. Furthermore, after the hit list information is presented, more units of mid-price products are likely to be sold than units of products with high and low prices.

1. Introduction

Popularity information is understood to be one of the crucial factors of success in the online marketplace, as such information is known to alleviate the issues of information asymmetry that result in consumers having a limited amount of information with which to identify what to purchase. The effects of popularity information differ across product types. We have undertaken field experiments in order to capture the causal effects of popularity information on product sales through an analysis of the subgroups of category and price in the context of the electronic marketplace in China.

Online shoppers are likely to require a significant amount of knowledge and time to make an optimal buying decision from a selection of products. Theories regarding observational learning and herding present a social learning mechanism (Banerjee, 1992; Bikhchandani et al., 1992). These theories state that, because individuals make decisions with incomplete and inaccurate information, they refer not only to information that they possess but also to the actions of predecessors, without any knowledge of the predecessors' decision making process. According to the informational cascades theory, referring to the choices of others could be efficient and rational (Li, 2004; Duan et al., 2009). Because popularity information is expected to alleviate information asymmetry, most online marketplaces provide popularity information based on past sales performance.

Popularity information likely plays an important role in the rapidly growing Chinese electronic market. The growth of the online marketplace is outstanding in the case of China's e-commerce market (Zhang et al., 2013). Over the past five years, online sales in China have increased 15 times over, amounting to RMB 1.8 trillion (US$288 billion) in 2013 (The Business Times, 2014). The Boston Consulting Group predicts that the size of China's flourishing e-commerce market will surpass that of the U.S. in 2015 and will become the next e-commerce mover in the world (Walters et al., 2011; Mozur, 2013). The leading online marketplaces of the Alibaba Group have annually 255 million active buyers, eight million active sellers, and 12.7 billion orders (Alibaba Group Holding Limited, 2014). Obviously, in such an active market, consumers have difficulties in finding the right merchants for them. Furthermore, rapid quantitative expansion of the online marketplace has resulted in a number of issues including information

* Corresponding author.
E-mail addresses: byoo@snu.ac.kr (B. Yoo), smjeon@gachon.ac.kr (S. Jeon), tongyohan@kisdi.re.kr (T. Han).

http://dx.doi.org/10.1016/j.elerap.2016.03.003
1567-4223/

asymmetry and trust. Previous literature notes that one of the unique characteristics of e-commerce is the separation of buyers and sellers with limited experiences of products; consequently, consumers are exposed to a high degree of uncertainty, which results in trust issues (Ba et al., 2003; Lucking-Reiley, 2000; Pavlou et al., 2007; Sun et al., 2006). Furthermore, electronic commerce in China has been rife with counterfeit goods (Tejada, 2015).

Moreover, apparel and accessories account for 68% of electronic commerce in China (CNNIC, 2011) and thus are likely to be popular. According to a Bain & Company report (Hoffmann and Lannes, 2013), apparel is one of the top three categories with the deepest digital penetration, and Chinese online consumers tend to be "repertoire" shoppers and bargain hunters rather than loyal to a single brand. In this light, Chinese e-commerce vendors should find a promotion mechanism through which to expose their products to online consumers who keep changing their minds. Considering this reality, popularity information is likely to be useful for both consumers and e-commerce vendors. The online apparel and accessory malls in Alibaba's Tmall provides an effective context through which to study the effects of popularity information, as they display hit list information in order to promote to potential consumers the products that are in vogue. The hit list is a kind of board displaying a list of the popular products with product names, images, and prices. The users who are interested in the popular products may click through the icon image of hit list at the very front page of the website, to reach the webpage of the hit list. This hit list information will represent early adopters' choices and will likely influence followers. Therefore, the online marketplace provides an ideal environment for peer influence on consumers' choice due to the easy availability of information on others' choices, or popularity information.

Hence, our study primarily investigates the causal effects of popularity information, or hit lists, on sales through field experiments. We seek to address the following research questions:

- How much do product sales increase when products are displayed on a hit list?
- How different is the popularity information effect across product groups?

To answer these questions, we conduct an initial pilot test with 17 products and a subsequent experiment with 290 products, recording the daily sales for each by posting selected products on the hit list. The purpose of this study is to clarify the causal relationship between the hit list information and product sales through the analysis of the subgroups of category and price and to provide practical implications regarding the importance of the hit list information presented on e-commerce websites in relation to business performance. Even though there have been many studies on popularity information, it is difficult to empirically identify the effects of this information. The equation we obtain by regressing sales quantity according to whether or not products are listed in popularity information such as ranking charts cannot identify the direction of causality, as sales and popularity information are likely to influence bi-directionally as well as to be influenced by external factors such as the network effect and word-of-mouth (WOM) (Yoo and Kim, 2012). This study sets up two experiments to identify the causal effects of the distinction between the treatment and control groups while avoiding the issue of identification by using the difference-in-differences method. To make another precise estimation and to verify the accuracy of results from the difference-in-differences method, this study also implements propensity score matching. These methods enable us to identify the pure impact of popularity information on sales.

Our results indicate that popularity information plays a significant role in online users' purchasing decisions. The finding that popularity information has an increasingly positive impact on seasonal apparel sales also indicates that people are likely to refer to popularity information more when buying seasonal products as opposed to when buying products for everyday use. This finding provides an additional explanation for the results found in the literature that niche products are more influenced by popularity information than are products with wide appeal. Furthermore, more units of mid-price products are likely to be sold than units of products with high and low prices.

Our study is closely related with the work of Tucker and Zhang (2011) identifying the moderating effects resulting from the variation in vendor's breadth of appeal for popularity information effects. They confirm the reinforcement effects of popularity information and, more importantly, popularity information may be greater benefit to narrow-appeal products than broad-appeal products. While our work complements previous research, it also differentiates itself by analyzing the empirically micro-transactional data set of a rapidly growing online marketplace and by identifying how the effects of popularity information on sales vary over product types in an online marketplace using the methods of difference-in-differences and propensity score matching. This research not only identifies the causal reinforcement effect of popularity information but also adds to the existing IS research by offering a new perspective – namely, that popularity information effects vary across product characteristics, including price. We identify the mitigating effects over subgroups of category and price. Furthermore, the empirical analysis in the context of the fast-growing Chinese online marketplace provides practical implications for the industry. Online stores reap benefits by manipulating the hit list information to maximize profits after taking our research team's advice.

This article is structured as follows. Section 2 introduces the related theoretical backgrounds and presents the research hypotheses. The data and methods are presented in Section 3. Section 4 reports the results from the field experiments. Finally, Section 5 discusses the findings and concludes.

2. Literature review and hypotheses development

2.1. Observational learning

The literatures of observational learning help us understand the characteristics of popularity information. Classic studies in this area find that decision makers have tendency to follow peers' decisions as they may infer product quality from what the peers have chosen (Banerjee, 1992; Bikhchandani et al., 1992). A number of studies examine popularity information, herding and social learning in the online marketplace (Duan et al., 2009; Ghose and Yang, 2009; Burtch et al., 2013; Zhang et al., 2013; Li et al., 2014). As herding exists in a traditional financial market, online consumers are also likely to exhibit herding behaviors (Simonsohn and Ariely, 2008). Traditionally, scholars have explained the usefulness of popularity information in terms of the theories of information asymmetry, trust, reputation, and compensation structure. Moreover, network externalities influence a product's value, while WOM throughout the network reflects a product's reputation. Kauffman et al. (2000) use network externalities to explain online herding behavior.

The informational cascades theory describes a common phenomenon in situations in which a consumer makes a decision among multiple products. The consumer has two kinds of information sources. On the one hand, she has her own accumulated knowledge and the information she gets from the website; on the other, she has the information that she derives from the decisions of others. The consumer reviews the information from the two sources together; however, the sources may contradict each