

Order Effect and Vendor Inspection in Online Comparison Shopping

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Abstract

In the context of online comparison shopping, the phenomenon of order effect and its impact has profound theoretical and practical significance, as many search engines and shopping portals offer paid placement and paid inclusion in search results. In this study, we investigate how order effects and other market competitive factors work together to attract consumers' attention to online vendors, which is manifested by the time spent on collecting more vendor information, and the probability of a vendor being included in a consumer's consideration set. We found that the effect of serial position of a vendor in a list is mediated by consumers' attention which in turn affects the probability of the vendor being accepted.

Keywords: comparison shopping, order effect, consumer information search, attention, virtual location

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Order Effect and Consumer Attention in Online Comparison Shopping

1. INTRODUCTION

For consumers, a significant advantage of e-commerce is comparison shopping (Alba et al. 1997), the ease of which is facilitated by the availability of general search engines such as Google.com and dedicated comparison shopping portals such as Bizrate.com, Shopping.com, and NexTag.com. With the increasing popularity of comparison shopping portals and shopping bots, price competition has for a considerable time been expected to intensify among online vendors because of lowered search costs (Bakos 1997; Brown & Goolsbee 2002). However, it has been found that online price dispersion is not lower than when it is offline (Brynjolfsson & Smith 2000; Clay et al. 2001), thus suggesting that there are other competitive factors besides price influencing electronic markets.

A vendor's location in a comparison shopping website is an important factor affecting vendor sales. In this context, vendors selling the same product typically appear in a list. Just as a good location helps attract traffic and sales to an offline vendor's store, appearing on the first screen or in the first position of an online list offers online vendors a significant advantage in being chosen by consumers (Smith & Brynjolfsson 2001). A consumer's varied reaction to options in different serial positions is known as an *order effect* (Hogarth & Eihorn 1992).

Although the importance of a vendor's serial position has been recognized in research (Smith & Brynjolfsson 2001), little is known about the underlying mechanism of how serial position affects consumer choice in electronic markets. In the context of an online comparison shopping portal, the main purpose of this study is to investigate the cognitive and behavioral processes through which vendors' serial positions, together with traditional competitive factors such as price levels and ratings, affects consumers' acceptance of vendors.

Such investigation is important not only to the theoretical understanding of order effect in consumer choice, but as well to industry practice. For instance, search engine optimization, paid inclusion and paid placement in the search results of search engines are increasingly a common practice in Internet marketing. The Search Engine Marketing Professional Association has estimated that search engine marketing earnings amounted to \$5.75 billion in 2005 and will reach \$10 billion in 2010, with paid placement accounting for 83 percent of the total currently spent (Sherman 2006). An important decision of search engines and comparison shopping portals is to price a serial position. On the other hand, vendors need to evaluate their returns from participating in such a practice. It is important to all vendors to understand the order effect in comparison shopping.

We proceed next to present the theoretical background of our research, followed by the research model and hypotheses. Then, we describe the research methodology and the empirical study. Following an interpretation of the empirical results, we conclude with a discussion of the theoretical and practical implications.

2. CONCEPTUAL BACKGROUND

2.1 Consumer Decision Criteria in Online Comparison Shopping

Consumer literature assumes that consumers pursue better value in comparison shopping (Zeithaml 1988). Consumer value is defined as what consumers get for what they have given (Zeithaml 1988). Consumer value, in the context of online shopping, includes not only product price and quality, but also customer service, prompt delivery, shopping security, convenience, and other non-contractible aspects (Smith & Brynjolfsson 2001).

One means of obtaining better value is shopping around. For a given product, comparison shopping portals and shopping agents in electronic markets provide consumers with the choice of a large pool of vendors (Alba et al. 1997). However, the decision to choose a vendor becomes complicated as the number of options grows. Consumers typically simplify the decision-making process by reducing the available group of vendors to a more manageable set, known as the consideration set or evoked set (Narayana & Markin 1975). A consideration set consists of brands or vendors that the buyer believes offer the best value, and which are substitutable to each other if a purchase decision is to be made immediately (Howard & Sheth 1969). The final purchase can then be based on the consideration set (Rao & Sabavala 1981). In this study, “consideration set” is used interchangeably with “acceptable vendors.” Therefore, it is essential for online vendors to be included in the consideration set to realize a transaction. The probability of a vendor being included in a consumer’s consideration set is the main dependent variable of this study.

Prior research has acknowledged that some traditional market competitive factors such as price, online word of mouth, and vendor brand awareness are important to online competition. *Price* is important in electronic markets because an important aspect of comparison shopping is to find a better price. Furthermore, e-commerce provides an easy entry for small vendors with a better cost structure. *Word of mouth* is a significant component of vendor reputation. Typical comparison shopping portals (e.g., Bizrate.com) collect consumer feedback to form *vendor reviews* and make this information directly accessible to the public. Vendor reviews often are summarized into *vendor ratings*, which are iconized into different levels (e.g., Bizrate.com uses four levels: poor, satisfactory, good, and outstanding). Word of mouth directly affects consumer purchase decisions (Chatterjee 2001; Henning-Thurau & Walsh 2003; Herr et al. 1991; Hugstad et al. 1987; Senecal & Natel 2004) because it provides additional information about the vendor (e.g., product quality, service, delivery, etc.) beyond product price, and because it reduces consumers’ perception of risk (Day 1971; Henning-Thurau & Walsh 2003; Hugstad et al. 1987).

Another aspect of vendor reputation is vendor brand awareness. *Brand awareness* is defined as a rudimentary level of brand knowledge involving, at the least, recognition of the brand name (Hoyer & Brown 1990). Although brand awareness applies to both vendor name and product, in the online comparison shopping context, we refer to vendor brand in this study. Brand awareness can affect consumer choice because it offers a convenient heuristic for choice (e.g., “I’ll choose a brand I know.”) and because it influences the perceived quality of the brand (Hoyer & Brown, 1990). Price, vendor ratings, vendor reviews, and brand awareness directly bear on a consumer’s utility perception of an offer.

2.2 Order Effect in Consumer Information Search

To study order effect in consumer information search, two categories of goals must be differentiated. The first category aims to integrate multiple information items to make a final judgment or impression of a single object. For instance, reading a list of financial reports to evaluate the financial risk of a company in auditing (Monroe & Ng 2000) and jury decision-

making falls into this category. In such tasks, there is only one target object to be evaluated; and all information items pertain to this object. The second category aims to rank alternatives in terms of preference (Duffy 2003; Kardes & Herr 1990), and includes, for example, vendor selection, product selection, and acceptance of job applicants. Existing research has mostly focused on the first category (Hogarth & Eihorn 1992; Jacob et al. 2002; Monroe & Ng 2000). Much less is known about the second to which comparison shopping belongs. Although some studies have demonstrated the existence of an order effect in preference- ranking tasks (Brunel & Nelson 2003; Scarpi 2004), they merely analyzed simple scenarios with only two options in a list. For example, Scarpi (2004) studied consumers' choice of two products at a shop, with regards to the positioning of both products at the entrance and inside the store, respectively. It was found that the product at the entrance had an advantage over the one inside. Scarpi (2004) attributed this to the framing effect (Kahneman & Tversky 1979). The more realistic situation, such as that which occurs in online comparison shopping where consumers have to rank multiple options in a list, has rarely been investigated. Therefore, a systematic investigation of the mechanisms underlying order effect in this context is necessary.

Why does an earlier serial position lead to a higher chance of a vendor being accepted, and how does a serial position work together with traditional competitive factors to affect the chances of acceptance? We believe consumer information search literature provides a good theoretical background for an explanation.

Consumer information search literature can be classified into two streams (Miller 1993). The first stream focuses on optimal search theories to answer the question: How many options should a consumer search to maximize her welfare in the presence of search costs (Ratchford 1982; Stigler 1961)? Assuming completely rational consumers, identical product quality, knowledge of market price distribution parameters, and a random inspection order of potential options, economic modeling methods suggest that a consumer should stop searching whenever the marginal profit is less than the marginal search cost (Miller 1993; Ratchford 1982; Stigler 1961). Optimal search theories assume the perceived value of an option would not be changed by the act of inspection; hence there is no room for order effect among the inspected vendors.

The second stream focuses on consumers' behavioral search models (Miller 1993). It has been recognized that assumptions made by optimal search theories are often unrealistic (Guo, 2001; Miller, 1993; Zwick et al., 2003). Behavioral search models seek to explain consumers' information search process by incorporating consumer psychology and cognitive processes, recognizing the bounded rationality of consumers (Meyer 1982; Miller 1993). For example, Diehl and Zauberan (2005) observed that the evaluation of a shopping experience can be affected by the product quality sorting order. Diehl (2005) found that searching too much in a sorted product list might degenerate the quality of consumers' decisions. However, the most relevant study on comparison shopping is Meyer's (1982) model of the information search process of consumers in an unsorted list.

Meyer (1982) suggests that consumers follow iterative steps to form a final consideration set or to make a final choice. First, they define a tentative consideration set based on preliminary estimates of option utilities that are above a certain threshold. Second, consumers make an inspection decision to inspect some options in the tentative consideration set for more information. Third, the utility of each option and the ranking of all options in the tentative consideration set are updated based on the newly collected information. Finally, the threshold utility for the tentative consideration set is updated, leading to a reduced set. This process continues until a final consideration set or a final choice is made. The most relevant finding by

Meyer (1982) is on how consumers make inspection decisions. A consumer's vendor inspection behavior has two aspects: (1) a decision regarding whether to inspect a vendor and, (2) the amount of time spent on inspection. We refer to the former as an inspection decision, and the latter, the inspection effort. In our study, we measure a consumer's vendor inspection behavior with the inspection time spent on reading reviews and visiting vendor websites. It represents both the inspection decision and the inspection effort.

Based on Meyer (1982), an important tenet in this process is that the inspection decision and the amount of inspection effort spent on an option increases with the perceived riskless value of the option. Meyers (1982) defines the riskless value of an option as a weighted sum of utilities associated with the known attributes. In the context of comparison shopping, attributes like price and brand awareness are readily available. While vendor rating is certain, the textual content of detailed vendor reviews and the real credibility of the vendor are much less certain before further inspection.

Vendor reviews often contain the non-contractible information of a vendor's offer, such as customer service quality, delivery service quality, dispute resolution, quality of the delivered product, and hidden costs. Such information is the intangible aspect of an offer (Laroche et al. 2005). A vendor's website provides additional information about the vendor's size, history, sales policy, and product details. All of this information is necessary for consumers to form an overall impression of the quality of the vendor (Wolfenbarger & Gilly 2003), to reduce risk perception (Laroche et al. 2005), and to build consumer trust for the final success of a transaction (Kim et al., 2004).

Based on consumers' general tendency to pursue product value and Meyer's (1982) conceptualization of search processes, the higher the utility suggested by the riskless vendor attributes (e.g., product price, brand awareness, and vendor rating), the more likely is a consumer to make an effort to collect additional information about the vendor to confirm that it is a good candidate. We hypothesize:

H1. (a) Better price levels, (b) vendor ratings, and (c) brand awareness are positively related to consumers' vendor inspection time.

While Meyer's (1982) process model of consumer information search does not explicitly address order effect, other behavioral research on consumer information search has suggested the following reasons for this phenomenon. First, consumers often adopt a satisficing strategy rather than an optimizing strategy when searching because of their decreasing motivation and limited cognitive capacity in the process (Jacoby et al., 1978; Haugtvedt & Wegener 1994; Miller 1993; Petty & Cacioppo 1986; Simon 1959). In the context of comparison shopping using a list, we would expect that careful vendor inspection decreases because the more a consumer searches, the more likely it is that some vendors encountered earlier in the list would satisfy that consumer. Even when consumers adopt an optimization strategy, the marginal return diminishes over time (Miller 1993; Ratchford 1982). Second, it is reasonable to assume that consumers' cognitive capacity decreases over time. Engagement in early vendor inspections quickly depletes consumers' cognitive capacity, which leads them to adopt an energy-saving strategy by relying on easily available and structured attributes rather than on vendor reviews and website visits (Petty & Cacioppo 1986). In summary, based on the argument that results from consideration of consumer motivation, cognitive capacity and the satisficing strategy, consumers are more likely to allocate inspection time to earlier vendors. We hypothesize:

H2. Ceteris paribus, the serial position of a vendor in a list is negatively related to consumers' vendor inspection time.

What is the consequence of vendor inspection? Meyer (1982) postulates that the subjective utility of an option increases with the amount of information collected about the option. However, Meyer (1982) does not give a detailed theoretical explanation. We suggest that vendor inspection leads to three effects: (1) confirmation biases, (2) discovery of a better match, and (3) uncertainty reduction. First, because inspection effort often is biased towards vendors who have better pricing and rating, when inspecting these vendors, consumers are more likely to come across positive feedbacks than negative ones. Moreover, based on the confirmation bias literature (Jonas et al. 2001), when consumers are facing both positive and negative reviews, a preliminary screening of alternatives makes them prefer supportive information compared with opposing information. Such bounded rationality occurs because it helps avoid or reduce post-decisional dissonance (Festinger 1957). Confirmation biases occur in both sequential and simultaneous information search and appear to be stronger in the former of which comparison shopping is an instance (Jonas et al. 2001). Second, it has been observed that the availability of quality information about an offer makes it easier for a consumer to judge whether the offer fits her special needs (Lynch & Ariely 2000). For example, regarding two vendors sharing the same rating; when a consumer knows that one vendor is known for late delivery, but punctuality is not her main concern, she might be more willing to accept this vendor rather than the other which is unknown. Such discoveries of better match and discounts of negative reviews can occur only to inspected vendors. Finally, as we discussed previously, there is considerable non-contractible information on a vendor's offer embedded in vendor reviews and a vendor's website, and this information is important to the evaluation of the vendor's trustworthiness (Kim et al., 2004; Wolfinger & Gilly 2003) and purchase risk (Laroche et al. 2005). Given that the vendors to inspect based on preliminary decisions are more likely to be the better ones, vendor inspection leads to a better evaluation because it fleshes out the credibility of these vendors and leads to confirmations more than disconfirmations. According to the prospect theory (Kahneman & Tversky 1979), other things being equal, the time spent on an option leads to more information which in turn reduces the perceived uncertainty of the option. In these lights, consumers' inspection of a vendor leads to a better impression which in turn leads to a higher probability of the vendor being accepted.

Because the serial position of a vendor affects vendor inspection time, and because vendor inspection time affects the probability of vendor acceptance, the serial position of a vendor contributes *indirectly* to the probability of a vendor's acceptance. The serial position of a vendor does not suggest the utility of an offer in itself; therefore, we expect its impact on vendor acceptance to be fully mediated by consumers' inspection. We hypothesize:

H3: Vendor inspection time mediates the effect of vendors' serial position on the probability of vendor acceptance.

3. METHODOLOGY

3.1 Data Collection

We conducted an empirical study to test our hypotheses. A convenience sample of 52 students who had real purchase intentions were recruited from a major university. Invitations were emailed to three class lists. Students were attracted to the study because they were promised free shipping and a 10% discount for each item purchased, with an upper discount limit of \$20.

Our subjects accessed Bizrate.com, which listed up to 25 vendors per page at the time of the study. Each vendor occupied a row in a list. Each row displayed the vendor's name (linked to the vendor's homepage), vendor rating (linked to vendor reviews), product availability, product

price, and a link to the product page at the vendor's website. Four "face icons" were used to represent different levels of a vendor rating (i.e., poor, satisfactory, good and outstanding). In detailed reviews, consumers rated vendors and commented on four points: their willingness to shop with the vendor again, on-time delivery, customer support, and whether the product met their expectations. There was also an icon indicating if the vendor was customer-certified (Customer-certified vendors referred to vendors which were evaluated highly by Bizrate.com panelists). Figure 1 illustrates a typical vendor list and vendor reviews.

<<Insert Figure 1 about here>>

Our subjects came with their own shopping objectives. A cubicle with comfortable seats and computers was set up in a research laboratory. Subjects were scheduled individually, and took as long as they wished to carry out the search. The search process was unobtrusively screen-recorded by a monitoring program. Subjects were asked to notify the assistant when they had narrowed vendors down to a few equally acceptable ones. The assistant then asked them to make a list of the vendors, and indicate which of the listed vendors they had heard of. Next, the assistant informed the subjects that they could proceed to purchase the item, or terminate the search. After each session, the monitoring program played back the shopping process and the data was coded. All search result pages of vendors visited by the subjects were recorded as observations, regardless of whether they were inspected. Vendors listed at Bizrate.com but not viewed by subjects (i.e., vendors listed in pages not viewed by subjects) were ignored. Our sample of vendor evaluations consisted of the sets seen, regardless of whether their reviews and vendor website were inspected. Some subjects also carried out product comparisons before comparing vendors; but product comparison was ignored. While the website allowed offers to be sorted by price, none of our subjects sorted the list. Consumers' inspection time was recorded by the system as the total number of seconds spent on vendor reviews and at a vendor's website.

3.2 Descriptive Data Analysis

The 52 subjects, among whom 25 were male and 27 female, came from eight different departments of the university, with an average age of 23 (from a range of 20 to 25 years). Twenty-five (48%) had online purchase experience and all of them had used the Internet for online product comparison. Items the subjects sought included printers, mice, cameras, CDs, microphones, sound cards, memory cards, ink cartridges, books, DVDs, CDs, headphones, video cards, speakers, CD players, and graphic cards. The average price was \$112, with prices being as high as \$927 (for a digital camera) and as low as a few dollars (for some CDs). There was a total of 752 vendor evaluations. The minimum number of vendors evaluated was three, while the maximum was 75, and the average was 14.4.

In a vendor list of seven of our subjects, the highest price offered was more than 200% of the lowest price. Deeper investigation revealed that heterogeneous products including both used and new items were offered by the list of vendors. Most of these cases occurred with small ticket items (e.g., books, CDs, DVDs). Those seven subjects were dropped because consumers' choice decisions in such contexts could be affected by an additional factor, product type (i.e., new or used). After these adjustments, we had 45 subjects and 609 evaluations of offers in the pool. The remaining subjects, on average, examined 13.5 vendors, within a range of 3 to 75. They chose to inspect 65 (11%) vendors.

We had two dependent variables (i.e., vendor inspection time and vendor acceptance) and four independent variables (i.e., serial position, price, vendor rating, and brand awareness). Some necessary data pre-processing was conducted. First, for inspected vendors, the inspection time

was log-transformed to reduce skewness. Second, vendor acceptance was coded as a binary variable (1=acceptance, 0=reject). Third, the serial position of a vendor was coded as an integer from 1 to 75. It was then log-transformed to reduce the influence of a relatively few number of long lists on the estimation of order effect. Fourth, product prices were converted to relative prices, that is, the percentage over the lowest price in the list. It was then multiplied by 100 to facilitate interpretation. Similarly, relative prices were log-transformed to avoid the excess influence of extreme values. Fifth, vendor ratings were coded as a continuous variable from 1 to 4. Some vendors were without ratings because of insufficient vendor reviews. Cohen et al. (2003) suggested using a dummy variable to indicate whether an observation has a missing value, and to supplement a sample average for the missing value. Next, we used two variables to represent a vendor rating: one dummy variable indicating whether a vendor was rated, and one continuous variable for the actual rating level (1-4). Average-substitution was used for those not rated. Finally, brand awareness was coded as a binary variable (1=aware, 0=unaware). Customer certification was coded as a binary variable as well (1=certified, 0=not certified). Demographic variables like consumer age, gender, years of Internet usage, and the number of online purchases were included as control variables. Information on shipping and tax was not included. Table 1 reports the vendor distribution over the combination of relative price (before log transformation) and vendor rating.

<<Insert Table 1 about here>>

Table 2 illustrates the correlation among the major independent and dependent variables based on pooled data. It indicates that acceptance of a vendor was significantly related to relative price, serial position, inspection time, brand awareness, rating, and the vendor being rated. Inspection time was significantly correlated with relative price, serial position, rating, and a vendor being rated. The correlation between inspection times and brand awareness was negatively significant, suggesting consumers' reliance on prior knowledge.

<<Insert Table 2 about here>>

3.3 Hypothesis Testing

Hypotheses 1 and 2 postulate the impact of price, vendor rating, brand awareness, and serial position on consumers' inspection of a vendor. To test both hypotheses, we used Tobit regression, which is an appropriate choice for handling the two-stage decision process (Meyer 1982) embedded in the inspection process: First, consumers needed to decide whether a vendor should be inspected; then, they decided how much time to spend on the vendor. The result of such a process generates censored data (Breen 1996) with the dependent variable characterized by a combination of an excessive number of zeros and a roughly normal distribution of inspection time for the inspected vendors.

Our sample of vendor evaluations was also a result of cluster sampling. Vendor evaluations by a subject were nested in subject samplings and were not independent. Therefore, traditional ordinary least squares regression with a pooled sample might not be appropriate; and hence random effects should be considered (Greene 2003). We adopted Tobit regression with random effects. We fitted two random effect Tobit regression models with full maximum likelihood estimation: One without the vendor's serial position (Model 1) and one with the serial position (Model 2). Table 3 records the results.

<<Insert Table 3 about here>>

Model 1 in Table 3 indicates that when controlling for consumer demographics, but without considering order effects, price had a significant negative impact on vendor inspection ($b=-2.17, p<0.001$, Model 1). The model also indicates that the vendor rating level did not have a significant effect on vendor inspection time ($b=1.98$, n.s., Model 1), while rated vendors attracted more inspection time ($b=4.81, p<0.01$, Model 1). We also found that brand awareness had no significant impact on vendor inspection time ($b=1.73$, n.s, Model 1). When order effect was included, Model 2 in Table 3 indicated that price still had a significant impact on inspection ($b=-1.47, p<0.001$, Model 2). Vendor rating level had no significant effect ($b=1.16$, n.s, Model 2); and did not attract significantly more inspection time for rated vendors ($b=2.91$, n.s, Model 2). In addition, brand awareness remained insignificant ($b=0.45$, n.s., Model 2). Judging from the fuller model, we conclude that hypothesis 1(a), i.e., price, was supported, and hypothesis 1(b), i.e., vendor rating, was partially supported, but not 1(c), i.e., brand awareness. In addition, it was evident that serial position had a significant and positive impact on inspection ($b=-2.64, p<0.001$, Model 2). Therefore Hypothesis 2 was supported.

To further appreciate the impact of serial position on consumer choice, let it be assumed that a vendor is moved 10 positions down in a list. Based on the model, holding other variables constant, the impact on inspection time would be $-2.64 \times \ln(10) = -6.08$. To produce the same amount of impact, we would need to increase the relative price of an offer by 62.5%, because $-1.47 \times \ln(62.5) = -6.08$.

Generally, the inclusion of serial position in Model 2 reduced the log likelihood of the Model 1 by 30.47 ($p<0.001$), indicating the importance of the additional contribution of order effect. Model 1 and 2 also indicate that within-subject variance (σ_e) was much larger than the between-subject variance (σ_u), which was also reflected by the small ρ . It suggests there was little variance in vendor inspection behavior across subjects. In such conditions, the random effect test and pooled test should produce similar results (Raudenbush & Bryk 2002). Our pooled test confirmed that the coefficient estimates were very close, with no change in significance.

Hypothesis 3 suggests that the impact of serial position on consumers' final acceptance of a vendor is mediated by vendor inspection. To verify this hypothesis, and following Baron and Kenney's (1986) suggestion for the mediator effect test, we tested another two models with consumers' acceptance of a vendor as the dependent variable. Model 3 had consumer demographics, relative price, vendor rating, brand awareness, vendor certification, and serial position as independent variables. Model 4 included the log-transformed inspection time as an additional independent variable. Logit regression was used with random effects. Table 4 reports the model fitting result.

<<Insert Table 4 about here>>

Model 3 in Table 4 indicates that without considering inspection time, relative price ($b=-0.99, p<0.001$, Model 3), vendor rating level ($b=2.38, p<0.001$, Model 3), whether a vendor was rated ($b=2.64, p<0.01$, Model 3), brand awareness ($b=1.35, p<0.05$, Model 3), and serial position ($b=-0.48, p<0.01$, Model 3) had significant effects on vendor acceptance. When inspection time was included, Model 4 in Table 4 indicates that relative price ($b=-0.97, p<0.001$, Model 4), vendor rating level ($b=2.62, p<0.001$, Model 4), whether a vendor was rated ($b=3.01, p<0.01$, Model 4), and brand awareness ($b=1.45, p<0.05$, Model 4) remained significant. However, the impact of serial position on vendor acceptance became insignificant ($b=-0.05$, n.s, Model 4). The

significance of serial position to vendor inspection (Model 2) and the insignificance of serial position to vendor acceptance when vendor inspection was included collectively indicated that the impact of serial position was fully mediated by vendor inspection, in support of Hypothesis 3. Model 4 also demonstrated the significant difference in acceptance behavior across subjects ($p=0.21$, $p<0.05$, Model 4).

We could also demonstrate the value of inspection time to vendor acceptance. Assuming other variables could be held constant and assuming a vendor attracts 10 more seconds of inspection, the impact on the acceptance odd-ratio would be $0.86 \times \ln(10) = 1.98$. In contrast, an increase in the relative price by 7.7%, which leads to $-0.97 \times \ln(7.7) = -1.98$, would neutralize the benefit of attention. However, in reality, inspection time changes with changes in price level or serial position. To better illustrate the order effect of vendor acceptance with a consideration of the mediating effect of vendor inspection and the interplay among all variables, based on Models 2 and 4, we simulated the order effect of vendor acceptance probability at various relative price levels for an average consumer in our sample. Basically, at each level of price and serial position, we estimated the inspection time based on Model 2. Then, the inspection time was substituted into Model 4 with other variables to estimate the probability of vendor acceptance. Figure 2 illustrates the order effect at some price levels.

<<Insert Figure 2 about here>>

Figure 2 indicates that the best price strategy (0%) always enjoys a high acceptance probability and is very insensitive to serial position. In contrast, if a vendor does not offer the best price, serial position becomes extremely important. For example, if a vendor charges 5% more than the best price, and shifts from position 1 to position 11, its probability of acceptance drops by about 40%. When the relationship between serial positions and vendor acceptance is evident, it is very easy for vendors to conduct a what-if analysis of the combination of price- and location-based marketing strategies in comparison shopping. Similarly, a shopping portal could devise a pricing strategy for various positions.

In the preceding hypothesis testing, we took a theoretical stance that vendor inspection produces new information for consumers and reduces the uncertainty of the non-contractible quality of a vendor's offer. An alternative perspective would be that consumers inspect a vendor to reconfirm the utility of the offer as suggested by price, vendor rating, and brand awareness. This perspective would suggest a moderating role of vendor inspection on other variables. To test this perspective, we added to Model 4, the interaction effects between inspection time and relative price, vendor rating, and whether a vendor was rated. The three interactions were all insignificant and the significance of other variables did not change. Therefore, vendor inspection is better interpreted as a discovery of new information rather than the reconfirmation of the old.

4. DISCUSSION AND IMPLICATIONS

Price and non-price competition are important aspects of online comparison shopping. One important form of non-price competition is securing an advantageous position in virtual space. In this study, we examined the order effect and vendor inspection in online comparison shopping. We hypothesized that serial position is mediated by vendor inspection to affect the probability of

a vendor being considered; and that vendor inspection is also affected by utility factors. Our empirical tests support the mediating effect of vendor inspection and indicate that consumers have better impressions of earlier vendors.

The implications of this study are manifold. The main theoretical implication of this study is that it explains the underlying mechanisms leading to order effect in online comparison shopping. From our findings, we conclude that how order effect affects preference ranking could be understood from the consumer information search perspective. Because of consumers' distribution of cognitive capacity and their declining motivation in information processing, the earlier vendors rather than the later ones attract more consumer attention as reflected by inspection time. According to Herbert A. Simon: "What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it." Consumers' vendor inspection of an offer tends to expose them to more supportive evidence, reduce the uncertainty and subsequently increase the perceived utility of an offer (Meyer 1982). In this way, a vendor's advantageous serial position complements price competition in attracting consumer attention and acceptance. The total effect is manifested as a primacy effect. In this sense, our explanation of order effect based on attention and information collection enriches extant literature on order effect, which is based on the mechanism of anchoring and adjustment. It also extends the research domain of order effect from information integration tasks (Hogarth & Eihorn 1992; Jacob et al. 2002) to preference ranking tasks.

The practical implications of this study are also significant. First, while past studies have suggested better web design for retail sites as a competition factor (Childers et al. 2001; Vrechopoulos 2004), this study suggests that in addition to traditional competition strategies such as pricing, word of mouth and brand awareness, advantageous positions can produce benefits similar to the "location" strategy in offline retailing. This study shows that an advantageous virtual location can help consumers discover a vendor's services and other value-added aspects, leading to a better impression and a higher probability of acceptance. This advantage is essentially achieved through gaining consumers' attention and satisfying their need for information. Therefore, virtual location competition basically is attention competition.

Second, this study offers an explanation to the question why the online market is still not frictionless (Brynjolfsson & Smith 2000; Clay et al. 2001). Like the optimal search theories in the consumer information search literature, the expectation of a frictionless online market hinges on the assumption that different offers are identical in product quality and consumers are completely rational. Under these assumptions, online prices will converge with the lowest price taking the entire market share. This study suggests that first, even for the same product, online offers differ in non-contractible aspects such as product delivery, customer service and brand equity. Vendors can compete on these aspects in addition to the price competition. Second, akin to the offline constraints on shopping trips, the limited cognitive capacity of consumers in information search and processing is the "friction" online. In sum, both the limited information conveyed by a product price and the cost to obtain additional information determine that the online market is not frictionless. Therefore, online vendors shall adopt a suitable marketing combination of price and location.

Third, this study suggests some potential competitive strategies for online vendors. For vendors who aim at a larger market share, pricing strategy seems to be more effective than paid placement. By offering the lowest price, they would be able to attract most consumer attention

even without an advantageous location. In other words, the offering of a lowest price is an effective means to implement a penetration strategy. In contrast, for vendors who want to implement a skim strategy, their online location becomes very important. They should carefully balance the loss of market share due to a disadvantageous location and the increase in unit profit.

The two strategies can be combined at different stages. For example, to compete with incumbents in a comparison shopping website, new entrants can use paid placement in addition to lower pricing and better ratings to attract more traffic. If exemplary service is provided to consumers, better word of mouth dissemination can be built up. As a vendor's good reputation grows, it may consider changing its pricing strategy for better profit. Moreover, the two strategies can be combined for different products. A vendor may offer the lowest price for some products to attract traffic, and then expose consumers to alternative or complementary products of higher profits. In such cases, the vendor needs to balance the loss of discounted offers with the gain from additional sales from other items.

For online comparison shopping portals, this study suggests that virtual space is in fact not unlimited. Because consumers inspect and consider only a limited number of vendors, listing too many vendors for one product will not necessarily result in better sales for the later vendors. Therefore, online comparison shopping portals should view virtual space as a scarce asset, and reflect this value in marketing strategies. This study suggests that the discriminative pricing for paid placement in comparison shopping websites is theoretically sound. Based on the order effect for various price levels as illustrated in Figure 2, pricing schemes can be designed by considering additional information such as the shopping portal's traffic, the absolute price of the product, and the vendor's other attributes.

Viewing virtual space as a scarce asset also suggests that extending the product line may be the major way to expand online space. Providing tools to allow consumers to search further (such as sorting tools) might also improve the depth of online space.

A number of limitations of this study should be noted. First, our observations were based mainly on a small sample of student subjects. Second, only student subjects were used. Real consumer behavior in online comparison shopping can be different in terms of involvement, price sensitivity, and vendor reputation sensitivity. Third, other information like vendor names and logos could potentially affect consumer attention as well, but were not covered in this study. Fourth, when a consumer faces a set of choices, many other context effects (Simonson & Tversky 1992) might also take place. Context effects might affect the formation of the consideration set as well as the final choice. Fifth, the availability of decision aids such as sorting tools would also change a consumer's consideration set and choice behavior (Häubl & Trifts 2000). It has been observed that consumers' decision making is affected by sorting available options (Diehl 2005; Diehl & Zauberman 2005). While the order effect would still be present in sorted lists, the impact is likely to change. How the order effect interacts with the use of sorting tools is an interesting direction for future research. Finally, because this study is not a controlled experiment, the proposed psychological explanations of the order effect in comparison shopping needs to be verified with more strictly controlled experiments.

5. CONCLUSION

This study examined the impact of vendors' serial positions on consumers' vendor inspection behavior and final choice in the context of online comparison shopping. Consequently, we found

that consumers accord more attention to vendors appearing earlier in a comparison list than to those listed later. This study also observed that the consumer's time spent on inspecting a vendor mediates the effect of a vendor's serial position on the consumer's acceptance of the vendor. This biased distribution of attention leads not only to a deeper, but also a better impression of the earlier vendors. Therefore, besides traditional utility factors such as a better pricing or vendor rating, an advantageous serial position serves as an alternative competitive strategy.

Our research presents important theoretical and practical contributions. Theoretically, this study explains the underlying mechanism of order effect in preference ranking tasks. In a practical sense, our research highlights the importance of virtual location for vendors in an online vendor list. It also suggests that online comparison shopping portals should manage virtual positions in a vendor list as valuable assets. The findings can aid practitioners in formulating appropriate competition and marketing strategies.

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DVD Empire						Avail: In Stock Condition: New	\$37.49 Go!
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(a) A portion of vendor list

Summary	Week	Month	Months
Positive	100%	84%	83%
Neutral	—	3%	2%
Negative	—	13%	15%

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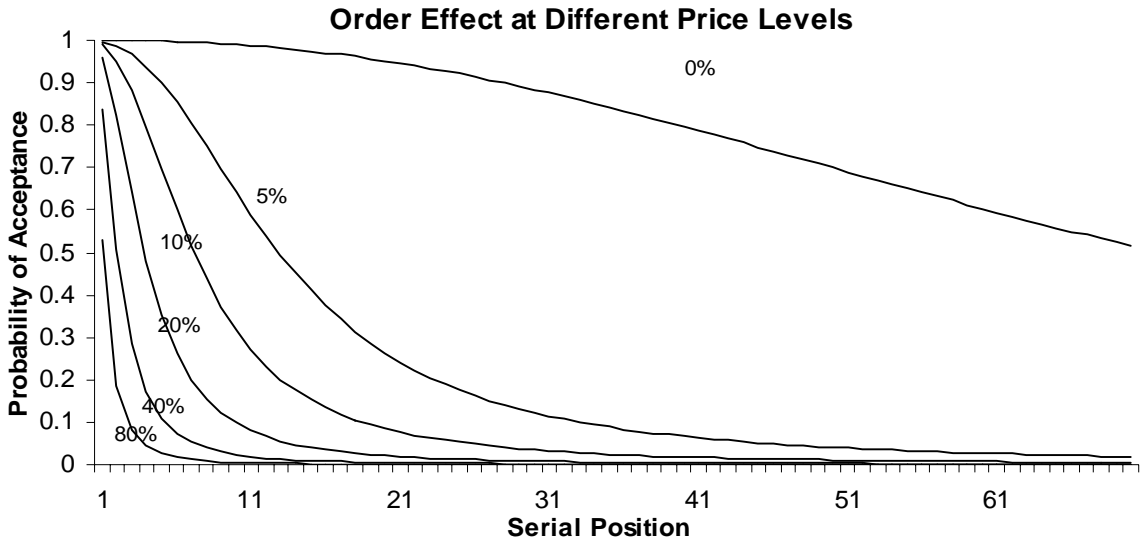
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(b) A portion of vendor reviews

Figure 1. Screen shots of the vendor comparison website.



Note: The above simulation is based on a vendor with the following attributes: Customer certified = yes, rating level = 4, rated = yes, brand awareness = no.

Figure 2: Order effect

Table 1: Vendor distribution (N=609).

Relative Price	Not Rated*	Poor	Satisfactory	Good	Outstanding	Grand Total
0-10%	41	12	2	107	33	195(32.02.%)
11-20%	39	2	3	60	33	137(22.50.%)
21-30%	8	0	0	25	22	55 (9.03%)
31-40%	6	0	0	16	8	30 (4.93%)
>40%	46	9	4	95	38	192(31.53%)
	140	23	9	303	134	609
Grand Total	(22.99%)	(3.78%)	(1.48%)	(49.75%)	(22.00%)	(100%)

* Numbers in the vendor rating columns indicate the number of vendors with a particular combination of price levels and vendor ratings.

Table 2. Correlation among variables based on pooled data ($N=609$).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)Acceptance							
(2)Relative price (log)	-0.36***						
(3)Serial position (log)	-0.35***	0.24***					
(4)Customer certified	0.06	0.02	0.08*				
(5)Inspection time (log)	0.58***	-0.32***	-0.37***	0.00			
(6)Brand awareness	0.23***	-0.01	-0.24***	-0.23***	0.11*		
(7)Rated	0.18***	0.00	-0.12**	0.55***	0.12**	0.17***	
(8)Rating (substituted)	0.14***	0.09*	0.00	0.36***	0.01	0.05	-0.08*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Model fitting for vendor inspection time.

Variables	Inspection time		Acceptance	
	Model 1	Model 2	Model 3	Model 4
Constants	-12.78	-11.25	-8.75	-8.99
Age	0.56	0.65	0.18	0.06
Gender	-1.70	-0.49	-0.71	-0.73
Internet experience	-0.57	-0.62	-0.14	-0.01
Online purchases	-0.30	-0.11	-0.06	-0.05
Customer certified	-0.90	-0.22	-0.08	-0.14
Rating (substituted)	1.60	1.16	2.38***	2.62***
Rated	4.81**	2.91	2.64**	3.01**
Brand awareness	1.73	0.45	1.35*	1.45*
Relative price (log)	-2.17***	-1.47***	-0.99***	-0.97***
Serial position (log)	--	-2.64***	-0.48**	-0.05
Inspection time (log)	--	--	--	0.86***
$\ln(\sigma_u^2)$	--	--	-0.70	-0.11
σ_u	0.18	0.00	0.71	0.95
σ_e	5.73***	5.14***	--	--
ρ	0.00	0.00	0.13*	0.21*
Log likelihood	-310.72***	-289.25***	-155.11***	-124.64***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.