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2000

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Sivakumar Viswanathan
New York University, sviswana@stern.nyu.edu

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Sivakumar Viswanathan
Information Systems Department, Leonard N. Stern School of Business, New York University,
44, West 4th Street, NY, NY-10012. {sviswana@stern.nyu.edu; fax-212-995-4228}

Abstract

This paper attempts to model the strategic interaction between firms in online and traditional markets. It analyzes how each market affects the competitive characteristics of the other. Existing research on electronic markets has focused largely on their welfare-enhancing features. However, electronic markets coexist with traditional markets with each strongly influencing the other. Results show that the profits of firms in competing channels increase as they differentiate themselves as much as possible from each other, and by differentiating themselves based on the characteristics over which consumers have the maximum variety in relative valuations. The choice of the factors of differentiation, however, is crucial, as are the relative sizes of the online and offline markets. The results also indicate that neglecting the impact of traditional markets on online firms risks oversimplification, and might lead to incorrect prescriptions to both offline and online firms.

1. Motivation and Research Questions

"*As demand for eSchwab's $29.95 online trades was booming beyond expectations, customers with Charles Schwab's traditional brokerage still had to pay an average of $65 per trade. The two-tiered pricing was awkward. Soon Schwab decided to price all trades at $29.95, thus adopting the same pricing strategy both online and off.*" - "Internet Defense Strategy- Cannibalize Yourself", Fortune, Sep., 1999.

Online retailing has been growing rapidly, and is soon predicted to account for a significant portion of the overall retail revenues. Given the explosive growth of online markets, there have been claims that Internet retailing would displace traditional firms and markets in several sectors. As a retailing channel, the Web differs significantly from traditional channels in several ways. It offers convenient access, wider variety, and ease of search/comparison. Consumers who value such features prefer shopping online. However, a large number of consumers prefer shopping via traditional channels. Overall, therefore, a more realistic scenario is one where both online and traditional firms co-exist, competing either for an overlapping set of consumers, or serving orthogonal segments. With more and more traditional firms beginning to realize the potential of online retailing, there has been a surge in the number of hybrid firms operating in both domains. According to recent surveys by Media Metrix and Nielsen, the lists of 50 top online retailing sites read like a Who's Who of land-based retailing. Gap.com, eSchwab, JCPenney.com, Wal-Mart.com and Barnesandnoble.com were among the hybrid firms that made the grade.

One of the serious challenges faced by traditional firms moving online is the issue of integrating their online strategies with their traditional operations. Since online markets are characterized by severe price competition, traditional firms that move online are forced to match their competitors' prices, and this can conflict with their pricing strategies offline. As illustrated by the quote above, Charles Schwab was forced to adopt the same pricing strategy both online and off. Wal-Mart, Home Depot, Electronics Boutique and Circuit City are examples of some other firms that have streamlined their traditional operations to be in sync with their online operations.

With more and more traditional firms moving online, Web-based markets and traditional markets are no longer isolated but strongly influence one another. The fact that online markets coexist with and compete with firms in traditional markets has been largely overlooked in the research literature. Most of the existing research on electronic commerce (for instance, see Bakos,1997, Brynjolfsson and Smith,1999; Bakos et al.,1999) that has focused on studying the efficiency of electronic markets, has neglected this strategic interaction between firms operating in the two domains.

This research seeks to address this issue by analyzing the impact of Internet retailing on traditional brick-and-mortar firms. More specifically, it seeks to examine how the strategic interaction between online, traditional as well as hybrid firms which have a presence in both markets, impact competitive outcomes in both markets. The differences between online and traditional channels, makes this issue more interesting. A spatial differentiation model (Hotelling 1929, Salop 1979) is constructed to examine the impact of the interactions between these two markets. The features of the equilibrium configurations and its sensitivity to various parameters are also analyzed. Finally, the welfare implications of this model are compared with the benchmark case where the online markets are independent of traditional markets.

2. A Model of Competition between Online and Offline Firms

In this model the online and traditional markets are each represented by a unit circle. There are three types of firms – pure online firms located wholly online,

traditional 'brick-and-mortar' firms located wholly offline, and hybrid firms with presence in both markets. Each firm *i* sells a commodity product and charges a price p_i. While the products themselves are commodities, the firms innovate on features of the buying experience associated with the products. Examples of such features include product comparison and evaluation information, pre-purchase help and support (perhaps from a live salesperson), product layout in the store, ease of purchase (for instance, one-click ordering), immediacy of delivery, customer service and after-sale support. It is precisely these channel-related features, and aspects of the buying experience that separates competing online and traditional firms (Steinfield and Whitten, 1999).

Consumers are utility-maximizers and each consumer is in the market for one unit of a product in each period. Consumers have single-peaked preferences over the heterogeneous features of the channel. For instance, some consumers may want to 'feel' the product prior to purchase, and have a salesperson inform them about relative product characteristics, while others may prefer browsing and studying products themselves on the Web. Thus, each consumer has an ideal configuration of channel-related features (for instance, active salesperson involvement, immediate delivery and a three-year warranty) that gives her the highest utility and the consumer incurs a loss of utility when she buys from a firm other than her ideal one. This is referred to as the *misfit cost*.

Consumers are uniformly distributed on each unit circle according to the position of the peak of their utility functions. Seller choices of channel-related features are differentiated along the same dimension. Consumers are assumed to have a high reservation price ř, relative to their total costs, which ensures that all firms are in direct competition and that all consumers in the market buy a differentiated product (Economides, 1989). Given the utility functions, the problem of utility maximization for consumers is equivalent to cost minimization where the costs to the consumer includes the price that she pays for her product added to the misfit cost. Firms choose strategies that maximize their profits and each firm decides the choice of its location and price, given the location and price of the other firms in its market. Firms play a two-stage game, with firms simultaneously choosing locations in the first stage followed by a simultaneous choice of prices in the second stage. The equilibrium for the two-stage game in prices and locations are derived.

3. Analysis and Discussion

This sections analyzes the simplest case where there is one firm of each type in each market – firm a, in market A, firm b, in market B, and firm h, the hybrid firm. The initial model assumes that consumers are either online or offline and consumers in each market purchase products only from firms in their market. The hybrid firm prices identically in both markets. These constraints are later relaxed to examine the implications of consumers switching across markets, as well as the implications of the hybrid firm being able to price discriminate across markets.

At equilibrium the firms locate opposite each other in the unit circle and each firm's price takes into consideration the price of the other firm (firm h) in its market. However, the hybrid firm, by virtue of being present in both markets, takes into consideration the prices of firms in both markets in choosing its price. The hybrid firm always prices between the prices of the pure online firm and the brick-and-mortar firm. Also, the firm in the market with the higher misfit costs, prices the highest, while the firm in the market with the lower misfit costs prices the lowest of the three (see figure 1). As consumers' disutility from buying a product other than their ideal one, increases, firms are able to charge a higher price. However, in the market in which consumers find the two firm's products to be relatively close substitutes (i.e., the market with lower misfit costs), the firms are forced to maintain lower prices.

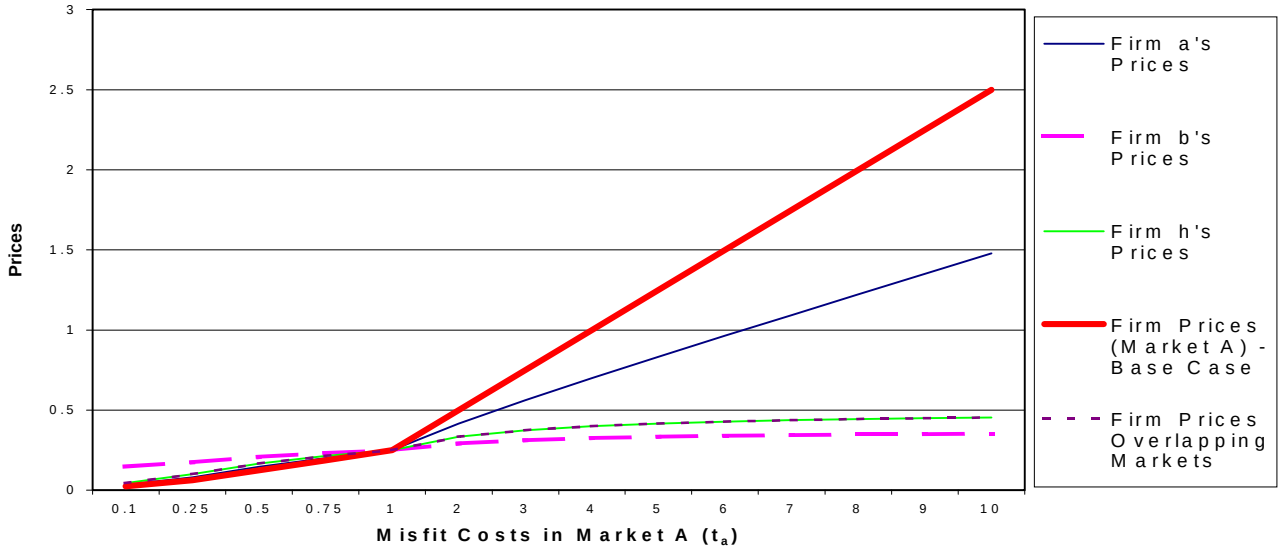
Figure 1 illustrates the impact of varying parameters (misfit costs in market A) on firm prices. As consumers in market A become more sensitive to the channel-related differences and suffer a greater loss of utility from mismatch, both the firms in that market (firm **a** as well as the hybrid firm) have an incentive to raise prices. However, the hybrid firm by virtue of being present both online as well as offline, is more sensitive to the competitive conditions in its other market as well and hence is limited by the characteristics of that market. Thus although the hybrid firm would rather price higher in the less competitive market, it has to take into consideration the competition in its other market (market B) in setting its price. As illustrated in figure 1, a firm (firm b) wholly inside one market is forced to react to changes in the competitive conditions in the other market despite no direct changes in the features of its own market (market B).

Thus, despite the fact that the pure online and the traditional firms do not compete for the same set of consumers, the presence of the hybrid firm reacting to competitive conditions in both the markets, introduces strategic interdependence between these two firms. The relative sizes of the two markets (as indicated by the number of consumers in each market - n_a, n_b) also affects the prices and profits of the firms in each market. As the online market grows in size relative to the traditional market, the online market begins to gain more importance and has a greater influence on the prices of the hybrid and online firm.

Base Case - To examine the impact of the presence of the hybrid firm in both markets, this is compared with the

base case where there is no 'hybrid' firm and the two markets are independent of each other. This is identical to the case where the hybrid firm is able to price discriminate across markets. Comparison with the base case helps us understand how the presence of the hybrid firm alters the competitive characteristics of the two markets at equilibrium. As illustrated in figure 1, when the markets are completely independent, the firms have an incentive to charge a higher price and thereby lowering net consumer welfare.

Figure 1 - Firm Prices with Varying Misfit Costs in Market A ($n_a = n_b = 1$; $t_b = 1$)



Overlapping Markets – It was initially assumed that consumers in each market purchase only from firms in their own market. However, as acknowledged earlier online markets and offline markets increasingly compete for the same set of consumers in many segments and consumers may access both markets. In other words, as the degree of overlap between the two markets increase, consumers in one market have increasing access to firms in the other market. As consumers from one market purchase products from the other market, they face a switching cost. In the limit, when the switching costs for consumers is zero, i.e., when the two markets completely overlap, all the firms charge the same price. This price is the same as the price charged by the hybrid firm when the two markets are interdependent (see figure 1).

4. Conclusion and Further Extensions

The results indicate that the prices and the total profits for all three firms are the highest when the two markets are completely independent and the prices and total profits are the lowest when the two markets overlap completely. The prices and the total profits for all firms, when the markets exhibit strategic interdependence due to the presence of the hybrid firm, fall in between these two extremes. In summary,

- The efficiency and competitive characteristics of online markets are significantly altered due to competition from traditional and hybrid firms.
- When online markets are more competitive than traditional markets and consumers differ in their channel preferences, offline firms may well be best served by specializing in, and highlighting their real-world strengths, rather than a hybrid online-offline strategy.
- However, when online markets are growing relative to offline markets, traditional firms may benefit by moving online and adopting a hybrid strategy.
- Neglecting the interdependence between online and traditional markets and the role of the hybrid firms provides a misleading picture and may lead to overestimating the efficiency and welfare-enhancing properties of online markets.

Future extensions include incorporating other pertinent differences between online and traditional markets, such as search costs and network externalities, and analyzing the impact of additional hybrid firms on the equilibrium characteristics of the model.

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