THE EFFECT OF CONSUMER REVIEWS ON VENDOR-RELATED AND MARKET-RELATED PRICE SENSITIVITY

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Abstract

The increased transparency of electronic channels is barely reflected in research investigating online consumer behaviour. To address this issue, we introduce two different types of price sensitivity: vendor-related and market-related price sensitivity. Price sensitivity is generally assumed to vary with product quality. While product quality is hard to discern for some product types, online consumer reviews enable consumers to easily differentiate between products that other customers perceive as high or low quality. We hypothesize, that the impact of perceived product quality on price sensitivity depends on the type of price sensitivity. We develop a model to test the impact of our two types of price sensitivity on sales as well as their interaction with review valence. We present early empirical evidence to support our conceptualization. Using a longitudinal dataset of 37869 prices, market prices and sales figures of 70 digital cameras, we identify both types of price sensitivity for Amazon customers. Furthermore, we find that consumer review valence moderates their impact on sales. Vendor-related price sensitivity is more important for high quality products while market-related price sensitivity is increased for low quality products. We outline the next steps of the current research project and describe its theoretical and practical implications.

Keywords: price sensitivity, electronic commerce, consumer reviews, information transparency.
1 Introduction

Online consumer reviews more and more serve as a valuable source of information for internet purchases. While customers are able to test products in bricks-and-mortar stores, their ability to evaluate product quality online is limited. Therefore, they have to rely on information such as consumer reviews. Accordingly, customer review valence is a measure of perceived product quality. This product quality information influences customer’s price sensitivity, which was found to be much higher for low, compared to high quality products (Ellison and Ellison, 2009).

A large variety of studies on (offline) price sensitivity have been conducted (cf. Bijmolt et al., 2005 for an overview) and identified a plentitude of influence factors on price elasticity. These primarily consist of customer and product characteristics. Many authors have argued that the internet increases price sensitivity (Bakos, 1997; Degeratu et al., 2000; Shankar et al., 1999), mainly due to higher visibility of competitive offerings (Lynch and Ariely, 2000) and lower search costs for quality (Diehl et al., 2003). Another empirical argument for increased price sensitivity is the lower price level online (e.g., Ancarani and Shankar, 2004). Nevertheless, most studies investigate price sensitivity within a monopolistic setting or include only two vendors into their analysis. This scenario is highly unrealistic online, where price comparison websites and customer reviews alter the economics of information search. With this in mind, we revisit the concept of price sensitivity in a scenario, where price and product quality information is readily available. We attempt to answer the research question: How is online price sensitivity influenced by perceived product quality in terms of consumer reviews?

Therefore, we first examine and extend the concept of online price sensitivity and its interaction with consumer reviews as a source of product quality information. Four hypotheses are derived from the theoretical conceptualization. We then test the proposed relationships by merging two large datasets of digital camera prices and sales. We conclude with a brief discussion of possible implications and an outline of the next steps.

2 Theoretical Foundation and Hypotheses Development

An important challenge for price sensitivity studies is their reference point. Many studies define price sensitivity as the sales increase that results from a price decrease at a specific vendor. This simplified view implies that customers are only influenced by one single firm and does not incorporate market events such as the competitive price level. Chevalier and Goolsbee (2003) go one step further and investigate vendor-specific and cross-vendor price elasticities between Amazon.com and BarnesAndNoble.com. We argue that it is necessary to move away from the monopolistic or duopolistic examinations of price sensitivity in an online context. Therefore, we extend previous models to a scenario, where a larger number of vendors compete for customers’ money. Two major properties of electronic commerce make this reconceptualization necessary. First, prices are transparent to every customer and can be obtained at a fixed cost of visiting a price comparison website (Bakos, 1997; Smith, 2002; Tang et al., 2010), compared to the sequential search that is necessary offline (Stigler, 1961). The high search costs created the realistic scenario that customers visit one or two stores and then make the decision whether or not to purchase. However, this assumption does not hold online (KPMG, 2011), where a full set of prices can be incorporated into the decision making process very easily. Since the visibility of competitive offerings has a positive impact on price sensitivity (Lynch and Ariely, 2000), the focus on one or two vendors can lead to erroneous results in an online context. Second, customers can switch easily within this extended set of vendors when the offering does not match their expectations, compared to the yes/no decision at the point of sale in a regular retail store. Accordingly, the whole set of alternatives in the market should also be incorporated when analysing online price sensitivities.

We propose a solution to this problem by decomposing price sensitivity. We argue that two types of price sensitivity need to be considered: vendor-related and market-related price sensitivity:
**Vendor-related price sensitivity** refers to the degree to which consumers’ behaviors are affected by the price that the vendor sets for its products. It can be interpreted as a factor that determines how sensitive consumers react to the vendor’s prices itself, without considering alternate offerings in the market. It matches the monopolistic view on price sensitivity and can also be described as the internal price sensitivity from the vendor’s point of view.

**Market-related price sensitivity** refers to the degree to which consumers’ behaviors are affected by the relationship between the vendor’s price and the competition’s prices. It can be interpreted as a factor that determines how sensitive consumers react on price premium that they have to pay with regard to alternative offerings. It can also be described as the external price sensitivity from the vendor’s point of view.

This view is an extension to Chevalier and Goolsbee (2003) who investigate vendor-related price sensitivity and cross-sensitivity with regard to one specific competitor. We introduce market-related price sensitivity as a measure of extended cross-vendor price sensitivity focussing on the channel competition in total instead of one specific competitor.

Based on the analysis above, we suggest that both types of price sensitivity are present in online retailing:

H1a: The retailer’s price negatively influences retailer’s sales (vendor-related price sensitivity)

H1b: The price premium charged compared to other retailers negatively influences the retailer’s sales (market-related price sensitivity)

Consumer reviews are a popular source of information for online purchases. A recent survey indicates that half of the online customers spend 75% or more of their online shopping time with product research. Consumer reviews and ratings are the most important data source in this endeavour (e-tailing group and PowerReviews, 2011). In order to evaluate the state of research on the impact of online consumer reviews on sales in general and on price sensitivity in particular, we conducted an interdisciplinary, structured literature review within the set of journals with an ISI impact factor above 1. We triggered EBSCOhost, ScienceDirect and ProQuest using the search term “online consumer reviews” and an appropriate set of synonyms. From the resulting set of 48 high-quality papers using real consumer reviews, 25 investigate the impact of consumer reviews on sales. Four different pieces of information are used to test this relationship: review valence in terms of the overall average rating of the product, number of reviews, individual review helpfulness and the content of the reviews itself. The former two are aggregations on the product level while the ladder two focus on individual reviews. Since we want to investigate impacts across products, we focus on review valence and the number of reviews. Our literature review indicates agreement on the positive effect between the number of reviews and sales (e.g., Archak et al., 2011; Chevalier and Mayzlin, 2006; Duan et al., 2008; Forman et al., 2008; Li and Hitt, 2008), with only few exceptions (Chintagunta et al., 2010; Clemons et al., 2006). The average review valence was found significant in eight papers (e.g., Archak et al., 2011; Chintagunta et al., 2010; Clemons et al., 2006) while three papers found no significant relationship (Duan et al., 2008; Forman et al., 2008; Park et al., 2012). However, no paper made the connection between consumer reviews and price sensitivity. We attempt to close this gap.

We take the position of a well-established vendor such as Amazon to establish the following hypotheses. Customers who decide for purchasing a high quality product indicate a high importance or at least awareness of quality. When customers face lower search costs for quality, their price sensitivity at a certain vendor increases (Diehl et al., 2003), because it is easier for them to judge the real value of the product. Since information on product quality information is less important for purchases of negatively rated products (since customers would otherwise not choose the low quality products), we expect vendor-related price sensitivity to be higher for high quality products compared to low quality products.

H2a: **Vendor-related** price sensitivity is higher for **high quality** compared to low quality products
In contrast, when perceived product quality is low, we argue that not the price at the vendor itself, but the relative price compared to the competitors is more important. Two major reasons can be identified for purchasing the low quality product. First, the customer is not using or processing the quality information presented to her. In our case, this information is manifested in online consumer reviews. Second, the product quality is of low importance to the customer. In both cases, the meaning of the product to the customer is not very high. Accordingly, the value of transacting with a well-established vendor is decreased. In this case, the customer will compare prices more heavily between different shops (Papatla, 1996). This would lead to higher market-related price sensitivity for low quality products compared to high quality products.

H2b: Market-related price sensitivity is higher for low quality compared to high quality products.

In summary, the two hypotheses suggest a reverse effect of quality on the two types of price sensitivity.

3 Data, Research Model and Preliminary Results

We test our hypotheses based on a sample of 70 mid-range digital cameras. Digital cameras were chosen as product group because they have been in focus of many studies in the online context (Kiang et al., 2011). For each of these cameras, we collected price and sales data from the largest German online retailer Amazon. Data has been collected over a period of a full year (November 2011-November 2012) to control for seasonal effects. We also collected additional information such as the number of reviews, review valence and release date. We used two data points per day and product for our analysis. The relationship between the Amazon retail price and sales at Amazon over time is used to approximate the vendor-related price sensitivity.

The data from Amazon was then merged with a second dataset that we recorded. For each of our products, we continuously logged the cheapest available online price at every time point using a price comparison website that represents the German online market very well according to the criteria by Allen and Wu (2010). Thereby, we are able to calculate the price premium that users pay at Amazon at every point in time. This price premium enables us to approximate market-related price sensitivity.

Previous studies defined the sales rank as a function of a product specific fixed effect as well as other factors that might influence the sales (Chevalier and Goolsbee, 2003). Today, sales rank is a well-established to approximate the actual sales of a product (Brynjolfsson et al., 2003; Chevalier and Goolsbee, 2003; Ellison and Ellison, 2009; Forman et al., 2008; Ghose and Sundararajan, 2006). The sales rank is updated hourly based on the sales of the product within its category. Thereby a numerically lower sales rank indicates higher sales. The data set consists of 37869 observations.

We also included variables that have been identified to be influential in previous studies such as the average review valence, the total number of reviews or the time elapsed since the product became available into our model. To test the impact of product quality, we performed at median split on the average review valence to categorize the products into a class of products that are perceived to be of high quality (HQ=1) and second class containing products with lower quality (HQ=0). Descriptive statistics on each variable (Table 1) and correlations between the factors (Table 2) are depicted below.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of sales rank</td>
<td>37869</td>
<td>2.177</td>
<td>0.697</td>
<td>0</td>
<td>3.64</td>
</tr>
<tr>
<td>Amazon retail price</td>
<td>37869</td>
<td>258.056</td>
<td>94.535</td>
<td>100.20</td>
<td>499.99</td>
</tr>
<tr>
<td>Price premium at Amazon</td>
<td>37869</td>
<td>22.855</td>
<td>18.985</td>
<td>0</td>
<td>407.38</td>
</tr>
<tr>
<td>Average review valence</td>
<td>37754</td>
<td>4.078</td>
<td>0.325</td>
<td>3.2</td>
<td>5</td>
</tr>
<tr>
<td>Log of total reviews</td>
<td>37869</td>
<td>1.782</td>
<td>0.388</td>
<td>0</td>
<td>2.38</td>
</tr>
<tr>
<td>Log of elapsed time</td>
<td>37869</td>
<td>3.535</td>
<td>0.305</td>
<td>2.10</td>
<td>3.94</td>
</tr>
<tr>
<td>High quality dummy</td>
<td>37869</td>
<td>0.482</td>
<td>0.500</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1. Descriptive statistics

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Based on the deliberations above, we formulate the following regression model to test our hypotheses:

\[
\log(\text{SALESRANK})_{tk} = \alpha + \beta_1 \text{AMAZONPRICE}_{tk} + \beta_2 \text{PRICEPREMIUM}_{tk} + \beta_3 \text{AVGVALENCE}_{tk} \\
+ \beta_4 \log(\text{TOTALREVIEWS})_{tk} + \text{HQ} \beta_5 \text{AMAZONPRICE}_{tk} + \text{HQ} \beta_6 \text{PRICEPREMIUM}_{tk} \\
+ \beta_7 \log(\text{ELAPSEDTIME})_{tk} + \mu_k + \varepsilon_{tk}
\]

The model was estimated in three steps. In the first step, only the well-established parameters were included in the model. Our findings and estimates are in line with previous research. In the second step, we included the price premium as a new variable. In the third step, the interaction between the high quality dummy variable and the Amazon price as well as the price premium was added to estimate differences between high quality and low quality products.

Table 3 gives full overview on the regression results. The models explain between 72% and 74% of the overall variation of product sales. With regard to the hypotheses, our main interest lies in the parameters \(\beta_1, \beta_2, \beta_5\) and \(\beta_6\). \(\beta_1\) and \(\beta_2\) are interpreted as measures of vendor-related and market-related price sensitivity, since they describe how a certain price change would change sales in terms of the sales rank. However, it is important to note that they cannot be compared to the traditional price elasticity measure with regard to their absolute value. We find significant support for the existence of both types of price sensitivity (H1a, H1b) for our set of digital cameras. \(\beta_5\) and \(\beta_6\) denote the difference between in price sensitivity between high and low quality products. The positive coefficient \(\beta_5\) shows that the impact of vendor-related price sensitivity is higher for high quality products (H2a). The negative coefficient \(\beta_6\) reveals that the impact of market-related price sensitivity is higher for low quality products (H2b). The reverse effect of product quality on vendor-related and market-related price sensitivity is illustrated in Figure 1.
4 Implications and next steps

In summary, this research-in-progress aims to make the following contributions:

- We re-conceptualize price sensitivity to incorporate online channel properties where not only one or two, but a large number of vendors compete with each other. Vendor-related and market-related price sensitivity are derived theoretically and supported by empirical evidence. The newly introduced proxy for market-related price sensitivity enables researchers to address questions that go beyond monopolistic or duopolistic.

- The two types of price sensitivity enable a more fine-grained analysis of the relationship between product quality and price sensitivity. We show that only market-related price sensitivity, and not price sensitivity in general, is higher for low quality products.

- We propose model and measures to study the suggested relationships using big datasets available on the internet. The applied combination of different data sets is a fruitful avenue for further research on the electronic channel.

From a practical perspective, the findings suggest that established vendors such as Amazon should incorporate consumer review valence into their pricing strategies. Accordingly, they have to worry less about other vendors pricing behaviour for high quality products than for low quality products. This result is accordance to previous studies findings that heavily branded retailers enjoy a price advantage, even in transparent markets (Smith and Brynjolfsson, 2001), however, this advantage is stronger for high quality products.

Nevertheless, the presented empirical findings have to be treated with care since the study is limited to one product group only at this stage. In the next steps, the analysis needs to be generalized beyond one product group to find broader empirical support for our concept. Furthermore, we intend to include product characteristics as an additional moderator to deepen our understanding of the impact of vendor-related and market-related price sensitivity on the internet.

References


