

# Can Online Retailers Escape the Law of One Price?

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**Abstract** Early academic research on electronic markets suggested that there are forces driving these markets towards the Bertrand equilibrium where firms set prices equal to unit cost. However, more recent empirical evidence shows that online retailers have been able to develop a number of strategies to escape the Law of one price. This chapter reviews the economic and marketing literature to analyze the strategies that may allow retailers to set prices above marginal costs in Internet markets. More specifically this chapter describes how online retailers use marketing, operations, distribution and communication strategies to avoid perfect competition equilibrium.

**Keywords** Electronic markets · Bertrand model · Frictional costs · Price dispersion

## 1 Introduction

Although the U.S. market is still dealing with the ongoing fallout from the financial crisis, U.S. retail e-commerce sales grew 50 % over the last five years, reaching a total of over \$220 billion in sales in 2012 according to U.S. Census Bureau data. During the same period U.S. offline retail sales grew only 6 %. This trend appears to indicate that the Internet is more efficient than traditional retail channels, as it continues to pull consumers away from malls, shops and other retail channels. The explosive growth of Internet retailing has produced a growing body of research on the differences between online and offline retail channels.

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One of the most studied distinctions between electronic retailing and conventional retailing concerns price strategies. The classic Bertrand model of price competition suggests that undifferentiated retailers selling homogeneous goods in markets with perfectly informed buyers will charge prices equal to marginal cost and will not earn any profit. This is known as the law of one price. On the flip side, retailers will make some profit in Internet markets if they follow differentiation strategies, consumers are not perfectly informed about the supply and if products are not homogeneous.

The literature on price dispersion on the Internet has primarily focused on measuring the size and time variability of price dispersion. While this literature has confirmed the existence of persistent price dispersion on the Internet, retailers must understand the causes of this phenomenon to deploy effective strategies to compete in online markets. While the violation of the Bertrand model and higher prices in Internet markets may be not a desirable outcome for consumers, sellers are interested in keeping prices high and will deploy different strategies to keep prices above marginal costs. This chapter studies different strategies that retailers may adopt to escape the law of one price. These strategies will be classified in three groups following the three main assumptions of the Bertrand model. The chapter will begin with a discussion of online sellers' strategies to increase information, followed by an analysis of online sellers' differentiation strategies and lastly, an exploration of the relationship between product heterogeneity and online prices.

Although recent research has provided some explanations why Bertrand model assumptions are violated on the Internet, most of the literature on this topic provides only partial explanations of the phenomenon, or studies only a specific violation of the Bertrand model. The range of existing approaches reflects the plethora of search models, market structure assumptions, market contexts, and the wide array of questions within the field of price competition on the Internet. However, modeling price competition, by definition, entails ignoring factors that are not significant in certain markets or for some of the Bertrand assumptions, but it is precisely these factors that may become key in other settings or markets. To overcome this paradox of studying price competition on the Internet, this chapter will integrate monocausal explanations and paradigms by systematically identifying a coordinate system of drivers in which the scope of existing online price dispersion theories can be delineated. This integrated approach will form the basis for developing the theory and moving towards a unifying framework. To achieve this goal, this chapter will review the literature on price competition in electronic markets to understand how online sellers will benefit from persistent higher prices and why the Internet does not provide the expected informational efficiency gains to consumers. The chapter aims to contribute to the theoretical literature by reviewing the impact of online price competition on retailers' competitive strategies and outline future research directions. The next section studies how online retailers deal with information costs. The third section describes online retailers' differentiation strategies, and the fourth section addresses online retailers' strategies with heterogeneous products. The final section outlines the main conclusions and future lines of research.

## 2 Information Costs and Price Competition on the Internet

Neoclassical economics suggest that price competition occurs because consumers are not perfectly aware of the prices and qualities of all products sold in a market (Stigler 1961). Consumers can not know all the prices quoted by different sellers at any given time, and any agent who wishes to ascertain the lowest price must conduct a search that involves costs, called information costs. Buyers actively collect product information to make potentially better purchase decisions. Consumers will search for product information until the marginal cost of obtaining a unit of information is equal to the marginal benefit of possessing this information. Consequently, both search costs and search benefits will define the search strategies of online consumers (Varian 1980; Schmidt and Spreng 1996).

Theoretically, the most important contribution of the Internet to markets' efficiency is the reduction of information costs. It would seem obvious that, at least for certain types of products, consumers can discover prices and product characteristics from competing suppliers much more easily in online markets than in offline markets. One of the first papers to explore information costs in electronic markets (Bakos 1997), suggests that information and communication technologies reduce information costs. According to Bakos (1997), if product offerings are poorly differentiated and consumers can easily find price information, buyers in electronic markets will be closer to the Walrasian scenario of individuals who are fully informed about prices. Full information about prices and products will trigger price competition among sellers, reducing price dispersion and shifting the balance of power to consumers. Despite some theoretical weaknesses of this assumption (Harrington 2001), and despite the amount of contradicting evidence, the common assumption that electronic markets reduce price dispersion is not completely wrong. Recent empirical evidence supports price dispersion reduction. Tang et al. (2010) show that as Internet shopbot usage increases, prices of books decrease and price dispersion decreases nonlinearly. While most of the empirical evidence on price competition in online markets is based on the observation of posted prices, recent research considering actual transaction prices reinforce the initial theoretical assumption that electronic markets reduce average prices and increase information transparency (Ghose and Yao 2011; Ong and Zhong 2011; Sengupta and Wiggins 2012). The differences in terms of price competition between posted and actual transaction data reflect the fact that outliers' prices distort the results. When using posted prices to measure price competition, lower prices may not be honored by retailers and higher prices may not generate any sales (Brynjolfsson and Smith 2000; Pan et al. 2004; Ghose and Yao 2011). Nevertheless, as we will discuss below, low or high posted prices may not be simple statistical outliers but also the result either of sellers' strategies to artificially increase information costs (Ellison and Ellison 2009) or of manufacturers' or retailers' multichannel pricing strategies (Carlton and Chevalier 2001).

Nevertheless, the body of research that shows that online purchasing is not as efficient as expected is large and for certain products still confirms that Internet

markets violate the assumptions of the law of one price. Under this assumption, the literature has revealed online retailers may benefit from high information costs. Therefore, online sellers should adopt price discrimination strategies and exploit consumers' heterogeneous information costs. Online retailers may follow different strategies to increase consumers' information costs. First, they may define prices according to frictional costs, the costs of using the Internet technology to search for product and prices (Hann and Terwiesch 2003; Brynjolfsson et al. 2010). Second, online retailers may obfuscate product and price information. Finally, online retailers should take also into account how market entry strategies will impact price competition. These three approaches will be discussed in the following sections.

## ***2.1 Frictional Costs and Competition on the Internet***

The model of search costs in a clearinghouse setting established by Varian (1980) is one of the most common models to explain Internet consumer behavior. According to this model, prices depend on the number of consumers who will use the Internet to search for products and prices. Internet intermediaries such as shopbots may play a significant role in reducing price dispersion and empowering consumers. However, Internet shopping is not frictionless. In Internet markets, consumers incur certain frictional costs such as access costs, learning costs and waiting costs (Baye and Morgan 2001; Hann and Terwiesch 2003). Varian model predicts that larger frictional costs will decrease price competition as fewer consumers will benefit from lower information costs. In cases where there are low levels of Internet and shopbot adoption, sellers benefit from information rents and price competition will be less intense. Over time, as more consumers become familiar with Internet technologies and intermediaries, price competition will intensify and prices will fall and get closer to marginal costs. Ward and Lee (2000) show that as consumers become more experienced with Internet shopping, both brand reliance and prices fall as consumers intensify product information searches. Brown and Goolsbee (2002) confirm the role of Internet access and learning effects on price competition. This research shows that the initial introduction of the Internet search sites was initially associated with an increase in prices for term life insurance. However, as Internet usage spread, average prices and price dispersion fell. Furthermore, this research shows that regions with higher Internet penetration undergo a faster reduction in online prices. Brynjolfsson et al. (2011) provide empirical evidence of the impact of this learning effect on prices, as they show that purchases made by consumers with prior Internet experience, and thereby lower learning costs, are more skewed toward niche products. Hann and Terwiesch (2003) observe that higher experience is negatively related to price offered by consumers in "name your own price" sites.

Nowadays, Internet access and the learning effects have a weaker impact on online price competition in developed countries, but it is still a relevant factor

when competing online in developing countries. Bock et al. (2007) show that Internet maturity could explain why online prices and price dispersion are higher in China than in United States. Goyal (2010) shows that the Internet kiosks increase the efficiency of soya beans market in India. In some other countries, Internet technology is not available but alternative information technologies such as mobile phones in Niger (Aker 2010) or FM radio in Uganda (Svensson and Yagazinawa 2009) increase markets' efficiency.

Internet access and learning effects may be considered temporary sources of sellers' information rents and price dispersion. However, most of the literature suggests that price dispersion in online markets is a persistent phenomenon (Baylis and Perloff 2002; Baye et al. 2004a, b) and that learning effects may play some role in this persistent effect. In fact, learning costs may attenuate online price competition. This is especially true in the case of the learning costs related to the specific functionality of a retailer' website. Online retailers may provide specific functionalities such as memorization of names, addresses or payment details to lower the cost of using their website with respect to others, as consumers gain experience shopping with a particular online store. Johnson et al. (2004) believe that this lock-in mechanism could explain why consumers visit less online stores despite the fact that alternative sellers are "just a mouse click away". Therefore, retailers' specific customer experience may create switching costs and allow for price premiums. Clay et al. (2002) conclude that the relatively higher prices of Amazon.com may be explained by specific features that reinforce the customer experience such as recommendation systems and links to international book sites. On the other hand, these authors also suggest that other aspects of the online customer experience in online bookstores, such as loyalty programs and third party reviews of books, are related to lower prices. Clemons et al. (2002) describe how customer experience in online travel agencies may create switching costs and support price discrimination strategies. Nelson et al. (2007) show that retailers with better product information and product representation charge higher prices.

In addition to learning costs, online retailers should take into account waiting times in their online pricing strategies. Online sellers should adjust their strategies to the fact that Internet buyers face a buy-or-wait problem and have a reservation price related to this decision which may also change over time if firms follow mixed-price strategies. For this reason, online sellers may charge higher prices for high demand products to less patient customers and lower prices for low demand products to more patient customers. Loginova (2009) shows that consumers with high product valuations will be willing to pay higher prices to avoid waiting costs, while consumers with lower product valuations will be willing to wait for the product in exchange for lower prices. Dana and Orlov (2009) provide empirical evidence that shows the efficacy of such strategies, using as an example airlines which use price cuts to induce consumers to fly at off-peak times because efficiency gains outweigh the lost rents from consumers willing to fly off-peak times at regular prices. Chellappa et al. (2011) show that for online buyers of airline tickets higher waiting costs are related to higher reservation prices. Rabinovich et al. (2008a, b)

show that lower shipping times are related to handling and shipping operations with higher margins. Furthermore, handling and shipping margins are inversely related to product margins.

## ***2.2 Sellers' Obfuscation Strategies and Competition on the Internet***

Weaker price competition may be in part attributable to price and product information obfuscation. Information obfuscation prevents consumers from comparing one product to another as the products may not seem similar in certain key characteristics such as price, functionality or components. Buyer confusion is an important source of market power and may reduce price elasticity of demand (Scitovsky 1950; Perloff and Salop 1985). Therefore, firms have incentives to make it hard from consumers to compare different goods (Kalayci and Potters 2011). In online markets, Ellison and Ellison (2009) show how computer memory sellers may obfuscate price by combining low prices with high shipping costs, by varying warranties, by offering low prices for products that attract customers to buy different products. Each of these practices can frustrate consumers' price search. Raising the cost of learning about each firm's offerings and forcing more consumers to conduct firm-by-firm searches will reduce price competition.

Clay and Tay (2001) provide some evidence of how retailers combine low prices for some products and high prices for other products. For instance, some online book sellers charge low prices for more popular books in order to attract customers to buy less popular books with higher prices. Similarly, online used book sellers charge high prices on new books to push customers to buy used books. Ellison and Ellison (2009) show how computer component retailers charge low prices for products of low quality, with the hope that buyers will choose more expensive products once they realize the low quality of their first choice. Not only price but also product information obfuscation seems to be related to higher prices, as shown by Clemons et al. (2002) in the online travel industry. Other firms tend to obfuscate service information such as stock availability to increase search costs and thereby produce higher price dispersion (Baylis and Perloff 2002; Hann and Terwiesch 2003).

Sellers may also use price changes to obfuscate price information. Lower menu costs in online markets allow frequent changes in prices (Smith and Brynjolfsson 2000). For instance, Oh and Lucas (2006) observe that online sellers make price comparison difficult applying frequent and small changes to prices. These authors show that online markets for computers exhibit synchronized price changes, not random changes that are frequently found in traditional markets. Furthermore, they find that small price increases occur more frequently than decreases and the frequency of price adjustment is associated with weaker price competition. Iyer and Pazgal (2003) show that retailers in online markets adopt mixed strategy pricing

and change prices over time in order to extract the maximum surplus from both loyal customers and bargain hunters. In contrast, some other researchers suggest that random pricing is not a common strategy in online markets of homogeneous products, and that prices are relatively stable (Bailys and Perloff 2002; Chen and Hitt 2001; Bounie et al. 2010). Complex price formats make it difficult for consumers to become informed about the true nature of prices which would allow price discrimination strategies (Chellappa et al. 2011). Furthermore, in the case of operations in international markets sellers may obfuscate prices by using different currencies. Bachis and Piga (2011) show how providing price information in different currencies result in lower price competition for flights whose endpoints are in countries with different currencies. Clay and Tay (2001) show that this heterogeneity in international prices also weakens price competition in online book markets.

### ***2.3 Market Entry and Competition on the Internet***

Traditional economics proposes that the impact of a change in the number of sellers on prices' directional moves depends on the specific search model employed in the analysis. For instance, the Rosenthal (1980) search model suggests that as the number of competing firms increases prices go up, while the Varian (1980) search model considers the opposite effect. However, empirical evidence suggests that such ambiguity does not apply to search behavior in Internet markets. In these markets, information search seems to follow the Baye et al. (2004a, b) model which implies that the impact of market size on price competition depends on firms' information transmission costs.

Price competition will be fierce in markets with a large number of sellers and low information transmission costs. Increased price competition is explained by the fact that new sellers enter the market with offers at lower prices. Bounie et al. (2010) observe that new sellers of CDs and DVDs in United States, United Kingdom and France charge lower prices. Similarly, Haynes and Thompson (2008) confirm that in online markets for cameras, newer sellers put downward pressure on the lowest price. In the case of electronics products, Lindsey-Mullikin and Grewal (2006) found that as the number of online stores increases, so does price competition. It is interesting to note that hit-and-run strategies may have an impact on the relationship between online price competition and the number of sellers. Online sellers following hit and run strategies charge lower prices for specific products for short periods of time. Consequently, in the presence of these strategies the number of sellers in electronic markets does not increase monotonically and is quite unpredictable. Periods of fierce competition with a higher number of sellers alternate with periods with higher mean prices and less sellers (Baye et al. 2004b; Ba et al. 2012; Haynes and Thompson 2013).

### **3 Retailers' Differentiation Strategies and Competition on the Internet**

To reduce price competition retailers may adopt differentiation strategies. Seller heterogeneity is explained by customer bases with different elasticities (Rosenthal 1980) or by different cost functions (Carlson and McAfee 1983). First, in markets with information costs, some retailers may have a larger base of loyal customers. Early movers, multichannel retailers with strong offline brands or retailers with superior service quality may have customers with more inelastic demands. In this context, early movers, retailers with stronger brands or better reputations or multichannel firms may charge higher online prices. Second, some retailers may have designed better operational processes or may benefit from operational synergies with offline distribution channels. Again, early movers or multichannel retailers may benefit from price premiums.

#### ***3.1 Brand, Reputation and Competition on the Internet***

In markets with high information transmission costs for sellers, brands will play an important role in signaling product and service quality to consumers. In this type of market, firms with good reputations may charge higher prices and firms with bad reputations have to compete with lower prices (Baye and Morgan 2009; Bounie et al. 2010; Liu et al. 2012). Furthermore, in such a market, mixed channel retailers may benefit from strong offline brands. Cooper (2006) show that online sellers of contact lenses with strong reputation in offline channels charge higher prices than unknown retailers in the contact lenses market, where consumers are uninformed about their options. Also, early movers in these online markets may enjoy awareness advantages and charge higher prices (Chen and Hitt 2001; Pan et al. 2003; Ennew et al. 2005).

However, the advantage of strong brands in online markets may have a temporary impact as long as consumers become more informed over time. In fact, the entry into the market of new sellers with strong brands erodes the price premium and triggers price competition (Baye and Morgan 2009). Liu et al. (2012) show that the threshold for the number of sellers needed to spark fierce price competition is relatively low. Tang et al. (2010) observe that as more booksellers with stronger brands offer a book, both mean prices and price dispersion fall. This is confirmed by Liu et al. (2012) in their research on electronics and the findings of McDonald and Wren (2012) in car insurance, which showed that more informed consumers who perform more intensive searches make brand advertising and firms' reputations less important. Similarly, Waldfogel and Chen (2006) show that with Internet intermediaries that allow search cost reductions the tendency to choose branded retailers diminishes by roughly a tenth.

Some Internet intermediaries provide consumers with user-generated feedback regarding product and service quality. The evidence suggests that user generated



feedback has the same effect as brands in Internet markets. Haynes and Thompson (2012) find that buyers use user-generated feedback as a quality signal for digital cameras. They show that cameras with better and more user reviews have higher prices, especially in higher quality products. Bounie et al. (2010) find that the number of reviews is related to the price premium, while the number of positive reviews does not have a significant impact on price. High reputation sellers of postcards or coins can charge higher prices on eBay (Melnik and Alm 2002; Resnick et al. 2006). Consumer reviews are relevant not only for goods but also for services. For instance, hotels in the upper quality segment with higher review scores could charge higher prices than their competitors (Yacouel and Fleischer 2012).

The effects of consumer reviews on competition are similar but not equivalent to brands. Product search relying on brands seems to have a relatively lower search effort compared to customer reviews. For instance, Chevalier and Mayzlin (2006) find that customers read the reviews rather than relying on statistics. The higher search effort related to customer reviews-based decisions may explain the mixed evidence on the impact of customer reviews on prices. Chen and Xie (2008) observe that consumer reviews are more effective with higher quality uncertainty. They find that consumer reviews have a higher impact on purchase decisions of complex and mass-market products such as consumer electronics or home appliances, while for both simple products such as videogames and market niche products such as rare books which usually have more informed consumers, consumer reviews have a more limited effect because the average expertise of online consumers is higher. This argument is also supported by Gu et al. (2012), which confirmed that for complex products such as digital cameras, consumer reviews have a greater impact on online sales. However, the results provided by Zhu and Zhang (2010) contradict the observations above, since they find that consumer reviews are more relevant for purchase decisions for more rare products and of more informed customers. Zhou and Duan (2012) find that consumer reviews have a greater impact on online sales of niche products than on online sales of popular products in the software industry. In a similar vein, Adams et al. (2011) find that buyers do not consider sellers' reputation scores when buying cars on eBay. Baylis and Perloff (2002) also find that good consumer reviews do not have any impact on camera prices, but that they push scanners' prices upward. Resnick et al. (2006) find that customer reviews boost sales but are not related to price premiums. Finally, Bocksted and Goh (2011) demonstrate that as with brands, customer reviews are not effective to differentiate if the number of sellers with positive feedback is relatively high.

### ***3.2 Operational Performance and Competition on the Internet***

Firms with better operational performance may follow service differentiation strategies or penetration pricing strategies. Even if products are homogeneous across retailers, online firms may provide different levels of service. Firms

providing better service may charge higher online prices. Brynjolfsson and Smith (2000) find that sellers with better consumer reviews are considered to provide better products and more reliable service and can therefore charge higher prices. These authors suggest that consumers who care about accuracy in delivery time are less sensitive to both item and shipping price and more than four times more sensitive to the presence of brand in an offer than consumers who sort by price (Smith and Brynjolfsson 2001). Venkatesan et al. (2007) also provide empirical evidence supporting the relevance of service reviews and show that online sellers with better service quality reviews from customers may charge a higher price, unless most of the sellers have positive service quality reviews. Similarly, Reibstein (2002) observed that consumers give on-time deliveries a very high importance when deciding whether to make an online purchase from a given seller again, which can therefore charge higher prices than less efficient competitors. Rabinovich and Bailey (2004) suggest that newer retailers use service quality as a market entry strategy. Early movers and mixed channel retailers, with a larger market base, may not need high levels of inventory availability and costly, extremely high service levels. Furthermore, they are also likely to have more established relationships with suppliers, allowing for a greater reliance on inventory drop shipping and lower dependence on in-stock inventory to fulfill the orders from online shoppers. These authors also observe that mixed channel retailers may enjoy service quality advantage compared to pure Internet retailers because of cross channel economies of scale synergies in inventory management.

Sellers with better operational performance may follow penetration pricing strategies. Bulk purchase discounts and economies of scale in inventory management facilities may benefit large retailers (Haynes and Thompson 2013). Both good and bad operational performance may be related to fierce price competition. Retailers with good operational performance can better internalize fixed costs and offer better discounts. This operational advantage may explain why Amazon and Barnes and Noble charged relatively low prices in the early two-thousands, although they were not the cheapest retailers (Dinlersoz and Li 2006), or why French online booksellers with larger catalogs charge lower prices (Bounie et al. 2010). On the other hand firms with bad operational performance may have higher inventory costs which will be an incentive to reduce prices. For instance, bad operational performance may explain some hit and run strategies in online markets. Xing et al. (2004) show that online retailers may cut prices to reduce their inventory of obsolete models.

A common finding in the literature on electronic commerce is that some retailers charge low unit prices but high shipping costs. Clay and Tay (2001) provide evidence of this strategy in the online book industry. Similarly, Nelson et al. (2007) show that online book, CD and DVD sellers compensate for low prices by charging higher handling and shipping fees, while Ellison and Ellison (2009) show that computer components sellers follow similar strategies. This evidence suggests that online consumers may maintain separate mental accounts for shipping charges and product price or do not care about shipping costs. For instance, Hackl et al. (2011) show that shipping costs have a slightly positive

impact on online sales. Hossain and Morgan (2006) find that setting a low opening bid and high shipping and handling costs on eBay yields higher revenue than doing the reverse (Hossain and Morgan 2006). Baylis and Perloff (2002), Brown et al. (2010) find that increasing shipping costs may boost revenues when these costs are not disclosed to buyers before they fill their “shopping carts”. It appears that compared to multi-channel retailers, pure Internet retailers tend to use these strategies related to shipping costs which result in higher total prices, more frequently (Ancarani and Shankar 2004). There is also some evidence that calls into question this argument. Smith and Brynjolfsson (2001) cast some doubts on the positive impact of higher shipping costs on the revenues of online book sellers and observe that online consumers are more sensitive to shipping prices and tax than to product price. Nevertheless, these authors suggest that their results should be interpreted with caution since the research related to this finding had some serious methodological limitations.

### ***3.3 Channel Strategies and Competition on the Internet***

Online sellers may follow multi-channel pricing strategies. Multi-channel retailers can differentiate themselves from pure Internet retailers through the combined benefits of offline and online channels. These retailers may provide more convenient access to information through the online channel and physical inspection, pickup and return services through the offline channel. Therefore, multichannel retailers may charge higher prices to coordinate prices across their different channels to prevent destructive competition between them. Most of the empirical evidence suggests that multi-channel retailers charge higher prices on the Web than their online-only competitors, although a multichannel retailer does not necessarily have to charge the same prices online and offline (Tang and Xing 2001; Pan et al. 2003; Bock et al. 2007). Ancarani and Shankar (2004) show that for homogenous products such as books or music CDs the average price levels are lower for pure Internet retailers than for multichannel retailers if shipping costs are not considered, since pure Internet retailers tend to charge higher shipping costs. Venkatesan et al. (2007) explain that multichannel sellers charge higher prices than pure Internet players because they have stronger brand recognition and provide shoppers additional convenience in terms of being able to switch transaction channels in the pre-ordering to post-fulfillment phases, for example, ordering online and taking delivery offline at a nearby store. The advantages of multichannel retailers may define entry strategies in some online markets. For instance, Dinlersoz and Pereira (2007) show that early adopters in the clothing and apparel online markets are multichannel retailers because of synergies between online and offline stores and because the need for physical inspection of the product reinforces brand loyalty. Consequently, in these markets multichannel retailers benefit from both operational synergies and early movers advantage and may charge higher prices than pure Internet retailers. However, Dinlersoz and Pereira (2007) suggest that market entry of multichannel retailers will depend on

the demand elasticity of their offline customers. Low cost firms such as Charles Schwab, which have customers with more elastic demands, will have stronger incentives to move into the Internet compared to firms competing for consumers with more inelastic demands such as Merrill Lynch.

Nevertheless, there are some doubts related to the persistent effect of multi-channel strategies on online prices over time. Some papers suggest that the effect of multi-channel strategies on prices tends to disappear over time. The theoretical findings of Jeffers and Nault (2011) support this argument and suggest that for homogenous products and markets with low frictional costs, such as CDs, books or DVDs online markets, multichannel retailers entry into online markets will lead to the classic Bertrand Paradox in offline markets whereby offline retailer will charge prices equal to marginal costs because price competition in online markets spreads into offline channels. Sengupta and Wiggins (2012) find similar evidence in the online travel industry and show that while multichannel entry in Internet markets increases price competition in online markets, it does so to a greater extent in offline markets. Xing (2010) confirms that price differences between pure Internet sellers and multichannel sellers decrease in the long run and tend to disappear in DVD online markets. Yang et al. (2010) suggest that pure Internet toy sellers tend to replicate multichannel price strategies over time. Li et al. (2009) also confirm the relevance of multichannel retailers' brands on price dispersion but show that DVD prices of pure Internet retailers and click and mortar retailers decrease but do not converge over time in Australia. Venkatesan et al. (2007) explain that multichannel retailers' entry into online markets increases price competition because as the number of multichannel sellers in the market increases, there is less and less scope for service differentiation in terms of multichannel characteristics, thereby causing downward pressure on their prices.

Finally, online price competition may be the result of manufacturers' channel strategies. Yoo and Lee (2011) suggest that manufacturers will benefit from the introduction of an Internet store regardless of the level of vertical integration. Following a price discrimination strategy, manufacturers will push Internet prices downward while raising offline prices because they expect that the proportion of price hunters will be higher in online channels than in offline channels. Wolk and Ebling (2010) confirm this hypothesis empirically, showing that manufacturers with stronger brands and market power tend to compete in online markets with lower prices than in offline markets. In this setting, offline retailers reselling their products on the Internet will be forced by manufacturers to charge higher online prices than manufacturers or pure Internet sellers. Nevertheless, manufacturers' strategies will depend on the power distribution in channel structures. Carlton and Chevalier (2001) show that in the perfume and DVD player markets, manufacturers have strong market power and can control online distribution by establishing their own online shops, while in the appliances market retailers with strong market power prevent direct online sales by manufacturers. These authors find that multichannel retailers charge higher online prices than pure Internet players, while manufacturers selling online charge higher prices than retailers. They suggest that manufacturers charge high prices in online markets to avoid the risk of

cannibalizing traditional channels. Channel cannibalization seems to be real threat in some industries. For instance, Umit Kucuk and Maddux (2010) describe how online competition in the wallpaper industry reduced the incentives of multi-channel retailers to compete on price rather than on service quality. This situation decreased overall service quality and increased customer dissatisfaction, provoking the decline of the whole industry.

#### **4 Product Heterogeneity and Competition on the Internet**

Most of the research on price dispersion studies homogenous products. However, as already stressed by Bakos (1997), information search on product quality is a significant determinant of online price. Complex products such as cars or computers have more attributes to examine. Consumers will incur a higher cost to gain a particular level of understanding of complex product quality through online searching. Therefore, more complex products will imply higher quality uncertainty and greater search efforts. Overby and Jap (2009) confirm the argument that online buyers will be at a greater informational disadvantage for products of high quality uncertainty than those of low quality uncertainty and show that online buyers and sellers prefer to trade used cars with low quality uncertainty. The main effect of high quality uncertainty on Internet competition is that buyers tend to limit product search to brands, and therefore sellers with strong brands may charge higher prices. Lal and Sarvary (1999) show that when product quality uncertainty is high, consumers will limit their Internet search to the brands they know, increasing the likelihood of monopoly pricing. Huang et al. (2009) confirm that quality uncertainty limits product search also for experience goods, because quality evaluation of this category of products require increased cognitive effort. Pozzi (2012) also observes high search costs in online grocery shopping that limit consumers' search intensity and concentrate sales in a few sellers. Hortaçsu et al. (2009) observe that when there is risk of breach of contract, buyers on eBay prefer to limit search and purchase to products from sellers inside their metropolitan area. Baylis and Perlof (2002) observe in the market for electronics that moderate levels of search costs and quality uncertainty imply higher price dispersion and higher prices in online markets. Brynjolfsson et al. (2010) suggest that more intensive search may be motivated by a desire to locate products with attributes such as a good reputation or a strong brand as product quality signals, instead of just low price. Frequently, consumers have heterogeneous levels of quality uncertainty. In this case, online sellers will try to exploit this heterogeneity by establishing mixed pricing strategies and charging higher prices to uninformed customers as shown by Clemons et al. (2002) in the online travel market. Clay and Tay (2001) show that online prices are lower for bestsellers and higher for more rare books. Similarly, Baye et al. (2004a, b) find a slightly negative relationship between prices and product popularity. Marketing literature considers that when a large proportion of consumers are uninformed, using high prices as quality signals may be an efficient competitive strategy for high quality sellers (Bagwell and Riordan (1991).

The literature on online markets provides scant evidence to support this strategy. Recently, Ong and Zhong (2011) suggested that users of the Chinese online market TaoBao use prices to signal quality.

In some electronic markets with high levels of quality uncertainty, brands and prices are not efficient signals of product quality. These electronic markets are similar to Akerlof's "markets for lemons" where search yields poor results and high quality uncertainty push average prices downward and drives good quality products out of the market. This situation confirms recent theoretical models on search costs that suggest that lower search intensity is related to low prices (Waldeck 2008). According to these models, price levels are an inverted U-shaped function of search intensity with the highest levels of price associated with moderate levels of quality uncertainty. Overby and Jap (2009) provide empirical evidence of low prices in markets with high product market uncertainty and show that prices for cars with high quality uncertainty have a significant discount in online channels and that as a result sellers tend to present these cars in offline channels. Koppius et al. (2004) find that electronic flower markets entail a decrease in information about flower quality compared to the physical markets and consequently lower bids in flower auctions. Similarly, Dewan and Hsu (2004) show that because of the greater uncertainty of eBay markets, stamps are sold on eBay with an average discount of 10 % compared to the prices traded on specialty auction sites.

Product value is also related to online price competition. There is empirical evidence of an inverse relationship between product value and online search effort. Consumers' low willingness to search for alternative products of high value in a market builds on Weber's law of psychophysics (Grewal and Marmonstein 1994). Applied to consumer search effort, this law implies that the psychological utility that a consumer derives from saving a fixed amount of money through increased information search is inversely related to the price of the item. According to this assumption, consumers' searches will be less intensive for more expensive items in electronic markets and therefore prices will be higher. Pan et al. (2003) show differences in price competition between low value products (books, CDs and DVDs) and high value products (electronics). Ghose and Yao (2011) confirm the inverse relationship between product value and price competition in B2B markets. Lindsey-Mullikin and Grewal (2006) show a similar relationship between price competition and the mean price of VCR, televisions and other electronics. Lower price competition for higher value products can also be explained by higher frictional costs (Hann and Terwiesch 2003), especially those related to waiting costs (Longinova 2009), or higher quality uncertainty since value and product complexity may be correlated (Popkowski Leszczyc et al. 2009).

## 5 Conclusions and Future Research

Price competition in Internet markets has been a subject of much debate in the literature. While different models have explained discrete aspects of price competition, there have been fewer empirical studies focusing on retailers' strategies to

counterbalance the increased market power of consumers in electronic markets. To overcome this problem, this chapter has integrated the economics, operations research and marketing literature into a single framework based on the three main assumptions of Bertrand model of price competition.

Retailers can establish price discrimination strategies to leverage the heterogeneity of online consumers' cost information. Differences between countries in Internet access costs may allow vendors to integrate geographical price discrimination strategies into their international expansion strategies. In this case, sellers can charge higher prices in those countries where consumers have lower rates of Internet access. Moreover, retailers may be able to design their sites to trigger mechanisms that increase switching costs from one site to another. The literature review shows that the strategy of price discrimination can also be supported in the different waiting costs consumers incur, charging higher prices to consumers with higher waiting costs.

The versatility of the Internet as a communication tool allows retailers to develop information obfuscation strategies that increase information costs. The literature in this field shows how retailers try to increase consumers' information costs through the use of HI-LO pricing strategies, continuous changes in prices or the obfuscation of information related to product characteristics or shipping.

Regarding the relationship between entry strategies in electronic marketplaces and search costs, the literature indicates that the entry of competitors into online markets increases competition if online consumers and retailers are able to reduce information search and information communication costs respectively. Therefore, the relationship between the number of competitors and price competition for homogeneous goods seems more in line with the Varian (1980) and Baye et al. (2004a, b) models in which the electronic market has an influence on information costs and thus alters the proportion of loyal customers versus the proportion of shoppers in the market. However, if electronic markets do not affect these information costs and as a result the ratio of loyal customers and shoppers remains constant, the Rosenthal (1980) model seems to offer a better explanation of the impact of a growing number of retailers on price competition. Therefore, in markets with heterogeneous product it is more probable that a growing number of competitors will not cause such a dramatic increase in competition. Nevertheless, the empirical literature on online markets suggests that Rosenthal's model (1980) will work fine as long as the number of competitors adopting differentiation strategies is limited. As the number of retailers with differentiation strategies increases, the differentiation advantage seems to dissolve and price competition seems to increase. So far, the literature provides initial evidence that price competition is fierce in markets with a large number of retailers with intensive brand advertising, with multichannel strategies or with good customer reviews. In fact, recent literature suggests that some differentiation strategies of online retailers have limited effects over time. Therefore, the study of the degree of inimitability of retailers' differentiation strategies should be a fruitful field of research. For instance, brand differentiation strategies of online retailers rely on superior service, early market entry or offline brands. The literature appears to provide some initial

evidence that early movers can enjoy a permanent advantage in online markets, while offline brand or service advantages are more temporary. The limited effect of service differentiation explains why incumbent retailers in online markets tend to adopt EDLP pricing strategies combined with not particularly high service quality, while new entrants adopt penetration strategies characterized by the combination of HI-LO pricing strategies and high quality service. Moreover, it seems that consumer elasticity is higher for the product component than for the service component, and that companies with EDLP strategies tend to charge higher shipping costs in order to offset lower product margins.

The literature also suggests that the operational advantages of multichannel retailers tend to fade over time as the number of multichannel retailers and the operational efficiency and reputation of pure Internet players increase. However, these operational advantages are a significant entry barrier for pure Internet players especially in markets with higher costs of information. Therefore, multichannel retailers may profit from early mover advantages in markets of heterogeneous products. A relatively new and unknown element in the analysis of online price competition is vertical channel coordination. Initial evidence and theory suggest that retailers in decentralized channels may benefit from higher prices only if manufacturers have very limited market power.

Finally, information costs in electronic markets for complex, rare or high value products are higher and allow retailers with strong brands or premium service to enjoy a sustainable advantage. However, high levels of information costs may not be desirable for online retailers, as they may expel high quality retailers from the market and force price competition among low quality retailers.

This chapter has shown that online retailers often escape the law of one price. Information costs are still significant in many electronic markets and differentiation strategies can confer advantages to online retailers that persist over time. It is clear that this field of study remains in its early stages and there are still many promising lines for future research. First, while most of the empirical evidence comes from research on U.S. markets, evidence from other countries raises doubts about some of the conclusions reached thus far. Therefore, future research should systematically address the roots for these differences in online markets. For example, it would be really interesting to look at how electronic markets emerge and grow in developing countries. Second, little research has been done on the relationship between functionality, switching costs for consumers and price competition. While it seems obvious that higher switching costs will ease price competition, the most effective mechanisms for raising these switching costs remain unknown. Also the literature on information obfuscation strategies in online markets is at an early stage. While Ellison and Ellison (2009) provide an interesting starting point for this challenge, the Internet allows for a wide range of strategies, many of which have not benefited from much study and remain unknown to retailers. Third, it would be interesting to delve into the temporary nature of differentiation advantages and to understand what differentiation strategies are more sustainable than others in online markets. Given the relevance of customer reviews on Internet markets, the relationship between brand identity,



reputation and customer reviews remains unclear. More precisely, future research should clarify the mixed evidence on the impact of customer reviews on prices and the complementary or substitution relationship between brand identity and online reputation. Regarding pricing strategies there is insufficient evidence on the effectiveness of prices as quality signals in online markets. Furthermore, the evidence on random price strategies in Internet markets is mixed and provides different and sometimes contradictory explanations. In this regard, it is unclear whether random pricing is the result of obfuscation strategies, price discrimination strategies or simply the bounded rationality of retailers who must make continuous adjustments to prices because they know the actual demand elasticity. Finally, future research should clarify the impact of EDLP and HI-LO pricing strategies on online retailers' profitability.

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