

# Price or Proficiency? A Household Production Explanation on Consumers' Choice of Online Retailer

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**Abstract:** The availability of online comparison shopping services, such as Google shopper, enables consumers to easily compare a large number of retailers on price and other features. Online retailers therefore need to understand whether the establishment of relationships with customers as a means of generating purchases is comparably effective as is the lowest-pricing strategy. This is the issue we investigate in our study. Specifically, we examine whether and why online consumers return to retailers they bought from in the past rather than relying on comparison services. We draw on the Household Production framework to propose a discrete choice model for our empirical investigation and calibrate it using data from a survey of online shoppers. We take a Bayesian approach and use the hybrid Metropolis-Hastings within Gibbs MCMC sampler to calibrate the model. Our results are consistent with our theoretically derived expectation that other types of costs, and not just monetary ones, do play a role in how consumers select online retailers.

**Key words:** human capital; discrete choice modeling; E-retailing

**JEL code:** M31

## 1. Introduction

In its recent summary of the online retailing sector, the US Department of Commerce reported that online retail sales reached \$225.5 billion in 2012, increased by 15.8% compared to those in 2011 (US Census Bureau 2013). In contrast, total retail sales increased by just about 4% in the same period. Online retailing is thus growing at a much faster pace than the traditional retail channel.

The growth of online retail sales is resulting from and, in turn, is leading to, the entry of a large number of retailers to the online channel. Consequently, this growth has also driven the evolution of comparison shopping services such as Google shopper and bizrate.com, whose main function is to help consumers to compare retailers primarily on price.

The availability of such services has led to concerns among some online retailers that, rather than returning to stores that they shopped from in the past, consumers might rely on comparison sites to find the lowest-priced retailers. Some retailers such as amazon.com, on the other hand, apparently believe that price is not the only factor, that past relationships with retailers do matter to consumers and that they should therefore build relationships with customers as a means of generating repeat purchases. Which of these two views is more appropriate is the issue that we investigate in this research. Specifically, we examine whether and why online consumers return to retailers

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they bought from in the past rather than relying on comparison services.

Our key argument is that, while price is certainly an important factor in the choice of a retailer, online consumers are also likely to consider costs such as those of time as well. This assumption is based on the household production model (Becker, 1965). The theory behind this model suggests that consumers' selection of a retailer could be the outcome of their desire to minimize not just monetary costs but other costs as well. In particular, consumers may wish to minimize at least one more type of costs, i.e., the cost of time.

Time and monetary costs have been used in both the economics and marketing literatures in the context of the household production model (Becker et al., 1990; McCorkle et al., 2012; Moorthy et al., 1997; Putrevu & Ratchford, 1997; Ratchford, 2001; Stigler & Becker, 1977). In addition to these two costs, we also consider a third, i.e., psychological costs. Such costs have been considered and used in the marketing literature (Shugan, 1980; Wiepking & Breeze, 2012) although not within the framework of the household production model. We define psychological costs as uncertainty regarding the results of one's actions or, in household production terms, uncertainty regarding the quality of the output. In the context of online buying, psychological costs could result from two sources: one, buying a poor product or, two, receiving poor service from a retailer.

We assume that whether the consumer focuses on time, monetary or psychological costs depends on her human capital related to online buying as well as her information capital (Becker & Nigel, 1986; Murray & Bellman, 2011; Ratchford, 2001). In the context of online purchases, information capital is the consumer's knowledge of different retailers. When she is a first time or new online buyer, the consumer will be low on this capital. She will therefore be uncomfortable regarding online buying and psychological costs will take priority over time costs. As a result, despite the fact that comparison shopping requires an investment of time, she may go through services such as bizrate.com rather than choosing a retailer on her own. As her experience with buying online increases, however, her information capital increases as well and she will gain familiarity with different retailers. She will therefore become more comfortable with returning to retailers that she is familiar with thereby avoiding the time costs of comparison shopping.

Even after she gains some information capital and lowers her psychological costs, whether a consumer returns to the same retailer depends on the relative importance of time and monetary costs to her. A consumer with lower income might focus on reducing her monetary costs whereas one who is pressed for time might instead place more importance on reducing the time involved. The former type of online consumer is unlikely to return to any single retailer but, instead, choose from few familiar retailers based on price. She would therefore reduce both time and monetary costs by comparison shopping among a limited set of retailers. This consumer would therefore continue to use comparison shopping services. The latter type, on the other hand, is more likely to maintain an extended relationship with one or, possibly, few retailers, and visit the same retailers directly—based on whether or not the product that she is purchasing is available at the retailer—to minimize the time costs of retailer search and comparison. This type of consumer, therefore, is unlikely to use comparison shopping services.

In summary, therefore, whether online consumers return to retailers that they bought from in the past, or rely on comparison shopping services, depends on which type of costs, i.e., monetary, time or psychological, that they wish to minimize. Additionally, it is affected by how much human capital related to online buying they acquired. Consumers with low capital are likely to desire lower psychological costs and hence rely on comparison shopping services. On the other hand, whether consumers with experience and more capital use comparison shopping services depends on their wish to reduce monetary or time costs. Those who are more interested in lowering monetary costs are likely to use comparison shopping services among a set of familiar retailers. Those who are

more concerned about time costs, instead, should return to the retailers that they have the most familiarity with. We empirically investigate these expectations in this research.

We next set up our theoretical framework by discussing why the household production with human capital model is appropriate in our context. In section three, we provide a description of the data that we use for our empirical analysis. Section four presents our model and our empirical results. We conclude the paper with a section summarizing our findings and providing some directions for additional research in this area.

## **2. Relevance of the Household Production with Human Capital Model**

We use the household production model (Becker, 1965; Devereux & Locay, 1992; Piggott & Whalley, 1996; Pollack & Wachter, 1977) as our theoretical framework to investigate whether consumers choose to return to an online retailer that they bought from in the past. Additionally, we draw on the notion of human capital (Stigler & Becker, 1977). The household production model with capital has been used extensively in the economics (Becker & Murphy, 1988; Becker, Grossman & Murphy, 1994) and marketing (McCorkle et al., 2012; Putrevu & Ratchford, 1997; Ratchford, 2001; Urbany et al., 1996) literatures.

The household production model, with human capital, is relevant to the study of online purchase decisions for a number of reasons. First, the model assumes that households or consumers produce an output that they consume and that they use a production process that utilizes some inputs for the purpose. In our context, the service that consumers produce and consume is that of purchasing a product online. The production process that they use is that of identifying and visiting appropriate retailers and transacting with them. The inputs are the time involved in searching for and transacting with the retailers and price of the purchase. Thus, the household production model is a nice stylized representation of how an online purchase occurs.

Second, the model assumes that consumers incur two types of costs, time and monetary, in producing a good or service for themselves. Consumers, in the online purchase situation, indeed incur both of these costs. Time costs are incurred as they search for a retailer. Monetary costs are incurred not only on the purchases but also in terms of lost savings if they fail to find the retailer with the lowest price. As discussed previously, we consider a third type of cost as well, i.e., psychological costs. Thus, under this augmented household production framework, the choice of an online retailer would be affected by consumers' desire to minimize one or more of these costs. Since consumers do incur all of these costs in online purchases, the framework should be able to provide some insights regarding how online consumers choose a retailer.

Third, the model permits individuals to differ in the capital that they possess. The online channel is as yet an evolving medium and is a relatively new channel. Consumers will therefore be heterogeneous in their knowledge of how to buy with those who have been buying via this channel for a longer time being more knowledgeable than others. Thus, consumers will vary in the amount of capital that they possess.

Fourth, human capital not only reduces the costs of production but also increases the capital available for future production through consumer-learning from the current production activity (Moorthy et al., 1997). This will also be the case for online buying since, as they continue to buy online, consumers' human capital will also increase in the form of gains in information capital (Ratchford, 2001), i.e., their knowledge of the price and service attributes of different retailers. Enhancement of this capital will affect how consumers purchase products online. In particular, they are likely to use it to reduce their time and monetary costs. This, in turn, should affect whether they use comparison shopping services or choose a retailer on their own.

Finally, the household production framework assumes that individuals choose the production process that is most appropriate for the level of capital that they have (Rosenzweig & Shultz, 1983). Thus, those with lower capital may choose a process that maximizes the production output from small inputs. Such individuals, however, cannot attempt to minimize the costs of production. Their low capital reduces their ability to invest in cost-reducing improvements to the production process. The production process that they choose would, therefore, focus entirely on maximizing the output. Those with higher capital, such as education, on the other hand, would not only be interested in maximizing the output but also in producing the output at the lowest cost (Michael, 1972). In other words, these individuals desire to increase the efficiency of producing the household output. These individuals would, therefore, choose a process that would lower the costs of production.

In our context, newer consumers to the online channel would have low information capital. They would therefore rely on comparison shopping services although this involves more time-related costs in terms of doing the search on the comparison shopping site and also going through the process of registering and providing personal information at retailers that such services might take them to. In return, they would reduce their psychological costs since they are able to obtain comparisons and, in most cases, ratings of the retailers as well as monetary costs since they can choose to go with less expensive retailers. Consumers with higher capital, on the other hand, can avoid the time-related costs of retailer search and comparison through comparison shopping services and those of registering with retailers that they didn't previously buy from by directly going to retailers that they shopped from in the past.

In summary, the household production model with human capital is a theoretically rich framework to investigate how online consumers choose retailers. Its key premise, in our context, is that consumers attempt to reduce the overall costs of purchasing a product online and, further, that they would use the human capital that they possess for this purpose. We, therefore, view consumers' use or non-use of comparison shopping services as the choice of a production process and assume that they use one of three processes: exclusive reliance on comparison shopping services, reliance on their own information capital and a combination of the two. Which of these three processes is used depends on the role of different types of costs in their production function which, in turn, depends on the amount of capital that they possess. At low levels of experience, or if they have concerns about the quality of products or retailer service online, their psychological costs could be high. In this case, they would rely on comparison shopping services.

As experience, and capital, increase, however, psychological costs may come down and the other type of costs, i.e., time and monetary costs, gain precedence. Between the two, if time costs are higher, the consumer should avoid comparison shopping services and, instead, rely on her information capital to directly visit the retailer that she considers the best. In a sense, she would depend on her capital to compare different retailers and choose the best thus avoiding the time costs involved in comparison shopping and potentially buying from unfamiliar retailers. If, on the other hand, monetary costs are higher, she would rely on comparison shopping services to find the lowest-priced retailer.

Finally, if time and monetary costs are both important, the consumer might follow a process where she relies on her information capital as well as on comparison shopping services. Thus, she may use comparison shopping services to identify the lowest-priced retailer among those that she is already familiar and has a relationship with. This will not only help her realize time savings—because she is not visiting new retailers and going through the process of setting up an online purchase with them—but will also reduce her monetary costs by pointing her to the lowest-priced among familiar retailers.

### 3. Description of the Data

Our data was collected by a leading online market research firm through an online survey. The survey was administered to 2500 participants drawn from an online panel managed by the company. The participants were chosen such that the demographic profile of the group was similar to that of the typical online consumer. Additionally, participants were only included if they purchased online at least once during the previous one year period. The categories that they purchased in, and the extent of their purchases, during this period, however, were not used as selection criteria. Participants were informed that the task should take fifteen minutes or less. The survey resulted in 2002 usable, completed, questionnaires.

The survey asked the participants a battery of questions regarding their online shopping habits and experience. The key question of interest was the one regarding how they choose a retailer and how, if at all, their selection process might have changed over time. In particular, the survey asked the participants to respond to the following items under the question "How have your online shopping patterns changed since you first came online?"

- (1) I look at fewer online vendors; know where I wish to shop
- (2) I go to vendors I've bought from before, online or offline
- (3) I go to a few specific portals and directories for shopping and online buying guidance
- (4) I look for known brands to purchase

Items 1, 2 and 3 are clearly related to the respondents' selection of an online retailer. Among the three, item 1 assesses whether the respondent has begun to form a set of retailers that she is familiar with. Item 2 investigates whether, rather than evaluating different retailers on every purchase occasion, the respondent just goes back to retailers that she has prior experience with. If, in response to this item, she indicates that she is more likely to go back to retailers that she bought from before, than to compare retailers on each occasion, she is not as likely to use comparison shopping services such as Google shopper or bizrate.com. Item 3, on the other hand, assesses whether the respondent is more likely to use comparison sites to find a retailer rather than going back to retailers that she has purchased from before.

We also included item 4 in our analysis to investigate whether consumers who visit the same retailers that they bought from before, rather than searching for new ones, are also likely to prefer brands that they are familiar with. If this is indeed the case, it would provide additional evidence in support of the household production and human capital framework: consumers who are interested in reducing the costs of time in their choice of online retailers are likely to be interested in the same benefit in their choice of brands as well.

For each of the four items, regarding how their shopping patterns changed since they first started going online, respondents could choose one of the following five ordered responses:

Much More	A Little More	About the Same	A Little Less	Much Less
☺	☺	☺	☺	☺

Thus, a response of "Much More" for item 1 ("I look at fewer online vendors; know where I wish to shop") suggests that the respondent is more likely to have a good idea of the retailers she would buy from and choose from.

Since the response options are ordinal, we specify our model as an Ordinal Probit. This specification assumes that respondents have a latent utility of response and that each possible response to an item in the survey has a threshold associated with it (Aitchison & Silvey, 1957; Ashfold, 1959; Gurland et al., 1960). A response is observed only if the respondent's utility crosses the threshold associated with that response.

In order to investigate the role of household production and human capital in store selection, we specify the latent utility in the ordinal probit specification as a function of variables that serve as proxies for time, monetary and psychological costs and for human capital. The specific variables that we use are discussed next.

### **3.1 Proxies for Households' Interest in Reducing Monetary Costs**

Since we do not have direct measures of households' interest in reducing monetary costs, we use some demographic variables as proxies for the same. The use of demographic variables as proxies is common in the literature (Messinger & Narasimhan, 1997; Murthi & Srinivasan, 1999; Narasimhan, 1984; Soberon-Ferrer & Dardis, 1991).

The specific demographic variables that we use are household Income and number of children in the household. The household income is an aggregate measure of the monetary resources available to the household—as resource availability increases, *ceteris paribus*, the household's focus on monetary costs, and desire for savings, should come down. This reduction, however, may not be uniform across households since two households with the same income but different family sizes will have very different purchasing powers—larger households would have a lower income per member of the household than smaller households. To allow for these differences, we also include the number of children under 18 in the household since such children are dependent on parents and hence reduce the household's purchasing power. .

### **3.2 Proxies for Households' Desire to Reduce Time Costs**

As in the case of monetary costs, our survey does not directly measure our respondents' desire to reduce the time costs of their online purchases. We therefore take a similar approach, as above, to incorporating households' interest in minimizing the costs of time. This approach too has precedence (e.g., Blattberg et al., 1978; Carlson & Gieseke, 1983; Fox et al., 2004; Hoch et. al., 1995; Marmorstein et al., 1992).

Households that have less time for household production activities are those that should be most interested in reducing their time costs. And, if one views the total time available to a household as consisting of two parts—one devoted to professional or work-related activities and the rest allocated to household production—families that spend more time on their work are those that should have less time for household activities and, hence, should be the ones that have a greater desire to reduce time costs. Based on this assumption, we use two variables that measure the household's commitment of time to work: number of work hours per week of the respondent and the number of work hours per week of the respondent's spouse. As the time spent at work increases for either head of the household, or both, the desire to save time on household production activities should increase.

### **3.3 Proxies for Psychological Costs**

Psychological costs result from uncertainty regarding an action such as a purchase decision. Consumers can be uncertain, regarding the choice of a retailer, due to a number of factors. For instance, a consumer who is unfamiliar with buying online may feel uncertain because of the many online retailers she can choose from. The large number of choices means that she will be unfamiliar with most of the retailers and will therefore be uncertain about whether she researched enough to buy from the best retailers.

The consumer's uncertainty would, of course, come down as she gains experience and learns about different retailers. Experience, however, cannot fully reduce uncertainty and particularly so if the consumer had some negative experiences in the past. For instance, a consumer who made many online purchases and, therefore, has much experience, but has had a negative experience with a retailer, may feel more uncertain than a consumer who doesn't have as much buying experience but has not had any prior problems in online buying. We therefore include a variable labeled *catastrophe* which is the respondent's answer to the question “Have you ever had an

online shopping catastrophe, or ever experienced online fraud, or have a really bad shopping experience?" in the survey. It's coded as 1 if the respondent answered "yes" and 0 otherwise.

In addition to her own experience, a consumer's uncertainty and, hence, her psychological costs, can also be reduced by observing others make similar purchases or buy from the same retailers they are buying from. Further, if the group of others that she observes consists primarily of people that she knows—for example, her friends and acquaintances—her uncertainty is likely to be reduced substantially. We, therefore, include a variable that represents the percent of the respondent's friends and acquaintances that use the Internet. Consumers who have a greater proportion of their friends and acquaintances actively using the Internet are less likely to feel uncertain about purchasing online and *vice versa*.

### 3.4 Human Capital

Consumers can have two types of human capital that they can use for any purchase decision—one which is intrinsic and another that is based on experience. Intrinsic capital is a resource that they can use regardless of whether they have prior experience with the specific type of purchase decision or not. Thus, for instance, even if she never purchased a car before, an educated consumer may be able to evaluate different options and make a better purchase decision than another consumer who is not as educated. We therefore use education as a proxy for intrinsic human capital. Education has frequently been used in this role in the literature (e.g., Becker, 1967; 1993; Ritzen & Winkler, 1977).

The second variable, *experience*, measures how long the respondent has been using the Internet for. The specific question in the survey was: "When did you first start to use the Internet to learn about products/services whether buying online or not?" This variable represents the human capital gained through use of the Internet. In addition to experience, we use another source of human capital potentially acquired through the respondent's employment. This variable, *company size*, represents the total number of employees in the firm where the respondent works and allows for the possibility that the use of the Internet by individuals can vary based on the size of their employers (e.g., DiMaggio et al., 2001; Forman, 2005). Specifically, it is likely that those who work in larger organizations have better access to and, hence, better experience with, the Internet than those who work smaller firms.

### 3.5 Preference for Efficiency

As discussed previously, in the household production with human capital framework, consumers use capital to increase the efficiency of their purchases. The desire to increase efficiency may be either due to the time and/or monetary constraints that the consumer faces or to allocate the saved time or monetary resources to other activities. The proxies that we included for monetary and time costs, above, only represent monetary and time constraints by consumers but do not capture the intrinsic desire for efficiency in order to save resources that can be allocated elsewhere. We therefore include three variables to represent consumers' desire for efficiency in our analyses.

- *Purchased Before*. Respondents were asked to indicate their level of agreement with the statement "I've bought from this vendor offline in the past" with regard to their most recent purchase. Respondents could choose one of five options: Agree Completely, Agree Somewhat, Neither Agree nor Disagree (Doesn't Apply), Disagree Somewhat, Disagree Completely. We coded the first option as a 1, the second as a 2 and so on. Agreement with this statement suggests that the respondent desires efficiency because visiting a retailer that she is familiar with—even if the familiarity is in the offline channel—should increase the efficiency of the purchase. For instance, a consumer who is familiar with the products of the clothing retailer Gap would be able to shop online faster at Gap.com since she is already familiar with this retailer's products. This will not be the case, however, if she is visiting a retailer such as Bluefly.com that she never bought from before.

- *One-click*. Respondents were asked to indicate whether an online site that “Offers “1-click” shopping convenience” made that retailer their most preferred. Respondents had the same five options as in the case of the *Purchased Before* variable. Agreement with this statement also suggests the respondent’s desire for efficient shopping.
- *Hold-past*. Similar to the *One-click* variable, respondents were asked to state their level of agreement with the statement that a retailer that “Holds onto past-purchasing information” was more preferred than other retailers. Again, respondents could choose one of the five options regarding their agreement with the statement. As in the case of the *one-click* variable, agreement with this statement, indicates that the respondent desires shopping efficiency since a retailer who holds on to past purchasing information can be faster to shop at due to features such as personal recommendations. For example, the online retailer Amazon.com makes product recommendations to returning customers based on their past purchasing patterns.

#### 4. Model and Empirical Results

As discussed above, we investigate the responses to the following four items of the question “How have your online shopping patterns changed since you first came online?”

- (1) I look at fewer online vendors; know where I wish to shop
- (2) I go to vendors I’ve bought from before, online or offline
- (3) I go to a few specific portals and directories for shopping and online buying guidance
- (4) I look for known brands to purchase

Also, as discussed previously, respondents could choose one of the five options “Much More”, “A Little More”, “About the Same”, “A Little Less” and “Much Less” for each of the items. Thus, these responses are on an ordinal scale. We therefore use an ordinal probit specification for our analysis. Formally, the model for each individual  $i$  in the sample, for each of the four items  $j$ ,  $j = 1, 4$ , is specified as follows:

$$\begin{aligned}
 U_{ij} = & \beta_{0j} + \beta_{1j}Income + \beta_{2j}Number\ of\ Children + \beta_{3j}Work\ Hours + \\
 & + \beta_{4j}Catastroph\ e + \beta_{5j}Friends\ Online + \beta_{6j}Age + \beta_{7j}Education \\
 & + \beta_{8j}Experience + \beta_{9,j}Company\ Size + \beta_{10,j}Purchased\ Before \\
 & + \beta_{11,j}One\ Click + \beta_{12,j}Hold\ Past + \phi_{ij}
 \end{aligned}$$

$$\begin{aligned}
 Y_{ij} = & 1 \text{ if } U_{ij} \leq 0 \text{ ('much more')} \\
 = & 2 \text{ if } 0 < U_{ij} \leq \gamma_{1j} \text{ ('a little more')} \\
 = & 3 \text{ if } \gamma_{1j} < U_{ij} \leq \gamma_{2j} \text{ ('about the same')} \\
 = & 4 \text{ if } \gamma_{2j} < U_{ij} \leq \gamma_{3j} \text{ ('a little less')} \\
 = & 5 \text{ if } \gamma_{3j} < U_{ij} \text{ ('Much less')} \\
 & \phi_{ij} \sim N(0,1)
 \end{aligned} \tag{1}$$

The model therefore includes sixteen parameters—an intercept, twelve slopes and three thresholds—for each of the four items that we analyze. We label this the *full model*. We also specify a *null* and *restricted* model to assess the validity of this model. The null model includes only the intercepts and serves as our baseline. The restricted model includes the proxies for monetary, time and psychological costs as well as those for human capital. It does not, however, include the three variables *purchased before*, *one click*, *hold past* that represent consumers’ desire for efficiency. The restricted model is expected to do better, in terms of fit, than the null model if the variables that represent time and monetary constraints, and psychological concerns, by themselves, are able



to explain how consumers choose an online retailer. Similarly, the full model should perform better than the restricted model if, in addition to time and monetary constraints, and psychological costs, the desire for efficiency is also a consideration in how consumers choose an online retailer.

While a comparison of the full model, with the restricted model, provides an assessment of the role of the desire for efficiency in the selection of online retailers, it cannot test whether the three variables that we use to represent consumers' desire for efficiency indeed capture the construct. They could, for instance, serve as additional proxies for the role of time costs since, by being efficient, the consumer can reduce the time spent on shopping. If this is the case, neither the estimated effects of time costs nor the desire for efficiency, would truly represent the effects they are supposed to be measuring. Instead, they would be partially capturing some parts of both effects and would therefore be difficult to interpret. Similarly, the efficiency variables could potentially be serving as additional proxies for psychological costs since, our efficiency variables capture the gains accruing from going back to the same retailers and consumers might be returning to retailers they bought from before not to increase their shopping efficiency but to avoid psychological costs. Likewise, our efficiency variables could, in fact, be serving as proxies for the role of intrinsic human capital since one could argue that the more educated consumer is also the consumer who is more likely to be interested in efficiency. Once again, if this is the case, the estimated effects of education would capture the effects of intrinsic human capital as well as the effects of education on the desire for efficiency (The three efficiency variables, however, cannot capture the role of monetary costs or the desire for savings since none of these variables represents monetary savings, if any, gained by visiting the same retailers).

To avoid such a possibility that the efficiency variables are contaminated by, or end up contaminating, the other estimated effects, we specify three *augmented models* that permit us to test whether these three variables indeed just represent consumers' desire for efficiency. Specifically, each augmented model includes interactions of the three efficiency variables with the variables representing one of the three types of costs, i.e., monetary, time and psychological. Our premise is that, if the three efficiency variables only represent consumer desire for shopping efficiency and do not capture the role of costs, the estimated effects of the interactions should not be significant and, hence, the augmented models should not do any better on fit than the full model. The three augmented models are as follows.

*Augmented Model 1*

$$\begin{aligned}
 U_{ij} = & \beta_{0j} + \beta_{1j}Income + \beta_{2j}Number\ of\ Children + \beta_{3j}Work\ Hours \\
 & + \beta_{4j}Catastrophe + \beta_{5j}Friends\ Online + \beta_{6j}Age + \beta_{7j}Education \\
 & + \beta_{8j}Experience + \beta_{9j}Company\ Size + \beta_{10j}Purchased\ Before \\
 & + \beta_{11j}One\ Click + \beta_{12j}Hold\ Past + \beta_{13j}(Hours\ X\ Purchased\ Before) \\
 & + \beta_{14j}(Hours\ X\ One\ Click) + \beta_{15j}(Hours\ X\ Hold\ Past) + \phi_{ij}
 \end{aligned} \tag{2}$$

*Augmented Model 2*

$$\begin{aligned}
 U_{ij} = & \beta_{0j} + \beta_{1j}Income + \beta_{2j}Number\ of\ Children + \beta_{3j}Work\ Hours \\
 & + \beta_{4j}Catastrophe + \beta_{5j}Friends\ Online + \beta_{6j}Age + \beta_{7j}Education \\
 & + \beta_{8j}Experience + \beta_{9j}Company\ Size + \beta_{10j}Purchased\ Before \\
 & + \beta_{11j}One\ Click + \beta_{12j}Hold\ Past + \beta_{13j}(Catastrophe\ X\ Purchased\ Before) \\
 & + \beta_{14j}(Catastrophe\ X\ One\ Click) + \beta_{15j}(Catastrophe\ X\ Hold\ Past) + \phi_{ij}
 \end{aligned} \tag{3}$$

*Augmented Model 3*

$$\begin{aligned}
 U_{ij} = & \beta_{0j} + \beta_{1j} \text{Income} + \beta_{2j} \text{Number of Children} + \beta_{3j} \text{Work Hours} \\
 & + \beta_{4j} \text{Catastrophe} + \beta_{5j} \text{Friends Online} + \beta_{6j} \text{Age} + \beta_{7j} \text{Education} \\
 & + \beta_{8j} \text{Experience} + \beta_{9j} \text{Company Size} + \beta_{10j} \text{Purchased Before} \\
 & + \beta_{11j} \text{One Click} + \beta_{12j} \text{Hold Past} + \beta_{13j} (\text{EducationX Purchased Before}) \\
 & + \beta_{14j} (\text{EducationX One Click}) + \beta_{15j} (\text{EducationX Hold Past}) + \phi_{ij}
 \end{aligned} \tag{4}$$

We take a Bayesian approach and estimate the parameters separately for each of the four items using MCMC methods. Specifically, we use the algorithm with the Metropolis Hastings-Gibbs sampler proposed by Cowles (1996) and implemented in Martin and Quinn (2005). Relative to other algorithms for ordinal data, this is not only relatively easy to implement but also displays good mixing. In the interests of space, we do not describe the algorithm here. The details, however, are available from the authors.

We drew 20,000 samples for each parameter from the conditional distributions. The first 1000 samples were used to burn-in the sampler. The reported estimates are therefore the posterior sample means of the remaining 19000 observations.

Table 1 summarizes the performance of the six models—null, restricted, full, augmented model 1, augmented model 2 and augmented model 3—in terms of DIC.

**Table 1 DIC for Different Models**

	Null Model	Restricted	Full Model	Augmented Model 1— with interaction of efficiency and time	Augmented Model 2—with interaction of efficiency and psychological costs	Augmented Model 3—with interaction of efficiency and intrinsic human capital
I look at fewer online vendors; know where I wish to shop	5982.09	5979.48	5920.63	5921.06	5922.28	5919.39
I go to vendors I have bought from before, online or offline	5353.23	5351.38	5251.59	5255.57	5257.43	5255.98
I go to a few specific portals and directories for shopping and online buying guidance	5851.26	5858.25	5753.43	5756.43	5759.91	5756.60
I look for known brands to purchase	5229.75	5231.45	5183.10	5188.32	5188.45	5184.74

The table suggests that, overall, the specifications that include the proxies for time, monetary and psychological costs as well as the efficiency variables are able to explain the data better than the null specification which only has the intercept terms included. Our empirical results, thus, provide evidence in support of our theory that the household production model, with human capital, and the efficiency variables can provide insights regarding how online consumers choose retailers.

Of greater interest is the pattern of the DIC's across the different specifications for each of the four items. In particular, the specification with the smallest DIC for item 1 is the augmented model with the interactions of education and the three efficiency variables whereas the best specification for the other three items is the full model. The restricted model, on the other hand, does perform slightly better than the null model for three of the four items and, in fact, performs worse for item 2. This pattern thus suggests that, while they can help in understanding how online consumers choose retailers, household production costs and human capital cannot by themselves explain the choices very well. Instead, we also need to consider the role of consumers' desire for efficiency in their shopping activities or, in household production terms, their desire to be efficient in producing

the service, for themselves, of purchasing a product online. This is the key finding of our paper in that it suggests that, in order to gain repeat purchases, online retailers should concentrate on helping their customers be more efficient in their shopping process.

Given the above finding, we now turn to investigating whether the estimates of the substantive variables, i.e., the proxies for consumers' desire to reduce monetary, time and psychological costs, the role of human capital and the efficiency variables are consistent with what theory would predict. Towards this end, we select the specifications with the smallest DIC for each of the four items for further discussion. Specifically, we select the full model for items 2-4 and augmented model 3—the specification with the interactions of education and the three efficiency variables—for item 1.

Item 1: I look at fewer online vendors; know where I wish to shop (This is the first item under the question “How have your online shopping patterns changed since you first came online?”)

**Table 2 Estimated Parameters for Item 1**

Item 1: I look at fewer online vendors; know where I wish to shop					
	Mean	SD	pseudo-t	0.025	0.975
Intercept	-0.146	0.255	-0.572	-0.644	0.348
Proxies for interest in reducing monetary costs					
Income	-0.021	0.013	-1.588	-0.047	0.005
NumChild	0.046	0.020	2.275	0.006	0.086
Proxy for interest in reducing time costs					
Total work hours	0.006	0.006	0.960	-0.006	0.018
Proxies for interest in reducing psychological costs					
Catastrophe	-0.100	0.062	-1.618	-0.222	0.021
Friends.Online	0.003	0.009	0.296	-0.015	0.021
Proxies for intrinsic human capital					
Edu	0.190	0.079	2.421	0.037	0.344
Age	0.019	0.018	1.073	-0.015	0.054
Proxies for acquired human capital					
Experience	-0.044	0.015	-3.000	-0.072	-0.015
Company.Size	0.001	0.011	0.114	-0.021	0.024
Proxies for desire for efficiency in shopping					
Purchased.Before	0.040	0.037	1.088	-0.032	0.113
oneclick	0.172	0.066	2.614	0.044	0.303
hold.past	0.191	0.060	3.162	0.073	0.310
Interactions of efficiency and education					
pchs.edu	-0.002	0.014	-0.125	-0.030	0.026
oneclick.edu	-0.046	0.025	-1.824	-0.096	0.003
past.edu	-0.029	0.023	-1.240	-0.075	0.016
Thresholds					
gamma2	0.848	0.030	28.018	0.792	0.910
gamma3	2.123	0.041	51.307	2.044	2.203
gamma4	2.805	0.060	46.995	2.689	2.924

Estimates of the model parameters for the responses to this item are included in Table 2. The table provides pseudo-t ratios for each parameter computed as the ratio of the posterior mean and the posterior standard deviation. We also include a 2.5%-97.5% confidence interval for each parameter based on the posterior draws.

The entries in the table suggest that the intercept is not significant suggesting that the variables included in the model are able to explain the responses to this item. Turning to the household production variables, the estimated effect of the number of children is positive. Taking into account the coding of the item—a response of 1 indicates a response of “much more”, 2 indicates “a little more” and so on up to 5 which indicates “much less”—the negative sign of the parameter indicates that, as the number of children in the household increases and, hence, the per capita income of the household comes down, the consumer is much less likely to “look at fewer online vendors”. Stated differently, the household is much more likely to search among multiple vendors presumably in search of better prices—this is what we would expect as income comes down.

Among the other significant estimates in the table, education increases the likelihood of searching among multiple vendors rather than sticking with few vendors. Once again, this is consistent with what theory would predict. Consumers incur search costs (Moorthi et al., 1997) as they search among multiple retailers rather than choosing from among a few. Educated consumers, however, should be able to search faster and, hence, incur lower search costs. Thus, this estimate as well, is consistent with intuition and what theory would predict.

Turning to the role of acquired human capital, the estimated effect of experience suggests that more experienced online consumers are more likely to select from among a few vendors rather than searching among multiple vendors. This is, of course, what the human capital theory would predict. Specifically, as they acquire human capital, consumers would employ the capital to increase the efficiency of their production processes. In this case, consumers who have more experience presumably tried multiple online retailers and settled on a few that they found to be most suitable for their needs and cost minimization objectives. This is obviously the most efficient approach to shop online rather than searching for a retailer whenever an online purchase is made.

The respondents' desire for efficiency in online shopping is also reflected in the estimated effects of the efficiency variables. Two of the three parameters are significant. Additionally, as discussed above in the context of the DIC's of the specifications, the efficiency variables are able to explain a bigger part of the variation in responses than the other variables. To discuss the substantive implication of the signs of these parameters, we recall the coding of the *oneclick* and *holdpast* variables. The responses to these variables are coded such that 1 represents strong agreement with the statement that a retailer that offers one click shopping, or holds on to past purchasing information, is the most preferred and 5 represents strong disagreement. The positive sign of these parameters, therefore, means that consumers who strongly disagree that these characteristics make a retailer their most preferred are likely to look at more vendors as they gain experience than consumers who strongly agree. Stated differently, consumers who are interested in the efficiencies resulting from (1) one-click shopping and (2) the retailer holding on to past purchase information and, hence, making the shopping task more efficient (for instance, by not requiring the consumer to provide personal and credit information again), are more likely to look at fewer online vendors as they gain experience.

Given that the augmented model performs better than the full specification in terms of DIC, we would expect one or more of the three parameters for the interaction of efficiency and education to be significant. This is, however, not the case and none of the interaction parameters are significant. This provides an explanation for why the DIC of the augmented model is only slightly higher than that of the full model.

Finally, estimates of the thresholds suggest a larger gap between thresholds two and three—going from 0.85 to 2.123—than between thresholds one and two (0.0 to 0.85) or thresholds three and four (2.123 to 2.804). This suggests that most participants of the survey are either clustered between responses one and two (“Much More” and “Little More”) or between three and four (“Little less” and “Much less”).

Overall, the significant effects of the substantive variables, i.e., the proxies for interest in reducing monetary costs, proxies for intrinsic and acquired human capital and the proxies for desire for efficiency in shopping are consistent with theory.

Item 2: I go to vendors I've bought from before, online or offline (Third item under the question "How have your online shopping patterns changed since you first came online?")

**Table 3 Estimated Parameters for Item 2**

Item 2: I go to vendors I've bought from before, online or offline					
	Mean	SD			
Intercept	-0.068	0.170	-0.397	-0.375	0.235
Proxies for interest in reducing monetary costs					
Income	-0.008	0.013	-0.595	-0.035	0.018
NumChild	0.014	0.020	0.675	-0.022	0.051
Proxy for interest in reducing time costs					
Total work hours	-0.001	0.006	-0.127	-0.011	0.010
Proxies for interest in reducing psychological costs					
Catastrophe	-0.053	0.060	-0.869	-0.168	0.073
Friends.Online	-0.015	0.009	-1.656	-0.034	0.000
Proxies for intrinsic human capital					
Edu	0.030	0.024	1.234	-0.017	0.079
Age	0.009	0.018	0.536	-0.025	0.047
Proxies for acquired human capital					
Experience	-0.043	0.014	-3.002	-0.068	0.017
Company.Size	-0.014	0.012	-1.137	-0.036	0.011
Proxies for desire for efficiency in shopping					
Purchased.Before	0.057	0.013	4.325	0.031	0.082
oneclick	0.132	0.025	5.342	0.082	0.185
hold.past	0.109	0.022	4.999	0.070	0.153
Thresholds					
gamma2	0.936	0.029	32.695	0.877	0.985
gamma3	2.380	0.059	40.661	2.260	2.493
gamma4	2.804	0.082	33.998	2.633	2.969

Estimates of the model parameters for item 2 are presented in Table 4. This item is substantively similar to item 1—whereas item 1 was with regard to whether online consumers restrict themselves to few retailers, because they know who to shop from, this item probes whether they return to the same retailers that they bought from before regardless of where the transaction occurred. Strong agreement with this item, i.e., a response of "Much More" would therefore indicate that, as they gain experience, consumers are likely to return to the same online retailers.

Given the similarity between items 1 and 2, we would expect the substantive results to be similar. This is, in fact, the case for parameters that are significant. Specifically, as in the case of item 1, experience has a negative and significant effect meaning that, as they gain experience, consumers are likely to go back to retailers that they have bought from in the past. Similarly, all the efficiency variables are positive and significant meaning that, as the desire for efficiency increases (i.e., the variables have smaller positive values), the consumer is likely to go back to the same vendors that she bought from before.

Interestingly, the estimated thresholds also follow a pattern similar to that in the case of the thresholds for

item 1. The gap between thresholds two and three is substantially larger than that between thresholds three and four. Thus, overall, the estimated parameters for item 3 are similar to those of item 1 and are consistent with theory.

Item 3: I go to a few specific portals and directories for shopping and online buying guidance.

**Table 4 Estimated Parameters for Item 3**

Item 3: I go to a few specific portals and directories for shopping and online buying guidance					
	Mean	SD			
Intercept	0.189	0.182	1.039	-0.164	0.545
Proxies for interest in reducing monetary costs					
Income	-0.001	0.014	-0.103	-0.028	0.024
NumChild	0.033	0.021	1.602	-0.008	0.070
Proxy for interest in reducing time costs					
Total work hours	-0.006	0.006	-0.934	-0.017	0.007
Proxies for interest in reducing psychological costs					
Catastrophe	-0.101	0.064	-1.577	-0.226	0.031
Friends. Online	0.003	0.009	0.298	-0.015	0.021
Proxies for intrinsic human capital					
Edu	0.000	0.027	0.018	-0.050	0.054
Age	0.019	0.018	1.066	-0.014	0.053
Proxies for acquired human capital					
Experience	-0.022	0.014	-1.559	-0.048	-0.001
Company. Size	0.004	0.012	0.293	-0.022	0.024
Proxies for desire for efficiency in shopping					
Purchased. Before	0.001	0.014	0.062	-0.023	0.030
oneclick	0.138	0.023	6.090	0.097	0.181
hold. past	0.140	0.022	6.392	0.092	0.183
Thresholds					
gamma2	0.837	0.028	30.066	0.791	0.897
gamma3	2.271	0.048	47.792	2.188	2.367
gamma4	2.712	0.058	46.400	2.602	2.826

The estimated values of the parameters for this item, included in Table 4, demonstrate an interesting pattern. Only two parameters—for two variables that proxy for the desire for efficiency in shopping—are significant. The positive sign of these parameters indicates that, as the preference for efficiency decreases, the use of portals and directories decreases as well (As discussed earlier, responses for the efficiency variables are coded such that higher values indicate lower preference for the item and vice versa. Similarly, the responses to item 4 are coded such that smaller values indicate greater agreement with the item). Conversely, as preference for efficiency increases, the respondent's use of portals and directories increases as well.

The finding that desire for efficiency and use of portals and directories go hand in hand is not surprising. The primary function of these services is to make shopping more efficient by helping the consumer learn about products and retailers and to compare different options. Additionally, as discussed in the introduction, portals such as bizrate.com also increase shopping efficiency by taking consumers directly to the checkout pages of the retailers. The interesting question, and the key one that we investigate in this paper, however, is whether the

increase in the use of portals and directories with an increased desire for efficiency means that repeat visits to retailers come down as well. Taken in isolation, this finding would, in fact, mean that. Nonetheless, taken together with the estimated effects of the efficiency variables for items 1 and 2 which suggest that consumers who desire efficiency are also more likely to choose from a few vendors and go back to retailers that they bought from before, this finding suggests that the opposite is the case. Specifically, rather than taking customers away from retailers, portals and directories may in fact be helping retailers to regain customers who desire efficiency in shopping.

The above conclusion, however, raises another question: why do efficient shoppers choose to go back to retailers they bought from in the past *via* portals such as bizrate.com rather than directly visiting the retailers? The household production model provides an explanation in terms of the consumer's desire to minimize both time and monetary costs. While visiting the same retailers to buy again reduces time costs, consumers cannot be sure that this is reducing their monetary costs as well. One easy solution to ensure that they are able to reduce their time *and* monetary costs, however, is to return to the retailers through a comparison shopping site such as bizrate.com after comparing prices across retailers and return to the familiar retailer only if it offers a competitive price. Thus, comparison shopping sites help consumers to keep tabs on whether the retailers that they know, and would like to shop at, are offering competitive prices.

Item 4: I look for known brands to purchase (Fourth item under the question "How have your online shopping patterns changed since you first came online?")

**Table 5 Estimated Parameters for Item 4**

Item 4: I look for known brands to purchase					
	Mean	SD	pseudo-t	2.50%	97.50%
Intercept	0.314	0.191	1.649	-0.010	0.715
Proxies for interest in reducing monetary costs					
Income	-0.004	0.015	-0.244	-0.035	0.023
Num Child	0.035	0.021	1.654	-0.005	0.074
Proxy for interest in reducing time costs					
Total work hours	-0.011	0.006	-1.826	-0.023	0.001
Proxies for interest in reducing psychological costs					
Catastrophe	0.034	0.063	0.540	-0.075	0.179
Friends.Online	0.005	0.010	0.519	-0.013	0.025
Proxies for intrinsic human capital					
Edu	0.059	0.027	2.142	0.006	0.106
Age	0.020	0.019	1.070	-0.018	0.057
Proxies for acquired human capital					
Experience	-0.027	0.015	-1.829	-0.053	0.000
Company.Size	0.008	0.011	0.673	-0.013	0.028
Proxies for desire for efficiency in shopping					
Purchased. Before	0.019	0.014	1.414	-0.011	0.046
oneclick	0.119	0.028	4.272	0.063	0.175
hold.past	0.072	0.024	3.037	0.024	0.115
Thresholds					
gamma2	0.754	0.028	26.667	0.693	0.810
gamma3	2.577	0.047	55.313	2.498	2.683
gamma4	3.117	0.063	49.511	2.999	3.225

We recall that this item is included in the empirical analysis to investigate whether consumers who are interested in returning to retailers that they bought from before are also likely to buy the same brands that they purchased before. If our results suggest that this is indeed the case, we would have evidence that consumers interested in being more efficient in their choice of retailers are also likely to be interested in efficiency in the manufacturer brands that they buy. In other words, rather than searching among different brands whenever they buy, they are more likely to buy the brands that they know from before. This is, in fact, what item 1 is assessing as well—whether consumers know the retailers they want to shop at. We therefore investigate whether the direction and pattern of the estimates for item 4 are similar to what we see in the case of item 1 (Table 2).

As expected, the estimates included in Table 5 follow a pattern that is similar to that of the parameter estimates for item 1. Thus, the intercept is not significant in both cases suggesting that the substantive variables are able to explain the responses to this item quite well. Additionally, all the significant parameters have the same sign as in the case of the estimates in Table 2. Specifically, education has a positive and significant effect. Similarly, the same two efficiency variables, as in the case of item 1 *oneclick* and *hold.past*—are significant and positive. Additionally, the estimated threshold parameters have the same pattern of gaps with threshold 2 and threshold 3 being much farther apart than threshold 1 and 2 or thresholds 3 and 4.

Thus, overall, the estimated effects of item 4 are consistent with those in the case of item 1 and, hence, consistent with what theory would predict. Additionally, the estimates across all four items are consistent with the household production with costs, human capital and efficiency theory. The selection of retailers by online consumers therefore is not just based on price comparisons, or convenience, provided by comparison shopping sites. Instead, the choices are based more on the desire to minimize other types of costs, i.e., of time, as well, and to increase the efficiency of the online shopping process.

## 5. Discussion and Conclusions

The wisdom in the popular business press and industry trade groups regarding online retailing today seems to be that most online consumers compare retailers based on price and choose a retailer that offers the best price. The implication of such beliefs is that online consumers are unlikely to go back to retailers that they shopped at unless the price is very attractive. We question this implication in our research.

Our key argument is that, while price and monetary costs are certainly an important factor in the choice of a retailer, online consumers are also likely to consider other factors as well. Specifically, we propose that, similar to any other household production process, online consumers would attempt to minimize costs of different types and not just monetary ones. For instance, they would be interested in reducing their time and psychological costs as well. Additionally, they will strive to enhance their shopping efficiency. If this is indeed the case, online shoppers should return to retailers that they bought from before since it is likely to reduce their time and psychological costs while also increasing their efficiency through services such as one-click shopping that are only available to returning shoppers.

We test our theory empirically using data from a survey of online shoppers regarding how their selection of online retailers has evolved as they gained experience on the Internet. Our results are consistent with the predictions from the theory in that the costs of time and the desire for efficiency in shopping do play a role in how consumers select online retailers. We do not, however, find a role for one of the other costs that we consider, i.e., psychological costs. Our key finding, overall, is that relative to costs, online shoppers are more concerned about



efficiency when they choose an online retailer. Thus, the managerial implication of our research is that, rather than focusing solely on price, online retailers who are attempting to build loyalty among their customers should strive to make the shopping process at their sites more efficient by offering services such as one-click shopping and product recommendations based on the past purchases of returning customers. In addition to this, our findings also suggest that they also need to be competitive on prices since online consumers not only desire savings on time spent in shopping online but also on the money spent on purchases.

A key limitation of our study is that we do not include price in our analysis. Thus, while our results suggest that the costs of time and concerns for efficiency do play a role in the selection of retailers and also that the desire for efficiency has a stronger role than the concern for time, we cannot assess the importance of time and efficiency relative to that of price in the choice of retailers. This is an issue that we leave for additional research.

Another limitation of our findings is that we do not distinguish between different types of products. Thus, for instance, we do not provide insights regarding whether our findings will hold in the case of different types of product categories or more so for some and less for others. Another interesting avenue for research, therefore, is to investigate the relative roles of monetary, time and psychological costs, and the desire for efficiency, in the choice of an online retailer for different types of products.

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