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COMPETITION ACROSS CHANNELS: DO ELECTRONIC MARKETS COMPLEMENT OR CANNIBALIZE TRADITIONAL RETAILERS?

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Abstract

Existing research on electronic markets has focused largely on analyzing their efficiency and welfare-enhancing properties, treating these markets as isolated entities. In reality, however, electronic markets coexist with traditional, land-based firms. They compete not only with similar rivals, but also with firms with different competencies, information technology, channel characteristics, and business cultures. The interaction between these different firms involves complex and interesting competitive dynamics, which cannot be captured by isolated models of electronic markets.

This paper models competition between firms that sell their products purely through electronic channels, firms whose primary retailing outlets are traditional land-based channels, and hybrid firms—those selling both off-line and online. A game-theoretic spatial differentiation model is used to analyze the impact of the coexistence of new, emerging technology-driven distribution channels with conventional retail channels, and the possible strategic interactions between these two vastly different retail environments. The features of market equilibria, and their sensitivity to different technological and channel parameters are studied, and the results of the model are compared with the benchmark case where the electronic markets are independent of traditional markets.

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 offline, online, and hybrid firms.

Keywords: Economic theory, electronic markets, electronic commerce, marketing channels

1. INTRODUCTION

*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. ["Cannibalize Yourself," *Fortune*, September 1999]*

Recently, there has been a significant increase in the number of firms attempting to reconcile their traditional operations with their own nascent online initiatives, and with intense competition from emerging Internet "pure-plays" (Gulati and Garino 2000). Recent surveys by Media Metrix and Nielsen indicate that the lists of top online retailing sites include a number of giants from land-based retailing such as Gap, Schwab, JCPenney, Wal-Mart and Barnes & Noble. As more and more traditional firms move online, online and offline channels are no longer isolated; clearly, they influence one another significantly, but it is still not clear whether they reinforce one another's value, or are merely substitutes for specific consumer segments. The fact that firms in the online channel coexist and compete with firms in traditional channels has not been explicitly studied in the existing research

literature. While researchers in marketing (Coughlan 1985; Zusman and Etgar 1981) have primarily studied traditional distribution channels, most research on electronic commerce (for instance, see Bakos 1997; Bakos et al. 1999; Brynjolfsson and Smith 1999) has focused on studying the efficiency of electronic markets rather than the strategic interaction between firms operating in either, or both, of these.

This research attempts to shed light on this serious challenge faced by traditional firms—the issue of balancing their online and off-line strategies. Since the online channel is characterized by intense price competition, traditional firms that move online are forced to match their competitors' prices, and this can conflict with their pricing strategies off-line. Beyond pricing, differences in channel and consumer characteristics make this balancing act a problem of significant complexity. For instance, Charles Schwab, Gap, Wal-Mart, Home Depot, Electronics Boutique, and Circuit City are examples of *hybrid* firms that have successfully synchronized their pricing strategies and/or operations across these two channels. On the other hand, firms like Levi Strauss, CompUSA, and Best Buy have either pulled back/delayed their online efforts, or attempted to separate their online and land-based channels. Other firms, like EggHead.com, have abandoned their traditional outlets in favor of a purely Internet-based retailing strategy. This research seeks to answer the following questions:

- What are the implications of the interactions between online, traditional, and hybrid firms for the positioning and pricing strategies of the firm as well as for consumer welfare? How do the significant differences between the two channels, such as personalization, network externalities, and market lock-in features, affect the competitive outcomes in both channels?
- What is the optimal time of adoption and the optimal channel configuration for a traditional firm seeking to adopt online retailing and what is their sensitivity to the parameters of interest?
- What is the impact of the various product, firm, and industry-related factors on the value-added by online retailing?

The first part of this study involves analyzing a spatial differentiation model (Cooper 1989; Salop 1979) to examine the impact of the interactions between pricing and demand in these two channels; this model and some preliminary results from the initial phase of this research are outlined in this summary. Ongoing work involves enriching this model to take into account the dynamic aspects of channel conflict and complementarity, focusing on the issues of timing, technology, and operational integration, and the “make-vs.-buy” aspects of launching an Internet-based store-front. The model will also be tested empirically using a targeted data set, the bulk (covering online efforts by traditional firms in 1998 and 1999) of the data collection and validation for this part of the study being complete.

2. OVERVIEW OF THE MODEL

Each channel—the online as well as the off-line channel—is represented by a unit circle. Firm *a*, the traditional “brick and mortar” firm is located in channel *A* and firm *b*, the pure Internet firm is located in channel *B*, while firm *h*, the hybrid firm has a presence in both channels—online as well as off-line (see Figure 1).

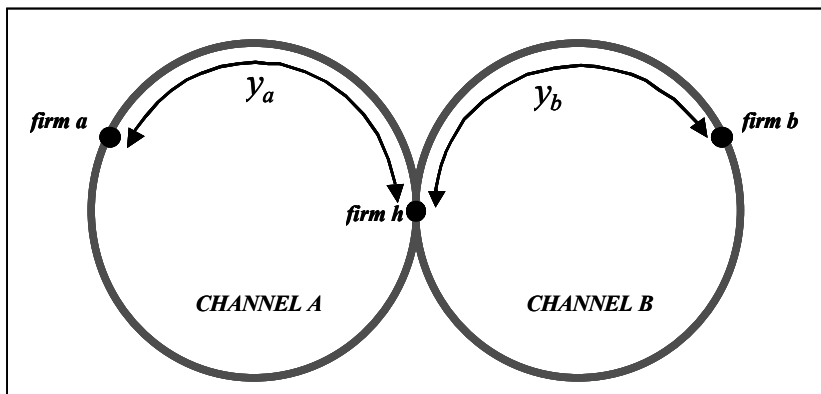


Figure 1. Model of the Channels

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 systems, 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 separate the competing offerings of online and traditional firms.

Consumers are utility-maximizers and each consumer is in the market for one unit of a product in each period. Each consumer has an

ideal configuration of channel-related features (for instance, active salesperson involvement, detailed customer reviews/feedback and immediate delivery) that gives her the highest utility. 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. 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. The number of consumers per unit distance in the traditional channel (channel *A*) is n_A , while the number of consumers per unit distance in the online channel (channel *B*) is n_B . Consumers are assumed to have a high reservation price r , in comparison with their total costs, which ensures that all firms are in direct competition and that all consumers in the channel buy a differentiated product (Economides 1989).

The consumer incurs a loss of utility when she buys from a firm other than her *ideal* one. This is referred to as the *channel misfit* cost. This model assumes quadratic channel misfit costs. So a consumer in channel *I* incurs a channel misfit cost equal to $t_I x^2$ for a product located x units away from her *ideal* product in that channel. A consumer in channel *I* who purchases a product from firm i at a price p_i , located at a distance x from her ideal product faces a utility function given by,

$$U_i = r - p_i - t_I(x)^2$$

Given the utility functions, the problem of utility maximization for consumers is equivalent to cost minimization, where the cost to the consumer is the sum of the price that she pays for her product and the channel misfit cost. Firms choose pricing strategies that maximize their profit functions. Each firm decides the choice of its location and price, given the location and price of the other firms in its channel.

Firms play a two-stage game, where firms simultaneously choose locations in the first stage followed by a simultaneous choice of prices in the second stage. The unique equilibrium for the two-stage game in prices and locations are derived. Detailed mathematical analysis and equilibrium solutions are available in a separate technical appendix. This paper analyzes the case where there is one firm of each type in each channel—firm a , in channel *A*, firm b , in channel *B*, and firm h , the hybrid firm. The initial model assumes that consumers are either online or off-line and consumers in each channel purchase products only from firms in their channel. This implies that the online channel and the traditional channel cater to different segments of consumers with differing needs. The hybrid firm prices identically in both channels. These constraints are later relaxed to examine the implications of consumers switching across channels, and the implications of the hybrid firm price discriminating across channels.

3. SUMMARY OF RESULTS AND DISCUSSION

At equilibrium, the firms choose to locate opposite each other in their channels and the optimal prices at equilibrium for the three firms are given by

$$p_a^* = \frac{t_a[2n_A t_B + n_B(t_A + t_B)]}{8[n_B t_A + n_A t_B]} \quad (1.1)$$

$$p_b^* = \frac{t_B[2n_B t_A + n_A(t_A + t_B)]}{8[n_B t_A + n_A t_B]} \quad (1.2)$$

$$p_h^* = \frac{t_A t_B (n_A + n_B)}{4[n_B t_A + n_A t_B]} \quad (1.3)$$

The optimal profits for firms a , b , and h are found to be

$$\pi_a^* = \frac{n_A t_A [2n_A t_B + n_B(t_A + t_B)]^2}{32[n_B t_A + n_A t_B]^2} \quad (1.4)$$

$$\pi_b^* = \frac{n_B t_B [2n_A t_B + n_B(t_A + t_B)]^2}{32[n_B t_A + n_A t_B]^2} \quad (1.5)$$

$$\pi_h^* = \frac{t_A t_B (n_A + n_B)^2}{8[n_B t_A + n_A t_B]} \quad (1.6)$$

Some preliminary results are evident from the above expressions:

- Competition between firms in one channel spills over to the other channel. A firm wholly inside one channel is forced to react to changes in the competitive conditions in the other channel, despite no direct changes in the features of its own channel.
- While each firm's price takes into consideration just the price of the other firm (firm h) in its channel, the hybrid firm, by virtue of being present in both channels, has to take into consideration the prices of firms in both channels in choosing its price.
- The hybrid firm always prices between the prices of the pure online firm and the off-line firm (see Figures 2 and 4).
- The firm in the channel that facilitates greater personalization and "market lock-in" prices the highest (see Figure 2 and 4).
- As consumers' disutility from buying a product other than their ideal one increases, firms are able to charge a higher price. However, in the channel in which consumers find the two firm's products to be relatively close substitutes (i.e., where channel-related differentiation is lower), the firms are forced to maintain lower prices.

Figure 2 illustrates the impact of varying misfit costs in channel B on firm prices. As consumers in the online channel (B) become more sensitive to the differences among the online firm and the hybrid firm, both the firms in that channel have an incentive to raise prices. However, the hybrid firm, due to its presence in both channels, is more sensitive to the competitive conditions in its other channel as well and hence is limited by the characteristics of that channel. Although the hybrid firm would rather price higher in the channel that facilitates greater personalization and "market lock-in," it has to take into consideration the features and competitive conditions of the other channel in setting its price.

- The relative sizes of the two markets, as indicated by the number of consumers in each channel (n_A and n_B), also affects the prices and profits of the firms in each channel.
- As the channel offerings in one market become more personalized and differentiated, *all* firms tend to price higher. However, the greater the difference in the sizes of the two markets, the lower the prices of all firms (see Figure 2 and 4). Also, as the online market grows in size relative to the traditional market, the online channel has a greater influence on the prices of the hybrid and the online firm (see Figure 4).
- The profits of the online firm increase with the increase in the size of the online market. However, the profits of the hybrid and the traditional firm (firm a) decrease, with the hybrid firm always making the highest profits.
- The channel-specific differences have a greater impact on the firm's prices while the relative sizes of the markets have a greater impact on the firm profits.

To examine the impact of the presence of the hybrid firm, the above case is compared with the base case where there is no hybrid firm and the two channels 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 2, the results indicate that when the channels are independent, the firms have an incentive to charge a higher price, thereby lowering net consumer welfare.

- In the base case, both the firms in each channel charge a higher price and make higher profits than in the case of interdependent channels, as illustrated in Figure 2 and 3.
- As the channel differentiation and market lock-in of the online channel increases relative to the traditional channel, the presence of the hybrid firm lowers *total* firm profits significantly. The total price charged by all firms is also lower in the case of interdependent channels, implying a greater consumer surplus than in the base case with isolated channels (see Figure 2).
- As the online market grows, the online channel becomes more important than the traditional channel for the hybrid firm. With the traditional channel beginning to lose significance, the hybrid firm and the pure online firm (firm b) tend to price closer to the price in the base case.

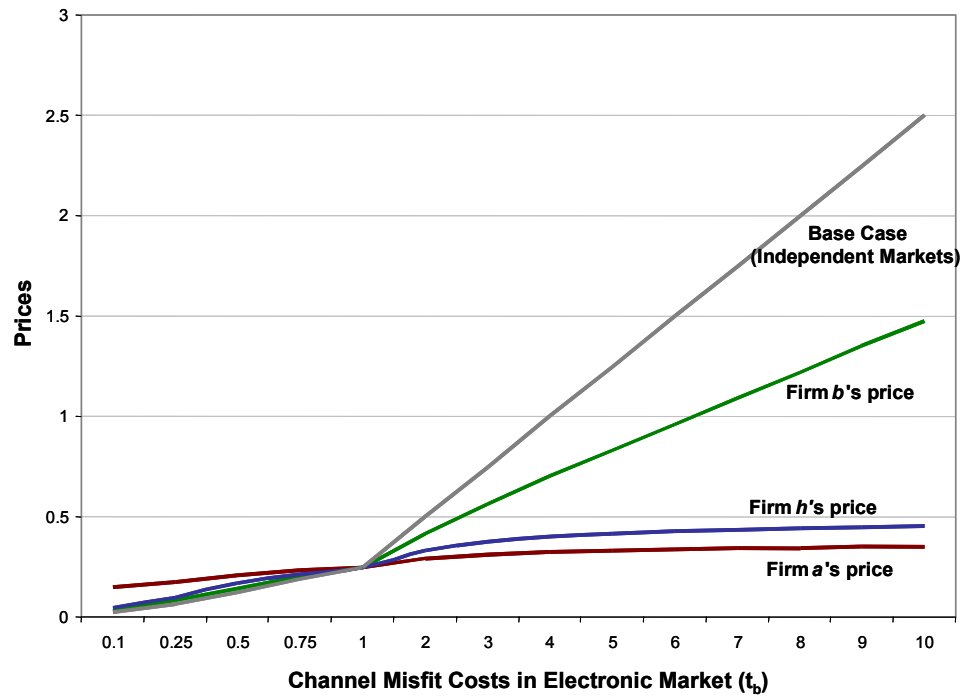


Figure 2. Firm Prices with Varying Channel Misfit Costs in Electronic Market
($n_A = n_B = 1$; $t_A = 1$)

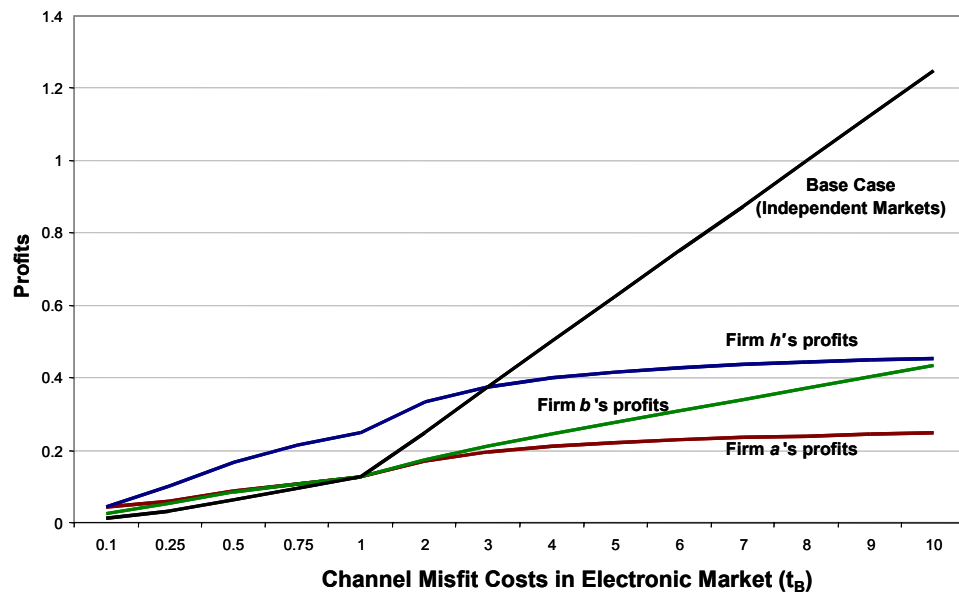


Figure 3. Firm Profits with Varying Channel Misfit Costs in Electronic Market
($n_A = 1$; $n_B = 1$; $t_A = 1$)

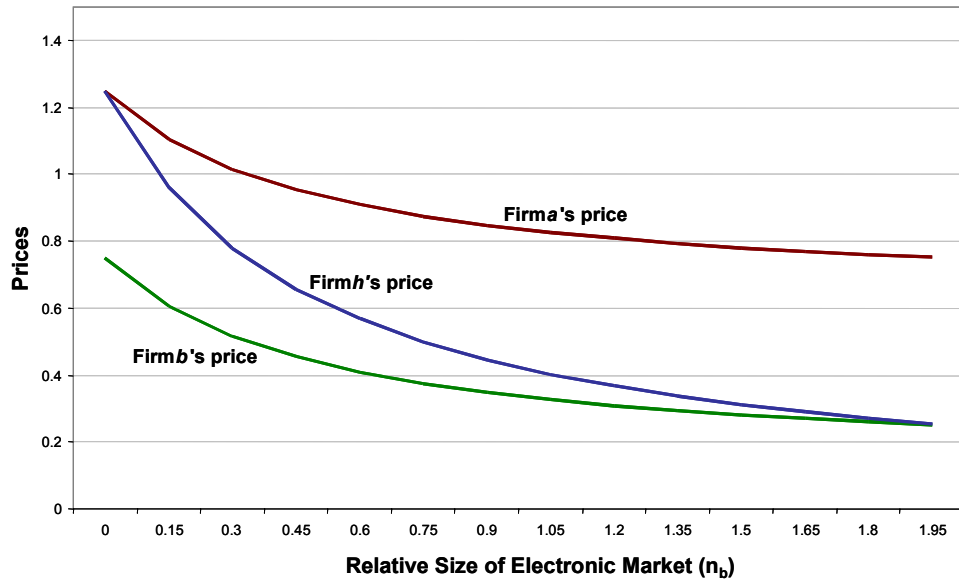


Figure 4. Firm Prices with Varying Market Sizes
 $(n_A = 2 - n_B; t_A = 5; t_B = 1)$

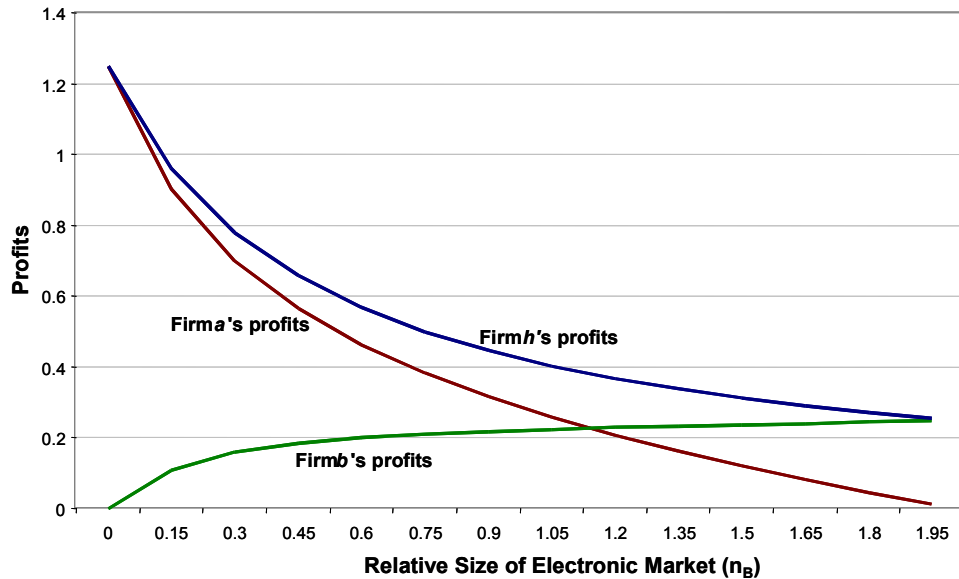


Figure 5. Firm Profits with Varying Market Sizes
 $(n_A = 2 - n_B; t_A = 5; t_B = 1)$

4. FUTURE EXTENSIONS AND CONCLUSION

Online channels and traditional channels increasingly compete for the same set of consumers in many segments, and consumers may actually make buying choices across both markets. This suggests an overlap between the two markets. As consumers from one channel purchase products from the other channel, they face a switching cost. The above model is enriched to incorporate this aspect. Preliminary results indicate that, at the limit, when the switching cost for consumers is zero, i.e., when the two channels completely overlap, all the firms charge the same price—the optimal price charged by the hybrid firm when the two channels are interdependent. The results also indicate that the prices and the total profits for all three firms, when the channels exhibit strategic interdependence due to the presence of the hybrid firm, fall in between the case where the two channels are

completely independent and the case where the two channels overlap completely. Ongoing work involves extending the current model to include other pertinent differences between online and traditional channels, such as search and inspection costs and network externalities.

In summary, the efficiency and competitive characteristics of the online channel are significantly altered due to competition from traditional and hybrid firms. Also,

- When channel-related differentiation and market lock-in features of the online channel differ from that of the traditional channel and consumers differ in their channel preferences, off-line firms may well be best served by specializing and highlighting their real-world strengths, rather than a hybrid online-off-line strategy.
- However, when online markets are growing relative to off-line markets, traditional firms may benefit by moving online and adopting a hybrid strategy.
- Neglecting the interdependence between online and traditional channels and the role of the hybrid firms provides a misleading picture and may lead to overestimating the efficiency and the welfare-enhancing properties of online channels.

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