Do market characteristics impact the relationship between retailer characteristics and online prices?

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Abstract

We propose that market characteristics interact with retailer characteristics to determine online prices. The retailer characteristics examined include—service quality of a retailer, channels of transaction provided by a retailer and the size of a retailer. The market characteristics capture the level and nature of competition, and the price level of a product. We utilize a Hierarchical Linear Model (HLM) framework for capturing and testing the proposed interactions. The better fit between the model and the online market structure is reflected by a twenty-five percent increase in explainable price dispersion over results from comparable studies. Our study demonstrates that while retailer characteristics do impact online prices, this influence is significantly enhanced or diminished by the accompanying market characteristics.

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Keywords: Internet markets; Retailer pricing strategy; Retailer service quality; Competition

Introduction

Industry surveys show that online firms have transitioned from the initial phase of investment and brand-building to the profit maximization phase. The published profitability and sales reports from 2001 to 2003 indicate that Internet-based retailing is now a firmly established and an increasingly profitable market. In light of this maturation, it is imperative to ask whether the extent of understanding of retailer pricing strategies comprehensively explains the online retailers’ pricing behavior. Shankar and Bolton (2004) have suggested that descriptive research on the determinants of retailer pricing strategies aids managers in profiling their pricing practices and predicting competitors’ behavior. However, it is important to note that the Internet as a retailing channel is significantly different from the traditional marketplace. In contrast to the traditional channels, Internet is characterized by vastly increased availability of information regarding product attributes, prices and retailer service quality metrics. A key challenge has been to obtain an understanding of the retailers’ continued ability to price differentiate in the face of lowered search costs in Internet markets. The main findings to date have been that—(a) price dispersion in Internet markets is persistent with time, (b) in some, but not all, instances retailer service quality explains some of the variance in online prices, and (c) the transaction channels provided by a retailer and level of competition matter (see Pan et al. 2004 for a detailed review).

Economic theories of consumer demand and retailer pricing suggest that product prices are a function of both—the characteristics of the retailers and the competition (Pakes 2003; Betancourt and Gautschi 1993). Studies of pricing by grocery retailers in offline markets have found that retail-
ers customize their prices at the brand store level. They do so based on their intimate knowledge about their customers, product categories, store characteristics, and most importantly in response to market competition (Shankar and Bolton 2004). Empirical evidence also indicates that when setting prices the retailers consider multiple objectives such as—reaction to competitor actions, maximizing store brand share, and manufacturer incentives (Chintagunta 2002). These observations from offline markets establish that retailer’s pricing decisions not only reflect their internal resources and objectives, but also point to the fact that the retailers pay close attention to characteristics of the market in which they operate. We are motivated to investigate existence of a similar effect in online markets where these characteristics are easily observable by the retailers.

A distinct feature of this study is that we explicitly incorporate interactions between retailer and market level factors. We believe that by examining the moderating influence of market level factors, we can provide a more comprehensive picture of the relationship between prices and retailer char-

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* Y: yes, N: no, H: homogenous products.
characteristics. Especially since existing empirical evidence from analyses of online prices indicates only a weak influence of service quality—an important aspect of retailers (Zeithaml et al. 2002). Considering the persistent online price dispersion, coupled with firms’ choice of strategic and tactical decisions based on the competitive forces that exist in their markets (Porter 2001), we examine whether this supposed anomaly can be explained by considering the interaction between the retailer and market characteristics.

Research question

The main objective of our paper is to study online retailers’ pricing strategies in a single framework that accounts for the influence of—(a) retailer characteristics - service quality and channels of transaction, (b) market characteristics - level and nature of competition, and the price of a product, and (c) interactions among these factors. Table 1 provides a comparison of our study with relevant literature. It is evident that the interaction between retailer and market characteristics and its effect on online prices has never been explicitly examined. This is the main focus of our study.

In remainder of the paper we use retailer in reference to retailers with a web presence. They can be multichannel retailers, that is they may have a physical presence and/or also use a catalog channel. Our hypotheses and analyses focus on the online pricing strategies of these retailers.

Expected contributions

Our study intends to make two primary contributions. First, we develop an integrated framework for studying the interactions between market and retailer characteristics. For retailers selling nondifferentiable products, market competition can vary widely across products and product categories. The differences in competitive forces make it feasible for the retailer to make a strategic choice (level of service quality, and transaction channels) across all products, and vary the tactical decision (price level) in each product-market depending on what competitive forces exist. Pricing is thus determined by the interaction between the retailer’s strategic choices and the market forces. Substantively, study of the interaction also provides a better understanding of the competitive effects of service quality, a relevant but sparsely researched issue in marketing.

Second, we highlight the fact that the determinants of retailer pricing decisions exist at two different levels of abstraction. Retailer characteristics such as service quality and transaction channels vary across individual retailers. Market characteristics such as level and nature of competition vary across product-markets and are common to all retailers selling the particular product. Traditional linear models cannot accommodate simultaneous inclusion of the retailer and market characteristics and the interactions between them. We utilize a Hierarchical Linear Modeling (HLM) framework which explicitly incorporates the main effects of retailer and market level characteristics at different levels, and also accounts for the interactions between them (Raudenbush and Bryk 2002). This allows us to test not only whether, but also when and how in the context of various market forces, do service quality and channels of transaction influence a retailer’s online pricing decisions.

We first present the conceptual model for our analyses and integrate the relevant literature to formulate five testable hypotheses. We then describe our data collection from heterogeneous sources reflecting information widely available to the consumers and retailers alike and explain operationalization of our constructs. Subsequently, we present the HLM framework which incorporates the factors at different levels of abstraction, and follow it up with discussion of the results from the analyses. We derive the managerial implications from our results, and conclude with a discussion on potential directions for future research.

Conceptual model and hypotheses

Main effects: influence of Internet retailer factors

Service quality

Varian (2000) predicted that over time two classes of retailers will emerge-low service/low price and high service/high price. A study of the online retail market by Pan et al. (2002) finds that service quality does explain a retailer’s ability to price differentiate, albeit very little. In contrast, the theoretical expectations indicate service quality as an important factor in consumers’ choice of a retailer (Wolfinbarger and Gilly 2003). Betancourt and Gautschi (1993) suggest that retailers provide services in order to reduce the customer’s total cost of consumption and that these services play an important role in customers’ selection of a retailer. They present an analytical model which shows that between two retailers selling the same product, a consumer would be willing to pay a higher price for the higher service quality retailer, but only as long as the consumer’s valuation of the difference in service quality is more than the difference in prices between the two retailers. Based on theoretical expectations we hypothesize that:

H1. The higher the service quality of a retailer the higher the prices charged.

Channels of transactions

Empirical evidence from several years of data indicates that multichannel retailers have higher price levels than pure-play (click only) retailers and brick-only retailers (Ancarani and Shankar 2004; Pan et al. 2003a; Ratchford et al. 2003). Due to their wide geographic presence, National Brick-and-Click retailers can provide customers value added services such as the ability to order products online and pick up (or in some cases return) the products in an offline store. Such services save time and provide added ease of use to
consumers. These facilities, which we term as fulfillment and post-fulfillment facilities, lead to greater consumer trust thereby reducing the price sensitivity of consumers. On the other hand, the single distribution channel for a pure play (Internet or click only) retailer, lowers the inventory costs and can be potentially leveraged to price differentiate by cost leadership. Consistent with prior studies, we expect National Brick-and-Click retailers to price higher because of better brand recognition, greater trust, and provision of better fulfillment and post-fulfillment facilities. Therefore,

\[ H_{2a} \] National Brick-and-Click retailers charge higher prices than pure-play retailers.

Local Brick-and-Click retailers can provide better fulfillment and post-fulfillment facilities albeit in a local area and thus have the potential to charge higher prices relative to pure play retailers. Since they are expected to have lower brand recognition than National Brick-and-Click retailers, we expect their price levels to be lower than those of retailers with national presence. Local Brick-and-Click retailers aim to utilize their online presence to extend their geographic reach beyond that of the traditional store. This would attract additional consumers without incurring significant additional costs. Based on valid expectations for both higher and lower prices, we do not specify any directional hypotheses related to the pricing strategy of Local Brick-and-Click retailers.

Online retailers that provide direct mail catalogs benefit from lower costs because direct mail catalog companies need little modification to include online ordering capabilities into their existing business models (Doolin et al. 2003). This addition of online ordering improves the convenience they provide to customer and can help the direct mail catalog retailer to differentiate and charge higher prices. Similarly, pure play retailers are adding direct mail catalogs to their channel portfolio because—(a) they can leverage existing infrastructure (distribution centers, customer service and telephone ordering) to support their direct mail catalog channel (Quick 2000), and (b) online retail managers believe that direct mail catalogs enables them to build brand recognition and increase trust among consumers (Quick 2000), thereby leading to higher prices. Hence, we hypothesize that:

\[ H_{2b} \] Online retailers that provide direct mail catalogs charge higher prices than pure-play retailers.

**Moderating effects**

The influence of retailer characteristics (service quality and channels of transaction) on online prices is expected to be moderated by market characteristics such as—level of competition, nature of competition. The main effects of retailer characteristics explain how, within a product market, the prices vary across retailers. The moderating effects of market characteristics capture the differences in the influence of the retailer characteristics on online prices across product markets.

**Interaction of level of competition and service quality**

Cohen (2000a) presents the concept of Distortion in Information Function (DIF-ness) to measure consumer’s tendency to use heuristics when faced with large amount of information. DIF-ness suggests that till a certain threshold consumers scan the increasing number of choices and make a choice that maximizes their utility. Beyond this threshold, increase in alternatives can lead the consumers to use heuristics based on brand name and service quality, to make their selection. Research in signaling theory suggests that consumers often use price as a proxy for quality of product and/or retailer (Kirmani and Rao 2000).

Considering these two aspects, we expect that when faced with small number of competitors in a product-market, retailers with high service quality can easily differentiate their services and charge a higher price. Increase in the number of competitors (DIF-ness) would initially force the retailers (especially higher service quality retailers) to lower their prices in order to avoid losing consumers to the competitors. When the number of competitors exceeds a certain threshold, both DIF-ness and signaling theory suggest that the consumers’ use of heuristics would counteract the downward pressure on prices created by increased competition. Thus, we propose that the number of competitors in a market would diminish the positive influence of service quality on prices; and the moderating influence of the number of competitors would be nonlinear in nature. With increase in competition high service quality retailers would charge higher prices than low service quality retailers. However, the difference in the prices of high and low service quality retailers is expected to reduce at a diminishing rate. We expect the level of competition to capture the differences in the extent to which service quality influences the prices charged by retailers across product markets. We hypothesize that:

\[ H_{3} \] The positive influence of service quality on prices charged by a retailer is diminished, albeit at a decreasing rate, as the number of competitors increase.

**Interaction of price level and service quality**

The price of a given product implicitly denotes the perceived risk and is an important determinant of consumers’ involvement in a product (Cohen and Areni 1991). According to Cohen (2000b), the consumers’ selection is based on risk averseness particularly when the price of a product is high. This would lead them to prefer retailers with high service quality, who benefit from the consumers’ risk averseness (or willingness to pay higher for service quality) by charging higher prices. The empirical evidence does indicate increase in price dispersion with increase in average price of the product (Pratt et al. 1979). This increase in dispersion could stem from the consumers’ willingness to pay higher prices to retailers who are able to reduce the perceived risk by inducing trust
In product-markets at higher price levels, retailers who are able to foster trust by way of better service quality are afforded scope for price differentiation and would charge relatively higher. Though for all products, the retailers with high service quality will charge higher prices than retailers with low service quality; their price premium would increase with the price of a product (Betancourt and Gautschi 1993). We expect the price level of a product to reflect the differences in the influence of service quality on prices charged by retailers across different product markets, and propose:

**H4.** The positive influence of service quality on prices charged by retailers is enhanced further as the price level of the product increases.

**Interaction of nature of competition and retailer characteristics**

A differentiation strategy can be successful if—(1) the benefits provided by the differentiation are valued by the consumer, and (2) the differentiation is unique or not easily replicated by the competitors (Barney 1991). In a market for nondifferentiable products, a retailer can offer higher consumer benefits by providing high service quality. The ability to charge a price premium for the higher service quality would then depend on competition from retailers who provide similar or higher levels of service to consumers (Betancourt and Gautschi 1993). We define one aspect of the nature of competition in a particular product market as the variation in service quality of the retailers selling that product.

As mentioned earlier, in general (for all products) the high service quality retailers are expected to charge higher prices than the low service quality retailers. However, the difference in the prices is expected to be higher in markets with a larger variation in service quality among retailers selling a product (where possessing high service quality is a unique asset) compared to markets with lower variation in service quality. We expect the variation in service quality to capture the extent of difference in the influence of service quality on prices charged by retailers across product markets. We hypothesize that:

**H5a.** The positive influence of service quality on prices charged by retailers is further enhanced when there is a high variation in service quality among the retailers selling the product.

National Brick-n-Click retailers have a higher trust with consumers, and provide unique channel alternatives for fulfillment and post-fulfillment processes, and thus can be expected to charge higher prices. However, this ability of a national retailer to price higher is dependent on the competition from other National Brick-n-Click retailers. Increase in the number of National Brick-n-Click retailers selling a product would result in reduced ability to differentiate from each other in terms of multichannel benefits and result in diminishing their price premiums. We hypothesize that:

**H5b.** The premium charged by a National Brick-n-Click retailer is diminished with an increase in the proportion of National Brick-n-Click retailers that sell a product.

**Data collection**

The criteria used for identifying data to collect was: (a) product categories that include nondifferentiable products to avoid price variation because of product differentiation, (b) availability of at least 20 products in each of the categories to indicate substantial penetration product in the online retail market, and (c) availability of a minimum of seven price quotes for each of the selected products to ensure a base level of competitive intensity. Using these criteria, eight product categories were selected—Books, Camcorders, DVDs, DVD players, PDAs, Printers, Scanners and Video Games. Table 2 provides the summary information of the data collected for operationalizing the constructs presented earlier in Fig. 1.

For each retailer we collected data for the service quality ratings and the competitive intensity from Bizrate.com (similar to Pan et al. 2003b). The data for size of the retailer was obtained from Alexa.com which provides rank of the retailer is a local brick and click retailer or if a retailer has also has a catalog is not easily evident online. However, we would expect consumers and National Brick-and-Click retailers to be aware of the identity of other National Brick-and-Click retailers through the competitive intelligence surveys that are usually undertaken in firms of this size.
Table 2
Constructs operationalized from multiple sources

<table>
<thead>
<tr>
<th>Construct</th>
<th>Data collected</th>
<th>Source</th>
<th>Related research using similar measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Posted price for a product. Used to calculate the price index.</td>
<td>Bizrate.com</td>
<td>Pan et al. (2002), Clay et al. (2002)</td>
</tr>
<tr>
<td>Service quality</td>
<td>Survey ratings obtained by Bizrate from online consumers over ten items on a 10-point scale (1 = Poor, 10 = Outstanding)</td>
<td>Bizrate.com</td>
<td>Pan et al. (2002)</td>
</tr>
<tr>
<td>Transactional channels</td>
<td>Dummy coded variables for characterizing the channels through which the retailer offers the products. The channels are first classified as one of the following: pure play (online only), national chain with online presence, and local store(s) with online presence. In addition, we also distinguish retailers that offer mail-order catalog.</td>
<td>Inspection of Retailer Websites</td>
<td>Tang and Xing (2002)</td>
</tr>
<tr>
<td>Size</td>
<td>Rank of retailers based on number of unique visitors to the online.</td>
<td>Alexa.com</td>
<td>Pan et al. (2003b)</td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>Number of retailers offering an identical product and with service quality ratings available from Bizrate.</td>
<td>Bizrate.com</td>
<td>Pan et al. (2003b)</td>
</tr>
<tr>
<td>Price level</td>
<td>Average posted price for a product.</td>
<td>Bizrate.com</td>
<td>Cohen and Areni (1991), Pan et al. (2003b)</td>
</tr>
<tr>
<td>Variance in service quality</td>
<td>Coefficient of variation of the service quality among retailers Selling a product</td>
<td>Bizrate.com</td>
<td></td>
</tr>
<tr>
<td>Proportion of National Brick-n-Click relations</td>
<td>Number of National Brick-n-Click retailers selling a product.</td>
<td>Inspection of Retailer Websites</td>
<td></td>
</tr>
</tbody>
</table>

Retailer website based on the number of unique visitors. The retailer’s transaction channels were coded based on inspection of retailer websites cross-verified with their description at Bizrate.com and web21.com⁵ (Tang and Xing 2002). Using location and geographical spread of physical store(s) the retailers were classified as:

- National Brick-n-Click: Presence of physical stores in more than one state.⁶ (Example: Best Buy with presence BestBuy.com)
- Local Brick-n-Click: physical store locations within one state. (Example: 17th Street Photo from New York with online presence as 17photo.com)
- Pure-Play: no physical stores present. (Example: buy.com and amazon.com)
- Catalog provider: if mail-order catalog services are offered. (Example: Sears)

Bias reduction

We collected 22,209 price quotes, for 1,880 products from 233 retailers. For our analyses we only used prices quoted for items identified as “new” by retailers other than refurb/discounters. We excluded retailers with missing service quality ratings.⁷ Though most retailers provide the price

search engines with product information such as—new, refurbished, the retailers primarily offering refurbished items tend not to do so. Refurbished and used products are generally sold at lower prices since they differ from new products in terms of product quality; thereby leading to a bias in the price dispersion measure. We conducted a manual verification of each retailer’s website to identify refurb/discounters,⁸ and removed them from our analyses. Table 3 shows the impact of the bias reduction on the size of the final data set, yielding a total of 13,393 price points suitable for analysis. To assess the qualitative impact of the bias reduction process we exam-

Table 3
Bias reduction reduces analyzable data

<table>
<thead>
<tr>
<th>Product category</th>
<th># Posted-prices Collected</th>
<th># Retailers Collected</th>
<th># Products Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>5750</td>
<td>2752</td>
<td>19</td>
</tr>
<tr>
<td>Camcorder</td>
<td>1386</td>
<td>882</td>
<td>86</td>
</tr>
<tr>
<td>DVD</td>
<td>9242</td>
<td>5738</td>
<td>30</td>
</tr>
<tr>
<td>DVD Player</td>
<td>547</td>
<td>446</td>
<td>66</td>
</tr>
<tr>
<td>PDA</td>
<td>568</td>
<td>479</td>
<td>77</td>
</tr>
<tr>
<td>Printer</td>
<td>1087</td>
<td>906</td>
<td>75</td>
</tr>
<tr>
<td>Scanner</td>
<td>708</td>
<td>574</td>
<td>77</td>
</tr>
<tr>
<td>Video games</td>
<td>2921</td>
<td>1616</td>
<td>74</td>
</tr>
</tbody>
</table>

⁵ web21.com provides a comprehensive directory listing of retailers and their physical store locations (if any).

⁶ In rare cases where the website had insufficient information, the retailer was directly contact for the information.

⁷ Bizrate requires a minimum of 30 customer surveys over last ninety days to publish ratings information. The exclusion of retailers without service ratings is methodologically necessary because service rating is a critical independent variable in our analysis.

⁸ The classification of “refurb/discount” retailers was also independently verified. Note that the presence of refurbishers can be a significant source of bias in the price information. It can certainly increase price dispersion since refurbishers are expected to price lower. Yet, to the best of our knowledge, no prior study has explicitly accounted for their presence in the data.
ined the dispersion of prices in the collected data and the analyzed data and found no significant difference. Although no significant difference was observed between the data, we believe that the bias reduction provides for more reliable and credible parameter estimates in our analyses.

**Calculation of price index**

To account for differences in price levels across different products within a category, we index the price charged by a retailer for a product.9 The price index is calculated as the ratio of the difference between the price charged by a retailer and the minimum price for the product to the minimum price for the product (Eq. (1)):

\[
PIND_{i,j} = \frac{PIND_{i,j} - \text{MinPrice}_j}{\text{MinPrice}_j}
\]

where, \(PIND_{i,j}\) = Price index for retailer \(i\) for product market \(j\); \(\text{MinPrice}_j\) = Minimum price charged by any retailer for product market \(j\).

**Measuring service quality**

Bizrate.com provides consumers with fourteen measures for service quality of a retailer. These are single-item measures on a scale of 1 to 10, where 1 is very poor and 10 is outstanding. Ten of these items measure the level of service quality of a retailer and include—Ease of Finding a Product, Product Selection, Clarity of Product Information, Look and Design of the website, Shipping Options, Charges Stated Clearly, Product Availability, Order Tracking, On-time Delivery, and Customer Support. We exclude four items that measure the intentions of the shopper to revisit the website, an overall rating of the retailer, whether the product met expectations, and shipping charges, since these four items do not directly measure the service quality of a retailer. The service quality measure for a retailer \(i\) (Servindi) was computed as the average of the ten items from Bizrate.com. Such a simple composite measure of individual items that measure different aspects of a construct has been widely used for measuring the market orientation of an organization (Jaworski and Kohli 1993), and the service orientation of a retailer (Homburg et al. 2002).

We conducted a principal component factor analysis with the ten items and found that all the ten items loaded into one factor that explained approximately ninety percent of the

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9 We do not include shipping and handling as part of the prices charged by the retailer for three reasons: (1) for the product categories used in our study, shipping and handling represents only 2 percent of the total price, and the correlation between the prices charged by a retailer with and without the charges is greater than 0.98 for all the product categories, (2) each retailer charges differently for different shipping options and thereby making direct comparison difficult, additionally the default shipping options provided in Bizrate.com vary from retailer to retailer, and (3) approximately 20 percent of the retailers do not report shipping and handling charges on Bizrate.com.
We also observed very high correlation between the service quality obtained from the factor analysis and the measure obtained as the average of the ten individual items. The substantive inferences of the study did not change with either of the service quality measure. To maintain parsimony in our model, we thus use one measure for service quality of the retailer as the average of the ten items.

**Market description**

The descriptive statistics for the variables used in our analyses are provided in Table 4. From Table 4 we note that—(1) the mean number of retailers in individual product-markets is lesser for Books, DVDs, and Videos Games as compared to other product categories. While the number of retailers offering books, DVDs, and video games is lower, these retailers are on average substantially larger than the retailers in other product categories, (2) the price dispersion varies from 18 percent (for printers) to 96 percent (for video games). These price dispersion levels are comparable to those reported by Pan et al. (2002).

**Hierarchical linear model framework**

Fig. 2 illustrates the structure of the data used in this study. As represented in Fig. 2, the variables used to test our hypotheses correspond to different levels of aggregation. Specifically, retailer characteristics, that is the main effects, are at the lowest level of aggregation and are measured for each retailer. The market characteristics, that is the moderating effects, are at a higher level of aggregation and are measured for each product market. Such data are designated as multilevel data (Raudenbush and Bryk 2002).

The above data structure suggests that a Hierarchical Linear Modeling (Raudenbush and Bryk 2002; Steenkamp et al. 1999) framework should naturally accommodate our conceptual model. In HLM, a linear regression model is specified at the lowest level of aggregation (Level 1). The intercept and slope coefficients for the model at Level 1 are modeled as a function of the variables at the next level of aggregation (Level 2). We are interested in explaining variation in prices charged by different retailers for a particular product. The prices charged by the retailer are a function of—(a) the characteristics of each retailer such as service quality, the channels of transaction that are available to the retailer, and the size of the retailer, (b) the characteristics of each product-market such as number of competitors, average price levels and nature of competition, and (c) the interactions of the retailer and the market characteristics. The retailer prices and characteristics that we are interested in are at the lowest level of aggregation and hence form the basis for the Level 1 regression model. The intercept and slope coefficients of the Level 1 model (the retailer level) are modeled as a function of the Level 2 variables (market characteristics).

**Proposed HLM model**

In the Level 1 model, the price index of a retailer is influenced by the various hypothesized retailer characteristics and is given by:

\[
PIND_{ij} = \beta_0 + \beta_{ij} \times SQ_i + \beta_{2j} \times NBC_i + \beta_3 \times LCM_j + \beta_4 \times C_i + \beta_5 \times Size_i + \epsilon_{ij} \quad (2)
\]

where \(SQ_i\) = service quality of retailer \(i\); \(NBC_i = 1\) if retailer \(i\) is National Brick-n-Click, 0 otherwise; \(LCM_j = 1\) if retailer \(i\) is Local Brick-n-Click, 0 otherwise; \(C_i = 1\) if online retailer \(i\) provides a mail-order catalog, 0 otherwise.

In the Level 1 model, the intercept term (\(\beta_0\)), the slope coefficients of service quality (\(\beta_{ij}\)), and the slope coefficient for the indicator of National Brick-n-Click retailer (\(\beta_{2j}\)) vary across product markets. The Level 2 models explain the variation across product markets in the intercept and slope coefficients of the Level 1 model. The intercept term is modeled as,

\[
\beta_{0j} = \gamma_{00} + \gamma_{01} \times LCM_j + \gamma_{02} \times VSQ_j + \gamma_{03} \times PL_j + \gamma_{04} \times PNBC_j + u_{0j} \quad (3)
\]

where \(LCM_j = \log\) of Number of competitors in product-market \(j\), \(PL_j = \) Price level of product-market \(j\), and \(VSQ_j = \) Variance in the service quality among the retailers in product-market \(j\).

The slope of service index is modeled as,

\[
\beta_{1j} = \gamma_{10} + \gamma_{11} \times LCM_j + \gamma_{12} \times VSQ_j + \gamma_{13} \times PL_j + u_{1j} \quad (4)
\]
The slope of National Brick-n-Click is modeled as:
\[ \beta_2 j = \gamma_{20} + \gamma_{21} \times \text{PNBC}_j + u_{2j} \]  
(5)

where, PNBC\(_j\) = Proportion of National Brick and Click retailers in product-market \(j\).

Substituting (3)–(5) in (2) we get,
\[ \text{PIND}_{ij} = \gamma_{00} + \gamma_{01} \times \text{LCM}_j + \gamma_{02} \times \text{VSQ}_j + \gamma_{03} \times \text{PL}_j + \gamma_{10} \times \text{SQ}_i + \gamma_{20} \times \text{NBC}_i + \beta_3 \times \text{LBC}_i + \beta_4 \times \text{Ci} + \beta_5 \times \text{Size}_i + \gamma_{11} \times [\text{LCM}_i \times \text{SQ}_j] + \gamma_{12} \times [\text{VSQ}_j \times \text{SQ}_i] + \gamma_{13} \times [\text{PL}_j \times \text{SQ}_i] + \gamma_{21} \times [\text{PNBC}_j \times \text{NBC}_i] + [u_{1j} \times \text{SQ}_i] + u_{2j} \times \text{NBC}_i] + [u_{0j}] + r_{ij} \]  
(6)

To test the proposed nonlinear relationship between level of competition and price premiums, we use a log conversion of ‘number of competitors’. \(\gamma_{00}\) represents the average price charged by the retailers. \(r_{ij}\) is a homoscedastic error term with mean 0 and variance \(\sigma^2_{u}\) and represents an estimate of the unexplained variance at the retailer level. \(u_{0j}\) is a random parameter with mean 0 and variance \(\sigma^2_{u}\) and measures the deviation of product market \(j\) from the mean, that is the unexplained variance in prices at the product-market level.\(^{11}\)

A Full Information Maximum Likelihood (FIML)\(^{12}\) methodology is used to estimate the model parameters \((\gamma', \beta', \text{and } u's)\) with an iterative algorithm (details on the estimation are provided by Raudenbush and Bryk 2002). Using Ordinary Least Squares (OLS) regression on multilevel data presents statistical problems because—(a) the multilevel data violates the assumption of independence (or homogeneity) of observations required in OLS, (b) it has been shown that the resulting estimates are biased, and (c) the estimated standard errors of the effects are too small (Raudenbush and Bryk 2002). These smaller estimated errors in fact lead to improved R-square values and also increase the significance of the estimated coefficients. It is important to note that by adopting the HLM approach we are not only estimating a more complex model, but also raising the requirements on robustness of the estimates from our model.

Analysis of pricing strategies

In addition to testing the hypotheses, we are also interested in evaluating if the interactions between retailer and market factors provide a significant improvement in explaining price dispersion. We accomplish this objective by estimating three benchmark HLM Null models that are explained below.

**HLM Null Model I**

In HLM Null Model I, the price index of a retailer \(i\) in product-market \(j\) (PIND\(_{ij}\)), is specified as a function of only an intercept term that varies across product markets. Using Eq. (6) as the basis, HLM Null Model I is given by:
\[ \text{PIND}_{ij} = \gamma_{00} + u_{0j} + r_{ij}. \]  
(7)

**HLM Null Model II**

The HLM Null Model II assumes that the price index of a retailer is impacted only by the main effects of retailer characteristics. Using Eq. (6) as the basis, HLM Null Model II is provided by:
\[ \text{PIND}_{ij} = \gamma_{00} + \gamma_{10} \times \text{SQ}_i + \gamma_{20} \times \text{NBC}_i + \beta_3 \times \text{LBC}_i + \beta_4 \times \text{Ci} + \beta_5 \times \text{Size}_i + [u_{1j} \times \text{SQ}_i] + u_{2j} \times \text{NBC}_i] + [u_{0j}] + r_{ij}. \]  
(8)

**HLM Null Model III**

The HLM Null Model III assumes that the main effects of both retailer and market characteristics influence the price index of a retailer. Even though it considers only the main effects of retailer and market characteristics, the HLM Null Model III differs from extant models in the literature because it accommodates for the retailer and market characteristics at different levels of aggregation. Using Eq. (6) as the basis, the HLM Null Model III is represented as;
\[ \text{PIND}_{ij} = \gamma_{00} + \gamma_{01} \times \text{LCM}_j + \gamma_{02} \times \text{VSQ}_j + \gamma_{03} \times \text{PL}_j + \gamma_{10} \times \text{SQ}_i + \gamma_{20} \times \text{NBC}_i + \beta_3 \times \text{LBC}_i + \beta_4 \times \text{Ci} + \beta_5 \times \text{Size}_i + [u_{1j} \times \text{SQ}_i] + u_{2j} \times \text{NBC}_i] + [u_{0j}] + r_{ij}. \]  
(9)

**Results and discussion**

**Model comparison**

When FIML is used for model estimation, a likelihood ratio (LR) test is appropriate for evaluating the significance of multiple fixed effects in the nested HLM models (Raudenbush and Bryk 2002). We evaluate the significance of the main effects of retailer factors with a LR test that compares HLM Null Models I and II. The significance of the main effects of market factors is established by the LR test between HLM Null Models II and III. Finally, the significance of the interactions between retailer and market factors is obtained through a LR test between HLM Null Model III and the Proposed HLM Model. We assess the explanatory power of a model by computing the observed variance in prices \((\bar{V}_p)\) with the variance of

---

\(^{11}\) One can also interpret the random effects parameter \(u_i\), as a heteroscedastic error term in the mixed heteroscedastic models used by Wittink (1977) and Shankar and Krishnamurthi (1996).

\(^{12}\) We also estimated our models using a Restricted Maximum Likelihood (REML) method because when either the number of retailers per product market or the number of total prices per product category is small, the FIML estimates can have smaller standard errors. We did not find any substantive differences in the REML and FIML estimates in our data.
the residuals from the corresponding model \( (V_r) \) for each product category. The explanatory power is assessed by an \( R^2 \) measure calculated as \( 1 - (V_r/V_p) \). In addition to the HLM Null Models (I, II, & III) we also compare the Proposed Model with a Simple Linear Model incorporating only retailer characteristics (similar to Pan et al. 2002). The variables in Simple Linear Model are size of a retailer channel structure has a significant influence on the prices charged by retailers. Over-all, we observe that the retailer channel structure has a significant influence on the prices charged by retailers.

Main effects—Influence of retailer characteristics

Table 5b provides the results from the estimation of the HLM model with all covariates (labeled as Proposed HLM Model in Table 5a).

Service quality

For all the eight product categories the statistically significant positive coefficient for service quality indicates that retailers with higher service quality are also charging higher prices. Across product categories we find consistent evidence that retailers consider service quality as a means for differentiating and thereby charging higher prices (supporting \( H_3 \)). We believe that this consistently significant influence of service quality is observed because our framework accounts for retailer and market characteristics at two different levels, and also incorporates their interactions.

Channels of transaction

In our analyses, a retailer is classified as pure play, National brick-n-click, Local Brick-n-Click, and catalog. All of the channel classifications are used in the analyses with the exception of pure play, which is used as the base. The coefficients for each of the retailer classifications are thus interpreted as the average increase/decrease in the prices relative to a pure play retailer. Over-all, we observe that the retailer channel structure has a significant influence on the prices charged by retailers.

Our results support \( H_2a \). We find that National Brick-n-Click retailers charge significantly higher prices than the pure play retailers in all of the eight product categories. The increase in price levels for National Brick-n-Click retailers ranges from 6 percent (printers) to 39 percent (DVD players). If the National Brick-n-Click retailers were to become cost leaders and price their products in relation to their economies of scale, one would expect to observe lower prices and not the higher prices that our results indicate. We believe that the National Brick-n-Click retailers are able to charge higher prices because—(1) they are able to engender trust among online shoppers
given their national presence and brand recognition, and (2) appropriate use of technology enables these retailers to provide shoppers additional convenience in terms of being able to switch channels of transaction from pre-ordering to post-fulfillment, for example ordering online and taking delivery offline at a nearby store. Arguably, such conveniences are part of a higher level of service quality that a retailer offers and the national retailers are clearly able to charge a premium for these additional services.\footnote{Note that in addition to the price levels all National Brick-and-Click retailers also charge the sales taxes in almost all states. Consequently, consumers are de-facto paying a premium significantly higher than that indicated in our results.} These findings provide additional empirical support to previous findings that multichannel retailers charge higher prices than pure-play retailers (Ancarani and Shankar 2004).

The Local Brick-n-Click retailers are observed to be—(a) charging significantly lower prices (than pure play retailers) in the PDA (5 percent lower) product category, (b) significantly higher prices in the books product category (25 percent higher), and (c) no significant difference in their price levels for the remaining 6 categories. In summary, we find that for a majority of product categories analyzed, Local Brick-n-Click retailers are not charging a premium for the facilities that their multichannel operation provides. The Local Brick-n-Click retailers seem to be using their Internet operations for better geographic reach, as there are minimal marginal costs in operating an Internet retail store. In this regard, it should also be noted that for customers outside of the geographic reach of the physical store, the Local Brick-and-Click retailer is equivalent to a pure-play retailer because none of the advantages of multichannel transactions are available.

Finally, retailers providing mail-order catalogs in addition to their website are found to be charging higher prices for three product categories (camcorder - 10 percent higher, printers and books - 5 percent higher). However, for two product categories they charge lower prices than pure play retailers (PDA - 4 percent lower, and DVDs - 2 percent lower). These results indicate that providing an additional channel of transaction (such as a catalog) does influence retailer pricing strategies, but the effect of providing a catalog in addition to a website varies by product category. Therefore, we do not find support for H$_{2b}$. In summary, our results provide conclusive evidence that National Brick-n-Click retailers charge higher prices than pure-play retailers, while the same is not true for Local Brick-n-Click retailers and online retailers with mail-order catalogs. Our results imply that while previous research has classified retailers in the online markets as either pure-play or brick-and-click (Pan et al. 2002; Tang and Xing 2002), there is finer distinction among brick-and-click retailers, with only the national brick-and-click retailers consistently charging higher prices than pure-play retailers.

\textit{Moderating influence of market characteristics}

Given that the interaction between retailer characteristics and market characteristics are significant for a majority of the product categories, we do not discuss the individual main effects of the influence of market characteristics on the pricing strategies of the retailers.

\textit{Level of competition and service quality}

In seven of the eight product categories (all product categories except camcorders) the coefficient of the interaction between competitive intensity and service quality is negative and significant, hence supporting H$_{4}$. The significance of coefficient indicates that an increase in the level of competition in a product market diminishes the positive impact that service quality has on the price charged by a retailer. However, the negative influence of level of competition has

| Table 5b |
|---|---|---|---|---|---|---|---|
| Product-market factors | Camcorder | DVD player | PDA | Printer | Scanner | Books | DVDs |
| Log of number of competitors | 0.015 | 0.60** | 0.13** | −0.16 | 0.03 | 0.07** | −0.40** | 1.65*** |
| Variance in service quality | −0.03 | 0.03 | 0.41 | −0.13 | 0.36 | −0.46 | 1.57** | 0.43 |
| Price level | 3.3E-5 | −5.8E-3 | −7.9E-6 | −1.2E-4 | −8E-6 | −2E-3* | −0.015** | −0.11 |
| Proportion-National Brick-n-Click | 0.13E-05 | 1.70*** | 0.24 | 0.58 | 3.0E-6 | 0.33*** | 0.062 | 0.50 |

diminishing returns, indicating a weakening strength of the decrease in the price charged with increasing number of competitors.

**Price level and service quality**

We hypothesized that the consumers’ selection of a retailer is based on risk averseness particularly when the price of a product is high. This would lead consumers to prefer retailers with high service quality, who would in turn benefit from the consumers’ risk averseness (or willingness to pay higher for service quality) by charging higher prices. The results indicate a positive and significant relationship between price level and service quality for only Books and DVDs. Therefore, for six of the eight product categories we do not find support for H4. Similar to Pan et al. (2003b) we do not find a strong support for the moderating influence of price levels on the relationship between service quality and prices. The weak influence of price levels on the premium charged by retailers could be that for products with higher price levels, consumers can search online for product information with ease. Once the consumers decide on a product to purchase, they make a choice of the retailer based on the various characteristics of the retailers offering the product. Therefore, we are unlikely to observe a moderating influence of price levels in our analyses.

**Nature of competition: variance in service quality and service quality**

We find significant support for a positive interaction effect between variance in service quality of retailers selling the product and the service quality of a retailer (H5a) for seven product categories (all product categories except books). The retailers who provide a high level of service quality further increase the price levels with increase in scope for service differentiation, which is typically marked by presence of low quality retailers. In such product-markets with high variation in service quality it is easier for high service quality retailers to justify their premiums.

**Nature of competition: proportion of national retailers and national retailer**

For six of the eight product categories (camcorders, DVD players, PDA, Books, DVDs, and Video Games), national retailers reduce their prices as the proportion of national retailers in the product-market increases (H5b). Our results show that while the national retailers charge higher prices than others, they do so only as long as competition from other national retailers in the product-market is low. An increase in the number of national retailers in the product-market diminishes the scope for service differentiation for national retailers in terms of multichannel characteristics, thereby exerting a downward pressure on their prices.

**Total effect of service quality**

An important objective of our study is to evaluate the effect of service quality of a retailer on prices charged. We propose that after accounting for market characteristics service quality would have a positive influence on the prices charged. In order to make inferences regarding the influence of service quality we investigate the total impact of service quality that includes both the main and the moderating effects. Evaluation of the total effects is particularly important because the moderating influences of market characteristics are found to have opposing forces - level of competition is observed to negatively impact the relationship, whereas the nature of competition is found to positively impact the relationship between retailer’s service quality and prices charged. The total effects of service quality measures the impact of a change in service quality of a retailer on the prices charged, and is obtained by taking the first derivative of Eq. (6) with respect to service quality:15

\[
\Delta \frac{\text{PIND}}{\text{ServQ}} = \gamma_0 + \gamma_1 \times \log(\text{#of competitors}) + \gamma_2 \\
\times \text{VServind} + \text{[rt]} (11)
\]

For each product category, we plotted the values of the derivative given by (11) for all the observations, that is for all the observed values of level of competition and the nature of competition. The plots indicate that the sign of the derivative is positive across the range of the data used in our study. We can safely conclude that for all product categories, and over a wide range of values of level of competition and nature of competition, service quality has a positive influence of the prices charged. The change in the derivative, over the various values of level and nature of competition are shown in Fig. 3 for two representative product categories—PDA and DVD Players.

Fig. 3 shows that for both DVD Players and PDAs, the prices charged by a retailer increases with the variation in service quality (nature of competition) and decreases at a diminishing rate with the number of retailers (level of competition). Specifically, we observe that as the number of retailers offering a product increases beyond 11 for DVD Players, and 20 for PDAs, the diminishing impact of the level of competition on prices charged is minimized. Overall, the change in prices charged by the retailer over the range of values for level and nature of competition is positive for an increase in service quality.

**Independent analyses of pure-play and brick-and-click retailers**

It can be argued that brick-and-click retailers have a larger set of constraints, such as price consistency between the offline stores and Internet stores that would impact their pricing strategies. These factors are not accounted for in our analyses and can potentially confound the observed results. To eliminate any possibility of such confounding effects, we separately estimated the model coefficients using only the pure-play retailers and only brick-and-click retailers (both national and local). The results of our analyses are provided in Appendix A. Table A1 shows that the results from the separate analyses are similar to the results obtained by pooling both pure-play only and brick-and-click retailers. We conducted a pooling test (Kumar and Leone 1988) to examine whether data for pure-play retailers and brick-n-click retailers can be combined. We could not reject the null hypothesis that the pooling is appropriate (for α=0.01). We find that the coefficients of pure-play only retailers are similar to the brick-n-click retailers, which implies that the factors outlined in our study impact the pricing decisions of retailers irrespective of their channel structure.

15 For Books and DVD players we find a significant positive influence of price levels, which is also included in equation 10 for calculating total effects.
Implications, limitations and future research

Theoretical implications

The results from this study contribute significantly to the current understanding of the sources of price differentiation by online retailers. Our study extends previous findings on how retailer characteristics such as service quality and channels of transaction (Pan et al. 2002; Ancarani and Shankar 2004) impact the prices. We also show how market characteristics such as number of competitors influence price dispersion in online markets. In particular, our proposed comprehensive model explains greater amount of variance in prices and provides empirical evidence that retailer and market characteristics interact to determine the prices charged by a retailer. Our key findings include: (1) a positive influence of service quality on prices across several product categories; (2) similar to prior findings (Pan et al. 2002), an increase in number of competitors induces a downward pressure in prices for all retailers, albeit at a decreasing rate; (3) for the first time in the literature, we show how the increase in scope for service differentiation is leveraged by high service quality retailers to increase their prices particularly in face of high competition; (4) interestingly we find that low service quality retailers in fact seek higher prices in markets characterized by either a large number of competitors and low variation in service quality or in markets with a large variance in service quality and few competitors, and (5) National Brick-and-Click retailers reduce their prices in face of increasing competition in form of other National Brick-and-Click retailers. The findings from our study pertain to retailer characteristics, market characteristics and their interactive effects, thereby highlighting the importance of incorporating the hierarchical structure of the market in a unified empirical model when studying pricing strategies of online retailers.

Managerial implications

We expect that in a wide variety of product-markets our findings will serve as benchmarks for retailer’s choices of service quality and channels of transaction. Such benchmarks are especially useful for established retailers who are in the midst of adding new products to their portfolio, and for new entrants jointly deciding market entry, service quality and channel related investments and prices. To provide an illustration of such a benchmark analysis, we conducted a post-hoc analysis with comparison of price levels across eight product-market segments.

Table 6
Comparison of premiums over segments

<table>
<thead>
<tr>
<th>Level of Competition</th>
<th>Low Service Quality</th>
<th>High Service Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variance in Service = H</td>
<td>Variance in Service = L</td>
</tr>
<tr>
<td>High</td>
<td>0.235&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.242&lt;sup&gt;b,c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cell 1</td>
<td>Cell 2</td>
<td>Cell 5</td>
</tr>
<tr>
<td>Low</td>
<td>0.248&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>0.199&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cell 3</td>
<td>Cell 4</td>
<td>Cell 6</td>
</tr>
</tbody>
</table>

Fig. 3. Total effects of service quality on online prices.
Table A1
Results from estimation of Hierarchical Linear Model

<table>
<thead>
<tr>
<th>Camcorder</th>
<th>DVD player</th>
<th>PDA</th>
<th>Printer</th>
<th>Scanner</th>
<th>Books</th>
<th>DVDs</th>
<th>Video games</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.012</td>
<td>0.43***</td>
<td>0.18***</td>
<td>0.14***</td>
<td>0.07***</td>
<td>-0.10</td>
<td>-0.24*</td>
<td>1.03***</td>
</tr>
<tr>
<td>-0.001</td>
<td>-0.05***</td>
<td>-0.57**</td>
<td>-0.29</td>
<td>0.49</td>
<td>0.35*</td>
<td>-1.21**</td>
<td>-0.41</td>
</tr>
<tr>
<td>4.5E-6</td>
<td>-5.4E-3</td>
<td>-1.8E-6</td>
<td>-3.2E-4</td>
<td>-4.1E-6</td>
<td>-6E-6*</td>
<td>-0.007*</td>
<td>-8.0E-2**</td>
</tr>
<tr>
<td>0.07**</td>
<td>0.018**</td>
<td>0.0157</td>
<td>0.19***</td>
<td>0.14**</td>
<td>0.006**</td>
<td>0.097</td>
<td>0.23*</td>
</tr>
<tr>
<td>-31.4**</td>
<td>-35.1***</td>
<td>-2.66</td>
<td>-3.8</td>
<td>-3.2</td>
<td>-4.2</td>
<td>-2.2**</td>
<td>-1.9***</td>
</tr>
</tbody>
</table>

Interaction effects

| Price level × service quality | 4.8E-6 | 5.5E-5 | -2.0E-4 | -1.0E-5 | -7.2E-6 | -1E-4 | 2E-4** | -0.008 |
| Log (number of competitors) × service quality | -5.1E-3 | -0.04*** | -0.03** | -0.06*** | -0.04*** | -0.01*** | -0.015* | -0.11** |
| Variance in service quality × service quality | 0.05* | 0.34*** | 0.31*** | 0.04* | 0.13** | 0.01 | 0.09* | 1.11** |

Brick-n-Click only

| Log (number of competitors) | 0.14 | 0.96*** | 0.04** | 0.02** | -0.14 | 0.18 | 0.02*** | 0.06 |
| Variance in service quality | -0.009 | 0.02 | 0.29 | -0.59 | 0.24 | 0.02 | 1.9 | 0.62 |
| Price level | 2.2E-5* | -4.5E-4 | -2.8E-6 | -3.1E-4 | -5E-6 | -5.7E-3 | -0.005 | -9.2E-3** |
| Retailer factors | Service Quality | 0.05 | 0.31*** | 0.07* | 0.01*** | 0.08** | 0.01** | 0.08*** | 0.10** |
| Size | -37.0 | -36.1*** | -6.7*** | -2.7 | -2.1 | -6.1*** | -1.2*** | -1.1 |
| Interaction effects | Price level × service quality | 7.1E-6 | -3.7E-5 | -9E-5 | -3.7E-5 | 2.2E-5 | 1.3E-3 | 8.5E-3 | -3.6E-3 |
| Log (number of competitors) × service quality | -7E-3 | -0.10*** | -0.028 | -0.009* | -0.01*** | -0.06* | -0.058* | -0.28** |
| Variance in service quality × service quality | -0.03* | 0.21** | 0.28*** | 0.03 | 0.01 | 0.009 | 0.32** | 1.96** |

*Significant at α < 0.10, **significant at α < 0.05, ***significant at α < 0.01.

We performed a median split of service quality, level of competition and variance in service quality to obtain two levels (High and Low) for each of the three factors resulting in eight segments. We then compared the mean price premiums charged by retailers across these segments. The results of this comparison (based on a MANOVA) are provided in Table 6.

From Table 6 we obtain the following insights on how the premium of a retailer with a certain level of service quality (high, low) varies across market conditions (level and nature of competition).

1. Low service quality retailer charges lowest premium in markets with low competition and little scope for service differentiation (cell 4). Any change in intensity of competition and/or availability for service differentiation (cells 1, 2, and 3), yield increased premiums for the retailer. It needs to be emphasized that though the premiums increase, they are not different from each other, that is level of premium is not significantly different across cells 1, 2, and 3.

2. In contrast, a high service quality retailer charges highest premium in markets characterized by low competition and low scope for differentiation (cell 8). Additionally, the high service quality retailer is able to seek similar high premiums in highly competitive markets with a high potential for service differentiation (cell 5).

We obtain the following insights on how the premiums charged between the high and low service quality retailers varies within same market conditions,

1. High service quality retailer charges significantly higher than the low service quality retailer when—(a) level of competition and scope for differentiation are high (cell 5 vs. cell 1), and (b) both level of competition and scope for service differentiation are low (cell 8 vs. cell 4).

2. Most importantly, under no market condition is the low service quality retailer able to charge significantly higher premium than the higher service quality retailers.

The above analyses, clearly identifies the market conditions that are suitable for retailers with a given level of service quality and transaction channels for charging higher prices. Such an analysis maps out the decision space for retailers, giving them quantifiable measures of tradeoffs that are critical for making informed entry in a product market, pricing decisions and investment levels for strategic positioning in terms of service quality. Finally, we note that these insights are based on post-hoc analyses of the results from our concep-
tual model and serve as guidelines for detailed examination by future research.

Limitations and future research

Current price dispersion research, which includes this study, is limited by not having access to supply side cost data. Future research needs to address revenue measures that consider the actual transacted prices. It is possible for the dispersion of transacted prices to be different from the dispersion in retailer prices. Further, we believe that factors such as product life cycle and timing of market entry need to be analyzed (Pan et al., 2002, 2003b), implying the necessity of longitudinal data. Note that pricing is one of the many strategic decision criteria that a retailer has to manage in order to optimize profits. For instance, Internet retailers are also interested in building a market share, and in ensuring consumer retention. Future studies should compare the influence of service quality across these different decision criteria and investigate the process through which they lead to optimal profits for retailers. Our results indicate channel choice affects the pricing strategy of the online retailer. In fact we find that retailers providing multiple channels of transaction also charge higher prices. Future research should investigate whether providing multiple channels of transaction also increases the revenues of the retailers, and why providing multiple channels of transaction affects consumer choice and willingness to pay. Given that price dispersion as a metric intrinsically signals the confluence of consumer search, retailer pricing strategies and informational efficiency of markets, we hope that our integrated approach will be useful to other researchers examining the interactions between these competing forces in electronic markets.

Acknowledgements

The authors thank V. Kumar, Jim Marsden, and Alok Gupta for their helpful comments.

Appendix A. Separate Analysis of Pure-Play and Brick-And-Click Retailers

(See Table A1).

References


