Electronic Commerce Research and Applications xxx (2013) xxx–xxx

Contents lists available at ScienceDirect

Electronic Commerce Research and Applications

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

An empirical comparison of market efficiency: Electronic marketplaces vs. traditional retail formats

Pingjun Jiang [a,*], Siva K. Balasubramanian [b,1]

[a] Department of Marketing, School of Business Administration, La Salle University, 1900 West Olney Avenue, Philadelphia, PA 19141, USA
[b] Stuart School of Business, Illinois Institute of Technology, Chicago, IL 60661, USA

ARTICLE INFO

Article history:
Received 3 April 2013
Received in revised form 8 November 2013
Accepted 8 November 2013
Available online xxxx

Keywords:
Electronic markets
Market efficiency
Data Envelopment Analysis
Consumer behavioral segmentation
Retailing

ABSTRACT

Researchers have found that price dispersion and market inefficiency exists in electronic marketplaces. Little attention has been bestowed to explore difference in market efficiency between traditional and electronic marketplaces. This study integrates both product and channel preference factors to analyze differences in market efficiency between electronic and traditional shopping environments. Data Envelopment Analysis (DEA) is applied to calculate market efficiency for single-channel and multi-channel shoppers. Results show that market efficiencies vary across consumer segments and products. In summary, this paper enhances understanding of market efficiency by incorporating behavioral segment and product characteristics into the explanatory framework.

1. Introduction

The last decade has seen an exponential increase in commercial use (buying and selling) of Internet. Between 2002 and 2012, retail e-commerce grew at 15–25% per year, following a fairly typical adoption pattern that transformed more mainstream consumers into online shoppers. In 2012, around 150 million Americans made at least one online purchase, and an additional 35 million used the Web to gather information about products (eMarketer Inc. 2012, National Retail Foundation 2012). By far, marketing activities accounted for most of the growth in online traffic. Overall, Internet has evolved into a well-established electronic marketplace. B2C retail e-commerce (both actual purchases and purchases influenced by Web shopping but actually bought from a brick-and-mortar a store) is estimated at $1.2 trillion in 2012, or over 40% of total retail sales in the United States (Forrester Research 2011).

Electronic marketplaces have the potential to fundamentally change how people shop. They can disrupt the structure of well established industries such as retail and consumer goods (Alba et al. 1997). An early, and popular notion among economists posited greater transparency and efficiency in digital markets. For example, online shopping was expected to diminish information asymmetries. The transparency characteristic was expected to include price, quality, and availability of most product. This grand vision of web-based information and product access was labeled "frictionless commerce" and sharply contrasted with the unpredictability and opaqueness that often characterize real-world markets (Smith et al. 2000). A related hypothesis predicted that electronic markets will reduce consumers' information search costs to produce efficiency gains, while the greater transparency was expected to increase the quality of information about price, leading to price convergence (Bakos 1997) and better market efficiency. However, early studies failed to support this notion of perfect, friction-free commerce. Several researchers (Bailey 1998, Brynjolfsson and Smith 2000, Erevelles et al. 2001, Lee and Gosain 2002, Clemons et al. 2002) found significant price dispersion on the Internet. Baylis and Perloff (2002) cited price discrimination as a likely cause of this unexpected finding. Some pointed to seller differentiation as a driver of price dispersion (Baye et al. 2004a,b, Pan et al. 2003). Others proposed that multichannel retailers have higher prices than Internet-only retailers (Pan et al. 2002, Ancarani and Shankar 2004). Finally, market level forces were considered by some as the chief cause of price dispersion online (Venkatesan et al. 2007, Pan et al. 2009).

While the preceding explanations of price dispersion in the electronic marketplace are interesting, they also raise a fundamental question: how is consumer welfare impacted if electronic marketplaces dominate the future of retailing? Unfortunately, this research question remains unexplored. There is a lack of research that compares market efficiency metrics between traditional and electronic marketplaces. In addition, no study of price dispersion

* Corresponding author. Tel.: +1 (215) 951 1728.
E-mail addresses: jiang@lasalle.edu (P. Jiang), sivakbalas@stuart.iit.edu (S.K. Balasubramanian).
[1] Tel.: +1 (312) 906 6516.

1567-4223/$ - see front matter © 2013 Published by Elsevier B.V.
http://dx.doi.org/10.1016/j.elerap.2013.11.003

or market efficiency has explicitly incorporated behavioral segmentation based on consumers' single or multi-channel shopping preference. Furthermore, despite evidence (Walter et al. 2006) that price variance attributable to a variable may differ across products, the price dispersion literature has not fully examined differences across products. Therefore, the main objectives of our study are as follows:

(1) Integrate both product and channel preference factors to explain differences in market efficiency when electronic and traditional shopping environments coexist.
(2) Compare market efficiency across online-only shoppers, offline-only shoppers, and multichannel shoppers; investigate if differences in market efficiency across these three groups also vary by product. In particular, how do product factors influence market efficiency when comparing traditional and electronic marketplaces?
(3) Explore how the electronic marketplace affects the competition structure among brands within an industry, i.e., how the efficiency frontiers for brands change when a new electronic marketplace option coexists with the traditional retail format.

Our study contributes to the literature on market efficiency in the electronic marketplace by adding new knowledge or extending existing knowledge. We introduce behavioral segmentation into marketing efficiency calculations. In addition, we explore efficiency changes by consumer segments for different products along a set of key product characteristics. We also discuss changes in efficiency frontiers.

Our study is structured as follows. We begin with a review of the literature on market efficiency in the context of price dispersion in traditional (offline) and electronic (online) marketplaces. We then present an exploratory framework that incorporates behavioral segmentation. The next section describes the research method, followed by our analysis. We discuss findings, their managerial implications, summarize our conclusions and limitations, and provide guidance for future research.

2. Market efficiency – a literature review

The market efficiency of traditional retail formats has been called into question in the price–quality relationship literature. Kamakura et al. (1988) provide a comprehensive overview. They examine the determinants of market efficiency with an application of Data Envelopment Analysis (DEA) to multiple product categories and conclude that a significant amount of inefficiency exists. A vast literature that explains inefficiency and price dispersion as an outcome of costly information can be traced back to Stigler's (1961) "Economics of Information" (EOI) theory, which posits that consumers will continue search until the marginal expected cost equals the marginal expected return. Nagle (1984) provides an excellent overview of economics literature on pricing, with a particular focus on asymmetric information. An exchange involves asymmetric information when one party has more information than the other party. Many pricing issues are associated with asymmetric information, such as the presence of "inefficient brands" in a consumer market. Nagle also finds that consumer information acquisition is closely related to price elasticity. The fewer the brands about which buyers are informed, the less sensitive they will be to the price of any one brand. The cost of consumer information acquisition is dependent on product attributes. As one moves from the search attributes to experience attributes and onto credence attributes, information about a brand's differentiating attributes becomes more costly.

A ramification from EOI is that some inefficient brands might continue to exist, because information is costly and therefore imperfect. By examining the previous price–quality literature, Kamakura et al. attribute market inefficiency and the survival of inefficient brands to several factors. First, since the actual product space is not continuous but contains only discrete offerings, and since consumers cannot buy mixtures of product offerings (especially for durable goods), these gaps may give each brand a monopoly over those consumers whose equilibrium lie in the vicinity of the brand (Rosen 1974). Second, ignorance of available offerings or of their characteristics may increase consumers willingness to pay more than the efficient price (Maynes and Assum 1982, Rosen 1974). Finally, consumers' buying strategies may involve a trade-off between the benefits of finding an efficient brand and the costs involved in this search (Pratt et al. 1979, Ratchford 1980, Stigler 1961). Overall, since the benefits of searching to find the most efficient brand may fail to exceed the costs of doing so, the optimal decision may be to purchase an inefficient brand—one whose price is above the minimum for its characteristics.

2.1. Key factors affecting market efficiency of electronic marketplaces

Though many factors influence market efficiency, there are three factors that are most salient in the market efficiency literature. These factors are: information acquisition, continuous product offering, and symmetric information. Bakos (1997) showed that reduced search costs in electronic marketplaces increased allocational efficiency and price competition among sellers. As a result, electronic marketplaces reduce buyer search costs to improve market efficiency. In addition, Internet agents that access and evaluate online information represent intelligent systems with the potential to substantially increase market efficiency (Palopoli et al. 2006). Overall, in electronic marketplaces, technology has changed how these factors drive market efficiency, as summarized in Table 1.

2.1.1. The impact of Internet agents on improving market efficiency

Aside from the positive factors that improve market efficiency, there are complex problems facing consumers in the electronic marketplace that have an adverse impact. First, prior to any purchase, consumers have to search a large number of websites to compare brands, products and merchants. This information acquisition and decision making process often entails significant time and search costs. Because of these costs, consumers may find it rather difficult to identify products that satisfy their needs. Fortunately, some of this difficulty is mitigated if consumers are assisted by Internet agents (Pivk and Gams 2000; Guttman and Maes 1999; Rosaci 2004, 2005). Hostler et al. (2005) assessed the impact of Internet agent in a retail online shopping environment.

Palopoli et al. (2006) explored the role of agents in various phases of the consumer decision-making process. Internet agent systems, such as intelligent agents, mobile agents, or collaborative agents, help customers to examine and evaluate product alternatives efficiently (Sarwar et al. 2000, Schafer et al. 2001). The contribution of Internet agents to market efficiency mainly stems from assisting and simplifying the interaction between users and computers. For instance, a feature-based filtering system may allow consumers to select products at a website based on featured keywords. Similarly, a collaborative filtering system may recommend products based on a consumer's similarity with other unknown consumers, as determined through a real time comparison of products searched and other information stored in his/her profile. A constraint-based filtering system may facilitate the specification of shopping constraints for the desired product (e.g., price range, delivery time) and return information on only those that meet these constraints. Finally, price comparison sites, such as shop-

Please cite this article in press as: Jiang, P., Balasubramanian, S.K. An empirical comparison of market efficiency: Electronic marketplaces vs. traditional retail formats. Electron. Comm. Res. Appl. (2013), http://dx.doi.org/10.1016/j.elerap.2013.11.003