

The Competitiveness of On-Line vis-a-vis Conventional Retailing

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Abstract

Previous research has directly studied whether on-line retailing is more competitive than conventional retail markets. The evidence from books and music CDs is mixed. The direct approach suffers from several key shortcomings. Here, we focus on the underlying competitive barriers and use an *indirect* approach to compare the extent of barriers in on-line as compared with conventional markets. Supposing that the costs to customers of switching bookstores are lower in on-line than conventional channels, we prove theoretically that the discounts on bestsellers would be *relatively* smaller in on-line channels. The empirical tests provide some evidence in support of this hypothesis.

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1. Introduction

Pricing is a key issue in both conventional and on-line retail channels. Indeed, pricing may be the most important differentiator between the two channels. On-line retailers are claimed to enjoy lower costs than their bricks-and-mortar counterparts, and hence can offer lower prices. *Business Week* columnist Robert Kuttner asserted that the Internet would reduce markets to the economist's model of perfect competition:

"The Internet is a nearly perfect market because information is instantaneous and buyers can compare the offerings of sellers worldwide. The result is fierce price competition, dwindling product differentiation, and vanishing brand loyalty."¹

Superficially, however, on-line markets appear to be much less competitive than conventional markets. In conventional book retailing, the largest chain Barnes and Noble has less than a 30% share of the market. By contrast, the market share of the largest on-line book retailer Amazon exceeds 70%.

Considerable work has focused on comparing prices in on-line channels with those in conventional stores. Brynjolfsson and Smith (2000) found that on-line retailers of books and music CDs set prices that were 9-16% lower than conventional retailers, and that on-line retailers made price adjustments that were up to 100 times smaller than those of conventional stores.

Other evidence on the degree of competition in on-line retailing, however, is not clear. On-line retailers of books and music CDs do not always exhibit lower dispersion of prices than their conventional counterparts (Smith, Bailey, and Brynjolfsson (1999)).

Brynjolfsson and Smith (2000) directly compared prices at on-line and conventional stores. The conclusions from direct comparisons, however, are subject to significant limitations. For instance, calculation of the full cost of a book to a buyer requires assumptions about the cost of the time incurred in traveling to and from conventional stores, and the shipment charges incurred by those shopping at on-line retailers. Further, the direct price comparison ignores differences in the benefits provided by conventional as compared with on-line retailers. A conventional bookstore provides a place for like-minded people to meet and socialize, while an on-line retailer may be more convenient for people sending books as gifts.²

¹ Robert Kuttner, "The Net: A Market Too Perfect for Profits", *Business Week*, May 11, 1998, page 20.

² At the wholesale level, McKeown, Watson, and Zinkhan (2000) find that car dealers pay more at on-line than conventional auctions. The price difference is consistent with differences in benefits

Moreover, a direct price comparison doesn't necessarily address the degree of competition: on-line retailers may set lower prices, but, owing to lower costs, they may enjoy higher *margins*. It is margins, and not prices per se, that reflect the degree of competition. The evidence on price dispersion is also not conclusive. Low dispersion of prices among competing retailers is consistent with both perfect competition as well as a very effective price cartel.

Further, an on-line channel may increase the accessibility of not only information about price, but also information about other product attributes (Alba et.al. (1997), Bakos (1997), Ariely and Lynch (2000)). To the extent that on-line retailing provides relatively better access to information about *non-price* attributes, buyers may be *less* price-sensitive and hence, prices will be higher.

In this paper, we use an indirect approach to measure the degree of competition in on-line markets. Like previous scholars, we focus on the retailing of books. Amazon was the first major success in on-line retailing. Presumably, business practices in on-line retailing are relatively more established in books as compared with other categories. This suggests that on-line retailing of books will be more amenable to systematic study.

The indirect approach emphasizes the underlying determinants of competition rather than prices as such. We focus on how changes in competitive conditions would affect the relative pricing of bestsellers to other titles. By considering *relative* pricing within a market (either conventional or on-line), we control for traveling cost and shipment charges, and differences in the relative benefits provided by conventional and on-line retailers, and in their costs.

Specifically, we identify three barriers to competition – fixed costs of supply, costs to buyers of switching among stores, and costs to buyers of searching for book titles. Our theoretical analysis shows that each of these barriers implies that bookstores will offer larger discounts on bestsellers than other titles. Further, our analysis shows that, if these barriers are lower in on-line markets, then bestseller discounts would be smaller in on-line than conventional markets.

Owing to limitations of our data, we were only able to effectively test the hypothesis that buyer search costs are lower in on-line channels. The results provide some evidence in favor of the hypothesis, hence confirming that barriers to competition are lower in on-line than conventional markets.

provided by the two channels.

2. Conventional Bookstore Pricing

Books differ from many other goods in that they are marked with a list price at the point of manufacture. Bookstores set prices not in absolute dollar terms, but rather in terms of discounts from list price.³ In common with other retailers, bookstores engage in a variety of pricing strategies, including loyalty programs, coupons, and clearance sales.

Bookstores stand out from other retailers in one respect. They systematically charge *lower* prices for their *most popular* items. Specifically, bookstores offer *larger* discounts on current bestsellers than titles not on the bestseller list. For instance, Barnes & Noble sets a 40% discount on all titles on its bestseller list, but no discount on most other titles. B. Dalton, which belongs to the same group but whose stores are much smaller, sets a 15-25% discount on selected hardcover bestsellers, and no discounts on other titles.

The pricing strategy of independent bookstores is quite different from that of the large chains. Generally, independent stores offer much smaller discounts, if any, on bestsellers. For instance, Majerek's, a small Indiana chain, does not offer discounts on any book.

On first impression, it seems odd for a bookstore to offer larger discounts for bestsellers than other titles. Since bestsellers are in the hottest demand, bookstores should be able to extract relatively higher margins. In conventional microeconomic models of both perfect competition and monopoly, when demand is higher, the price will be higher.⁴

The most obvious explanation of the discrepancy in the pricing of bestsellers and other titles is that the wholesale cost of bestsellers to retailers is lower. The industry practice is for publishers and wholesalers to set prices to retailers in terms of a discount from the list price. An industry source has advised us that the difference in wholesale discount between bestsellers and other hard cover titles ranges from 15-30%. This can account for only a part of the discrepancy in retail discount between bestsellers and other hard cover titles at Barnes & Noble.

³ Brynolfsson and Smith (2000) compared the absolute prices of books in conventional and on-line channels. It would have been more appropriate to compare the discounts.

⁴ The demand for new books is inherently uncertain. The practice of discounting bestsellers also contradicts the general retail policy of managing uncertain demand by setting a high initial price and marking down if demand is low (Lazear (1986), Pashigian and Bowen (1991), and Png (1991)).

It is possible that bookstores benefit from larger volume discounts on bestsellers. This would make bestsellers relatively cheaper and account for the greater discount on bestsellers. This, however, cannot explain differences in the relative pricing of bestsellers to other titles at Barnes & Noble as compared with B. Dalton. Since both chains belong to the same parent group, their wholesale costs should be similar.⁵

Recent research into variations in retail pricing over time may help to explain why bookstores systematically discount bestsellers. Warner and Barsky (1995) found that retailers of many consumer products systematically reduced prices at weekends and on holidays, when demand was expected to be highest. MacDonald (2000) found that retailers of seasonal food items such as barbecue items, ice cream, and canned yams systematically cut prices at the peaks of seasonal demand.

The preceding observations contradict the standard demand-supply model, in which demand increases result in higher (not lower) prices. There is a close parallel between the variations of pricing over seasons and weekends/holidays and the pricing of bestsellers vis-à-vis non-bestsellers. The demand for bestsellers is higher than that for other titles, hence this demand is like the peak demand for seasonal items and weekend/holiday demand for general consumer products. Just as Warner and Barsky (1995) and MacDonald (2000) found that retailers cut prices when demand was high, we have observed bookstores cutting prices for the items in highest demand.

Rotemberg and Woodford (1999) present four possible explanations for the puzzling behavior observed by Warner and Barsky (1995) and others. These theories can be adapted to explain the retail pricing of bestsellers vis-à-vis other titles.

- A. **Switching Costs.** Bookstores may use the bestseller list as a loss leader to attract customers and then exploit their costs of switching to other stores for higher-margin items. Owing to the publicity surrounding the bestseller list, book buyers pay relatively more attention to titles on the list. Bookstores leverage this attention by setting relatively lower prices. Once buyers are in the store, they may be attracted to buy other items, which are priced with relatively higher margins. Although customers know that these other items are relatively more expensive, the cost (in time and money) of traveling to another store deters them from buying elsewhere.

⁵ Other important features of wholesale distribution of books include returns policies, cooperative advertising, slotting allowances, and credit terms.

The switching cost theory applies more strongly to large bookstores, as they have more titles with which to exploit customers attracted by bestsellers. It can explain why Barnes & Noble discounts bestsellers much more heavily than B. Dalton, although both belong to the same group. Referring to Table 1, Barnes & Noble and Borders stores are about 6 times larger than B. Dalton and Waldenbooks stores. Accordingly, loss leaders are much more effective at Barnes & Noble stores.

- B. Search Costs. Bilal (1989) theorized that the arrival of new customers generates peaks in demand. New customers, however, are less certain about product quality than repeat customers, hence the demand of new customers is relatively more sensitive to price. Applied to the retailing of books, the theory would be that the cost to buyers of searching for bestsellers is much lower than the cost of searching for other titles. Bookstores are not only more likely to sell bestsellers, they will also carry larger inventories and so there are less likely to be out of stock. Accordingly, the demand for bestsellers is more elastic, and hence bookstores would offer larger discounts (lower prices) on bestsellers.
- C. Fixed Supply Costs. A store incurs some costs in carrying a title that are fixed in the sense that they are unrelated to the sales volume of the title. These include minimum shelf space and shelving labor, cost of inventory, and database entries. A store will sell a relatively larger volume of bestsellers as compared with other titles, hence its average cost of supplying bestsellers is relatively lower. Accordingly, in the long run, there will be relatively more retailers of bestsellers and since the supply of bestsellers is larger, it is possible that, despite the higher demand, the price will be lower. This explanation is quite consistent with casual observation: gas stations, convenience stores, and supermarkets sell bestsellers, especially low-priced paperbacks, but not other slower-moving titles.
- D. Pricing Transparency (Tacit Collusion). Suppose that the various competing sellers in an industry engage in tacit collusion to maintain price above the competitive level. For the collusion to succeed, each seller must not find it worthwhile to cheat on the tacit cartel by cutting price to draw additional business. The disciplinary mechanism is that the others will retaliate and bring down the price to an even lower level, and hence cutting profits for all sellers. Since the demand for bestsellers is relatively high, the temptation for a bookstore to cut the price of bestsellers is relatively greater. One way to ensure stability of the tacit cartel is to set a relatively lower price for bestsellers.

To varying degrees, theories A-C probably apply to conventional book retailing. The Tacit Collusion theory (D), however, seems improbable. Retail prices are

very transparent and easy to adjust. If the major bookstore chains were tacitly colluding, and one were to cheat on the cartel, its lower prices would be quickly observed and the competitors could respond with similar or larger discounts very quickly.⁶

3. Conventional vis-a-vis On-line Pricing

On-line retailers face the same issue as conventional bookstores – how to price bestsellers relative to non-bestsellers? We now consider the extent to which the various theories A-D apply to the pricing of books sold by on-line retailers. It is important to stress that, realistically, the on-line retailers may not necessarily form a separate market. Rather, they compete amongst one another as well as with conventional bookstores.

- **Switching Costs.** Can a customer who is visiting an on-line bookstore switch relatively more easily to a competing store than a customer in a conventional bookstore? Certainly, the time, effort, and money required to switch from one on-line bookstore to another is lower than to switch between conventional bookstores. However, shipment charges are a slight countervailing factor: most on-line bookstores levy a shipment charge that favors larger purchases. On balance, we contend that buyer switching costs are lower among on-line than conventional bookstores. Hence, on-line bookstores would draw less advantage from loss leaders, and therefore, should *not* discount bestsellers so heavily relative to other titles.
- **Search Costs.** In conventional channels, the cost of searching for bestseller is lower than that for non-bestsellers, hence the demand for bestsellers is more price elastic. In on-line channels, the cost of search for bestsellers and non-bestsellers should be almost the same. In both cases, it is simply a matter of entering the title into a search box.⁷ Accordingly, the demand for bestsellers should not be much more elastic than that for other titles. Hence, in on-line channels, the price of non-bestsellers should be relatively closer to that of bestsellers, meaning that their discounts should be closer.

⁶ In fact, as we discuss below, the major bookstores base their discounts on different bestseller lists. If competing bookstore chains were indeed tacitly colluding, they would focus on the same bestseller list, in order to avoid misunderstanding. The fact that they base discounts on different lists is further evidence against the Tacit Collusion theory.

⁷ Alba et.al. (1997), Bakos (1997), Ariely and Lynch (2000) show that on-line channels may increase the accessibility of information about other product attributes relative to conventional channels.

- **Fixed Supply Cost.** On-line retailers do not incur many of the fixed costs (unrelated to the sales volume of the title) associated with physical retailing. Hence, their average cost of supplying non-bestseller titles should be much closer to the average cost of supplying bestsellers. Accordingly, the on-line supply of bestsellers should not be so much larger than the supply of other titles, and hence, the discounts on bestsellers should be much closer to that on other titles.
- **Pricing Transparency.** The prices of books sold on-line are even more transparent than the prices in conventional bookstores. An on-line retailer could employ an automated system to monitor the prices of its competitors. Further, on-line prices can be adjusted instantaneously. Indeed, in May 1999, when Amazon increased its discount on bestsellers to 50% from 40%, its competitors, bn.com and Borders.com, responded within hours. Accordingly, the risk of defection from a tacit cartel will be very slight. Hence, it is very unlikely that the Tacit Collusion theory applies to the pricing of books sold through on-line channels.⁸

4. Data and Empirical Model

Table 1 reports the sales, number of stores, and average store sizes of the four largest conventional bookstore chains (by sales) in the United States -- Barnes & Noble, Borders, Waldenbooks (owned by Borders), and B. Dalton (owned by Barnes & Noble).⁹ Table 2 reports the sales, number of visitors, and number of categories of the four largest on-line bookstores (by sales), Amazon, bn.com, borders.com, and Fatbrain.¹⁰

At one time, all conventional store chains based discounts on the bestseller list published in the Sunday edition of the *New York Times*. However, in September 1999, Barnes & Noble switched to its own bestseller list. By June 2000, Crown was the only major chain that continued to use the *New York Times* bestseller list. Moreover, the conventional bookstore chains did not necessarily discount all of the titles on their respective bestseller lists. By contrast, the five largest on-line retailers all used the *New York Times* bestseller list and discounted all titles on that list.

⁸ Kauffman and Wood (2000) observed that the timing of price changes by major on-line book retailers is very close, and conclude that there is substantial evidence of tacit collusion among on-line retailers. Closely-timed price changes, however, are also consistent with a competitive market where sellers respond quickly to common demand or cost changes.

⁹ The fifth largest conventional bookstore chain was Books-a-Million, with 1999 sales through conventional and on-line channels of \$404 million. We were unable to collect prices from Books-a-Million. Further, we could not break down the chain's sales between conventional and on-line channels.

¹⁰ In November 2000, following our data collection, bn.com acquired Fatbrain.

During the week of June 19, 2000, we collected the actual discounts on thirty-seven titles at Northern California outlets of the four largest conventional chains (Barnes & Noble, Borders, Waldenbooks, and B. Dalton) and the four largest on-line booksellers (Amazon, bn.com, Borders.com, and Fatbrain). Twenty titles consisted of the top five titles in the Sunday, June 18, 2000 *New York Times* bestseller lists for hardcover fiction and non-fiction and paperback fiction and non-fiction. To represent titles that were not bestsellers, the other seventeen titles consisted of the top five in the same headings for the week of June 20, 1999 (excluding those titles that were among the June 18, 2000 bestsellers).¹¹

Tables 3 and 4 report descriptive statistics of the sample.

In the previous section, we used theoretical analysis to show that on-line markets should be more competitive than conventional markets on four dimensions – buyer switching costs, buyer search costs, fixed supply costs, and pricing transparency. Taking into consideration the available data, we find that we can construct a clear test of only one prediction – that buyer switching costs are lower in on-line markets.

Generally, if buyer switching costs are lower in on-line as compared with conventional markets, then discounts on bestsellers should be *relatively* lower in on-line markets. We test this effect in a least-squares regression model with *DISCOUNT*, the percentage discount from the list price, as the dependent variable.

We measure the size of a conventional store by the normalized variable, *AREA*, defined as the average store area in thousand square feet in a chain less the average store area of the four chains divided by the standard deviation of the store area of the four chains. By construction, *AREA* has zero mean and standard deviation of one. Similarly, we measure the size of an on-line store by the normalized variable, *CATS*, defined as the number of product categories carried by the on-line store less the average over the four on-line stores divided by the standard deviation over the four on-line stores. The reason for using normalized measures, *AREA* and *CATS*, is so that we can compare the sizes of conventional and on-line channels on a common basis.

Let the independent variables, *BEST*, *CONV*, and *ONLINE*, denote a bestseller title, conventional store, and on-line store respectively. Then, we operationalize the prediction of lower buyer switching costs as follows:

¹¹ A limitation of our data is that we could not detect price discrimination by conventional and on-line bookstores among their various customers.

Hypothesis 1 (Lower Buyer Switching Costs): The coefficient of *BEST*AREA*CONV* would be significantly larger than the coefficient of *BEST*CATS*ONLINE*.

However, it is possible for the coefficient of *BEST*AREA*CONV* to be significantly positive because larger conventional stores give higher discounts on *all* titles and not specifically on bestsellers. To check this possibility, we also include *AREA*CONV* as a separate independent variable, with no prediction as to the sign of its coefficient. Likewise, we include *CATS*ONLINE* as a separate independent variable, with no prediction as to the sign of its coefficient.

What about the other three predictions – that buyer search costs and fixed supply costs are lower, and that pricing transparency is higher in on-line markets? Our data do not allow a clear test of these predictions separately. Rather, we can only test these three predictions *jointly*. We operationalize the joint test as

Hypothesis 2 (Lower Competitive Barriers): The coefficient of *BEST*CONV* would be significantly larger than the coefficient of *BEST*ONLINE*.

We also included several other independent variables in the regression. The first was a moderating variable that may have an important impact on pricing. This is the sales revenue of the chain. A chain with higher sales revenue may command market power and set relatively lower discounts on *all* titles, both bestsellers and non-bestsellers. On the other hand, a chain with higher sales revenue may enjoy greater scale economies, and hence set relatively higher discounts on all titles, both bestsellers and non-bestsellers. The same argument applies to on-line stores. Accordingly, we include *SALES*, the sales revenue of the chain or on-line store, as an independent variable with no prediction as to the sign of its coefficient.

Two other independent variables were *HARD* and *ONLINE*. The variable *HARD*, which indicates a hardcover title, captures any general difference in pricing between hardcover and paperback titles. The indicator variable, *ONLINE*, captures any general difference in the pricing of all books between conventional and on-line channels.

5. Results

As a preliminary step, we checked for heteroskedasticity in the ordinary least squares (OLS) residuals. In the presence of heteroskedasticity, the OLS estimates are consistent, but the standard errors computed in the conventional way are not.

We detected heteroskedasticity and accordingly, applied White's (1980) heteroskedasticity consistent covariance estimator to all the regressions.

Table 5 column (i) reports the results of the OLS regression for conventional stores only. The coefficient of *BEST*AREA*CONV* was 0.089, which was positive and significant. This result is consistent with the presence of significant buyer costs of switching among stores, which lead larger bookstores to make greater use of bestsellers as loss leaders. Specifically, a chain whose stores were one standard deviation (10,701 sq.ft.) larger than the average offered a 8.9 percentage point higher discount on bestsellers.

The coefficient of *AREA*CONV* was not significant, which indicates that larger bookstores did not offer higher discounts on *all* titles. Rather, they focused larger discounts on bestsellers. The coefficient of *SALES* was not significant, which indicates that the pricing policy of chains with higher sales did not systematically differ from that of chains with lower sales.

Also referring to Table 5 column (i), the coefficient of *BEST* CONV* was 0.145, which was positive and significant. The discount on bestsellers was 14.5% points higher than that on other titles. This result is consistent with three explanations of why bookstores offer larger discounts on bestsellers -- buyer search costs, fixed supply costs, and pricing transparency.

Table 5 column (ii) reports a regression for on-line stores only. The results were similar to those for conventional stores. There was strong support for the presence of buyer switching costs (coefficient of *BEST*CATS*ONLINE* was 0.066 and significant), and support for the combined effect of buyer search costs, fixed supply costs, and pricing transparency (coefficient of *BEST*ONLINE* was 0.161 and significant).

Table 5 column (iii) reports a regression that applies another measure of the size of an on-line store -- *VISITS*, the number of visitors to the on-line store less the average over the four on-line stores divided by the standard deviation of visitors over the four on-line stores. The results using this alternative measure were quite similar to those where the size of on-line stores was measured by *CATS*.

Next, we considered the two hypotheses regarding the degree of competition in on-line as compared with conventional markets. Table 5 column (iv) reports the results. Hypothesis 1 (Lower Buyer Switching Costs) implies that the coefficient of *BEST*AREA*CONV* would be significantly larger than the coefficient of *BEST*CATS*ONLINE*. The coefficient of *BEST*AREA*CONV* was 0.089 and significant. From column (iv), the coefficient of *BEST*CATS*ONLINE* was 0.066

and significant. Using a one-tailed *t*-test, we infer that the coefficient of *BEST*AREA*CONV* was not significantly larger than the coefficient of *BEST*CATS*ONLINE*. (The *t*-statistic was 1.159, while the 5% critical value is 1.645.) We infer that the evidence does not support the hypothesis that buyers incur lower costs of switching among stores in on-line as compared with conventional channels.

We included *AREA*CONV* and *CATS*ONLINE* as separate independent variables, with no prediction as to the sign of their coefficients. Neither variable was significant, which indicates that larger conventional stores do not offer larger discounts on all titles in general, and similarly, larger on-line stores do not offer larger discounts on all titles in general.

Regarding Hypothesis 2 (Lower Competitive Barriers), this implies that the coefficient of *BEST*CONV* would be significantly larger than the coefficient of *BEST*ONLINE*. In fact, the coefficient of *BEST*CONV* was *smaller* than the coefficient of *BEST*ONLINE*. Clearly, the Hypothesis was not supported.

We included three other variables as independent variables, with no prediction as to the sign of their coefficients. The coefficient of *SALES* was not significant, indicating that the pricing policy of retailers with higher sales did not systematically differ from that of retailers with lower sales.

The coefficient of *HARD* was 0.038 and significant. Hardcover titles were discounted by 3.8% points more than paperbacks. The coefficient of *ONLINE* was 0.249 and significant. This suggests that, having adjusted for other factors such as whether a title was a bestseller and whether it was in hard covers, on-line stores generally provided a 24.9% point higher discount than conventional channels.

In Table 5 column (v), we report the results of tests with the size of an on-line store measured by *VISITS*. The results supported Hypothesis 1 (Lower Buyer Switching Costs). The coefficient of *BEST*AREA*CONV* was 0.089 and significantly larger than the coefficient of *BEST*VISITS*ONLINE*, 0.048. The *t*-statistic for the difference was 2.067, which is significant at the 5% level for a one-tailed test. Hence, with the size of an on-line store measured as *VISITS*, the data do support the prediction that buyer switching costs are lower in on-line markets.

By contrast, the results did not support Hypothesis 2 (Lower Competitive Barriers), the joint test that buyer search costs and fixed supply costs are lower, and that pricing transparency is higher in on-line markets. These results are consistent with those using *CATS* as the measure of the size of an on-line store.

Next, we considered whether the preceding results might be sensitive to the inclusion of the data from Fatbrain. The principal reason for isolating Fatbrain is a key difference in its target customers. Whereas Amazon, bn.com, and Borders.com catered to the general consumer market, Fatbrain focused on selling technical books, training materials, and corporate documentation to corporate customers (Fatbrain Com Inc., SEC Form 10K, January 31, 2000). Consistent with the difference in customer segment, Fatbrain's pricing policy also differed sharply from those of the other on-line bookstores: Fatbrain discounted almost all titles, whether bestseller or not, by 30%.

In light of these disparities, we repeated the empirical analysis, excluding the Fatbrain data. Table 6 reports the results. It is instructive to compare column (ii) of Tables 5 and 6. With the exclusion of the Fatbrain data, the constant was lower and the bestseller discount (coefficient of *BEST*ONLINE*), was higher. This is consistent with the exclusion of data in which the discount was almost uniform across bestsellers and other titles.

Further, with the exclusion of the Fatbrain data, the coefficient of *BEST*CATS*ONLINE* was not significant. This suggests that on-line booksellers that carried more categories did not discount bestsellers more deeply. The results in Table 5 were skewed by the inclusion of Fatbrain, which did not discount bestsellers relative to other titles and carried only one category.

Table 6 column (iv) reports the results of the regression of the combined sample from conventional and on-line stores. Hypothesis 1 (Lower Buyer Switching Costs) implies that the coefficient of *BEST*AREA*CONV* would be significantly larger than the coefficient of *BEST*CATS*ONLINE*. The coefficient of *BEST*AREA*CONV* was 0.102 and significant. From column (iv), the coefficient of *BEST*CATS*ONLINE* was -0.017 and not significant. Using a one-tailed *t*-test, we infer that the coefficient of *BEST*AREA*CONV* was significantly larger than the coefficient of *BEST*CATS*ONLINE*. (The *t*-statistic was 5.613, which is significant at the 1% level.) The results provides strong support to the hypothesis that buyers incur lower costs of switching among stores in on-line as compared with conventional channels.

Hypothesis 2 (Lower Competitive Barriers) implies that the coefficient of *BEST*CONV* would be significantly larger than the coefficient of *BEST*ONLINE*. In fact, the coefficient of *BEST*CONV* was *smaller* than the coefficient of *BEST*ONLINE*. Clearly, the Hypothesis was not supported. We consider that these results should not be interpreted as evidence against the Hypothesis, but rather the outcome of a limited data-set, which did not allow for precise tests of

the various competitive barriers -- buyer search costs, fixed supply costs, and lack of pricing transparency.

Table 6 columns (iii) and (v) reports the regressions, excluding the Fatbrain data and with the size of an on-line store measured by *VISITS*. The results are quite similar to those with the size of an on-line store measured by *CATS*.

Based on the results from the conventional and on-line bookstores that catered to general consumers, we infer that, adjusting for relative store size, the bestseller discount is higher in conventional than on-line channels. These results are consistent with our Hypothesis 1 that buyer switching costs are higher in conventional than on-line channels.

6. Limitations

An alternative explanation of the difference in pricing policies between conventional than on-line bookstores is that they arise from systematic differences in the customer populations of conventional and on-line book retailers. Degeratu et.al.'s (2000) study of grocery retailing found that on-line shoppers were younger and better educated than those in conventional stores. These observations are consistent with computer users being younger and better educated than the general population. Degeratu et.al. also found that on-line shoppers were more likely to have children and had a higher household income than those in conventional stores. These observations are consistent with on-line shopping providing convenience and saving of time.

Whether on-line buyers of books are more likely to have children and have a higher household income than those who shop in conventional bookstores is an empirical question. To the extent that there are such differences, on-line shoppers will have a *higher* opportunity cost of time, and should be more vulnerable to the use of bestsellers as loss leaders for bait-and-switch and should be relatively insensitive to the price of non-bestseller titles. Accordingly, these differences tend to bias actual discounts policy *against* our Hypothesis 1 (Lower Buyer Switching Costs).

Another difference between the customers of the two channels for books is that on-line shoppers probably live further away from major metropolitan areas, and some are in foreign countries. It is hard to say whether these customers have relatively higher or lower opportunity cost of time. In any event, our regression model included two variables, *ONLINE* and *BEST*ONLINE*, to capture any systematic differences between the customer populations of conventional and on-line channels. As reported above, the coefficients of both variables were positive and significant. Nevertheless, in future research, it would be desirable to

control directly for these differences in customer population when analyzing pricing in conventional and on-line channels.

An alternative explanation of the disparity between conventional and on-line retailers in the pricing of bestsellers relative to other titles proceeds from a behavioral hypothesis. Amazon is the far away industry leader in on-line retailing of books. Suppose that Amazon has (arbitrarily) decided a policy of 50% discount on bestsellers and 30% discount on other hard cover titles and 20% discount on other paperbacks. Suppose, further, that Amazon exercises price leadership over the other, smaller on-line retailers. Then, their discount policies would follow those of Amazon.

In future research, this behavioral hypothesis could be tested with observations of the pattern of pricing over time. Amazon's market share is diminishing over time, with the entry of bn.com, Borders.com, and other competitors. Accordingly, its power to exercise price leadership should also be diminishing. Hence, under the behavioral hypothesis, the discounts offered by competing on-line retailers should diverge over time. By contrast, this divergence would not arise under our hypothesis that on-line retailing is indeed more competitive than conventional retailing.

We collected the data on discounts by visiting the various conventional and on-line bookstores. This information did not reflect any personal discounts offered by the stores, and hence do not take account of any price discrimination that the stores may have effected. In future work, it would be important to collect data that takes account of such price discrimination.

Finally, we note that our results were generally biased *against* finding that bestseller discounts were lower in on-line than conventional channels. Ho, Lu, and Tang (2000) found that the pricing policies of on-line branches of conventional bookstores were closer to their conventional parents than those of pure on-line book retailers. Half of our on-line pricing data set was derived from affiliates of conventional bookstores – bn.com and Borders.com. If we had confined our on-line sample to pure on-line stores, we would have found stronger evidence that bestseller discounts were lower in on-line than conventional channels.

7. Concluding Remarks

In this paper, we have exploited a systematic difference in the pricing of bestsellers relative to other titles. Specifically, we have shown that, in a market where buyer switching costs are lower, the pricing of bestsellers will be relatively closer to that of other titles. Our empirical analysis provides some evidence of this result and the hypothesis that buyer switching costs are higher in conventional than on-line channels.

It is worth emphasizing that, by focusing on *relative* pricing within a market (either conventional or on-line), we control for traveling cost and shipment charges, and differences in the relative benefits provided by conventional and on-line retailers, and in their costs. Accordingly, our analysis accurately addresses the question of whether on-line markets are more competitive than conventional markets.

Borders, the second-largest conventional retailer of books, and Amazon, the largest on-line retailer, sell music CDs as well as books. The demand for music CDs also varies between bestsellers ("top of the charts") and other titles. Given the practice of discounting bestsellers relative to other titles in retailing of books, it might be expected that music retailers would engage in similar behavior.

In fact, however, both conventional and on-line music retailers appear to set similar prices for bestsellers and other titles. This difference between the pricing of books and music CDs might be explained by a systematic policy of the leading music publishers to discourage discounting. Until recently, the five leading music publishers maintained "Minimum Advertised Price" programs, under which the publishers withheld cooperative advertising payments from any retailer that advertised prices below the stipulated minimum. These programs effectively discouraged retailers from discounting music CDs.

In May 2000, the five leading music publishers agreed with the Federal Trade Commission to disband their "Minimum Advertised Price" programs. It would be interesting to observe whether music retailers will follow retailers of books to discount bestsellers.

References

Alba, Joseph, John Lynch, Barton Weitz, Chris Janiszewski, Richard Lutz, Alan Sawyer, and Stady Wood, "Interactive Home Shopping: Incentives for Consumers, Retailers, and Manufacturers to Participate in Electronic Marketplaces", *Journal of Marketing*, Vol. 61 (July 1997), 38--53.

Ariely, Dan, and John G. Lynch, "Wine On-line: Search Costs and Competition on Price, Quality, and Distribution", *Marketing Science*, Vol. 19 No. 1 (2000), 83--103.

Bakos, J. Yannis, "Reducing Buyer Search Costs: Implications for Electronic Marketplaces", *Management Science*, Vol. 43 No. 12 (December 1997), 1676--1708.

Brynjolfsson, Erik, and Michael D. Smith, "Frictionless commerce? A comparison of Internet and conventional retailers", *Management Science*, Vol. 46 No. 4 (April 2000), 563--585.

Hann, Il-Horn, Eric K. Clemons, and Lorin M. Hitt, "The Nature of Competition in Electronic Markets: An Empirical Investigation of On-line Travel Agent Offerings", Working Paper, Fisher College of Business, Ohio State University.

Ho, Hoong Pok, Ding Lu, and Fang Fang Tang, "Paradox of On-line Trading: Evidence and Interpretation", Department of Economics, National University of Singapore, July 2000.

Degeratu, Alex, Arvind Rangaswamy, and Jianan Wu, "Consumer Choice Behavior in On-line and Traditional Supermarkets: The Effects of Brand Name, Price, and Other Search Attributes", *International Journal of Research in Marketing*, forthcoming.

Kauffman, Robert, and Charles A. Wood, "Analyzing Competition and Collusion Strategies in Electronic Marketplaces with Information Asymmetry", Carlson School of Management, University of Minnesota, 2000.

Lazear, Edward P., "Retail Pricing and Clearance Sales", *American Economic Review*, Vol. 76 (March 1986), 14--32.

MacDonald, James M., "Demand, Information, and Competition: Why Do Food Prices Fall at Seasonal Demand Peaks?" *Journal of Industrial Economics*, Vol. 48 No. 1 (March 2000), 27--45.

McKeown, Patrick G., Richard T. Watson, and George M. Zinkhan, "Electronic Commerce and Pricing", Working Paper, Terry College of Business, University of Georgia, 2000.

Pashigian, B. Peter, and Brian Bowen, "Why are Products Sold on Sale? Explanations of Pricing Regularities", *Quarterly Journal of Economics*, Vol. 106 (1991), 1015--1038.

Png, I.P.L., "Most-Favored-Customer Protection versus Price Discrimination Over Time", *Journal of Political Economy*, Vol. 99 No. 5 (1991), 1010--1028.

Rotemberg, Julio, and M. Woodford, "The Cyclical Behavior of Prices and Costs", in John Taylor and M. Woodford, Eds., *Handbook of Macroeconomics*, Amsterdam: North Holland, 1999.

Smith, Michael D., Joseph Bailey, and Erik Brynjolfsson, "Understanding Digital Markets: Review and Assessment", in Erik Brynjolfsson and Brian Kahin, Eds., *Understanding the Digital Economy*, Cambridge, MA: MIT Press, 1999.

Warner, Elizabeth, and Robert B. Barsky, "The Timing and Magnitude of Retail Store Markdowns: Evidence from Weekends and Holiday", *Quarterly Journal of Economics*, Vol. 110 (1995), 322--352.

White, Halbert, "A Heteroskedasticity-Consistent Covariance Matrix and a Direct Test for Heteroskedasticity," *Econometrica*, Vol. 48 (1980), 817--838

Table 1: Conventional Bookstores

	Barnes & Noble	Borders	Walden-books (Borders)	B.Dalton (B&N)
1999 sales (US\$ million)	\$2,822	\$1,914	\$981	\$426
Number of stores, Dec. 1999	542	300	904	400
Average store size, Dec. 1999 ('000 sq. ft.)	23.4	27	3.9	4

* Includes on-line sales through Web site.

** Over 120 are Books-a-million stores with average size of 20,000 sq.ft., while fewer than 60 are Bookland stores with 4,000 sq.ft. average size.

Sources: "Chain Sales Rose 11% in Fiscal '00 to \$6.8 Billion", *Publishers Weekly*, Vol. 247 No. 13 (March 27, 2000), page 13; Company 10-Ks, press releases, and web pages.

Table 2: On-line Bookstores

	Amazon	bn.com	Fatbrain	borders.com
1999 sales (US\$ million)	\$ 800	\$ 202	\$ 28.8	\$ 18
No. of visitors, Dec. 1999 (million)	15.8	5.9	0.26	0.86
No. of product categories (including books), June 2000	14	7	1	4

Sources: "Chain Sales Rose 11% in Fiscal '00 to \$6.8 Billion", *Publishers Weekly*, Vol. 247 No. 13 (March 27, 2000), page 13; Company press releases and web pages; Karen J. Bannan, "Book battle", *Mediaweek*, Vol. 10 No. 9 (February 28, 2000), pp. 72-76.

Table 3: Average Discounts

Types of titles	Conventional Stores		On-line Stores	
	Bestsellers	Non-bestsellers	Bestsellers	Non-bestsellers
Hardcover fiction	22.8%	0.0%	43.5%	30.0%
Hardcover nonfiction	12.5%	0.0%	45.0%	30.0%
Paperback fiction	15.0%	0.0%	39.5%	22.5%
Paperback nonfiction	8.3%	0.0%	43.5%	25.0%

Table 4: Sample Statistics

Variable	Unit	Mean	Std deviation
<i>DISCOUNT</i>	percent	0.217	0.190
<i>HARD</i>		0.486	n.a.
<i>BEST</i>		0.541	n.a.
<i>CONV</i>		0.5	n.a.
Store area	'000 sq.ft.	14.575	10.701
<i>AREA</i>		0	1
No. of categories		6.500	4.822
<i>CATS</i>		0	1
No. of visitors	million/month	5.705	6.226
<i>VISITS</i>		0	1
<i>SALES</i>	Billion\$/year	0.899	0.936

Table 5: Regression Estimates

(White heteroskedasticity consistent covariance estimators)

Dependent variable: *DISCOUNT*

Independent variable	(i) Conventional stores	(ii) On-line stores	(iii) On-line stores	(iv) Conventional and on-line stores	(v) Conventional and on-line stores
<i>CONSTANT</i>	-0.021 (0.030)	0.369*** (0.022)	0.444*** (0.039)	0.003 (0.029)	-0.014 (0.029)
<i>HARD</i>	0.032** (0.015)	0.044*** (0.012)	0.044*** (0.014)	0.038*** (0.010)	0.038*** (0.010)
<i>ONLINE</i>				0.249*** (0.024)	0.263*** (0.025)
<i>BEST*CONV</i>	0.145*** (0.014)			0.145*** (0.014)	0.145*** (0.014)
<i>BEST*ONLINE</i>		0.161** (0.012)	0.161*** (0.014)	0.161*** (0.013)	0.161*** (0.014)
<i>AREA*CONV</i>	-0.003 (0.015)			0.011 (0.015)	0.002 (0.015)
<i>CATS*ONLINE</i>		0.138*** (0.022)		-0.001 (0.009)	
<i>VISITS*ONLINE</i>			0.235*** (0.044)		-0.003 (0.010)
<i>BEST*AREA*CONV</i>	0.089*** (0.013)			0.089*** (0.013)	0.089*** (0.013)
<i>BEST*CATS*ONLINE</i>		0.066*** (0.014)		0.066*** (0.015)	
<i>BEST*VISITS*ONLINE</i>			0.048*** (0.014)		0.048*** (0.015)
<i>SALES</i>	0.004 (0.019)	-0.470*** (0.067)	-0.757*** (0.138)	-0.014 (0.018)	-0.003 (0.019)
No. of observations	148	148	148	296	296
R-squared	0.549	0.664	0.558	0.787	0.773
F-statistic	34.63	56.21	35.81	117.39	107.99

Standard errors in parentheses

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 6: Regression Estimates (Excluding Fatbrain)

(White heteroskedasticity consistent covariance estimators for i, iv and v)

Dependent variable: *DISCOUNT*

Independent variable	(i) Conventional stores	(ii) On-line stores	(iii) On-line stores	(iv) Conventional and on-line stores	(v) Conventional and on-line stores
<i>CONSTANT</i>	-0.021 (0.030)	0.240*** (0.037)	0.237*** (0.047)	-0.024 (0.029)	-0.024 (0.029)
<i>HARD</i>	0.032** (0.015)	0.045*** (0.011)	0.045*** (0.011)	0.038*** (0.010)	0.038*** (0.010)
<i>ONLINE</i>				0.266*** (0.026)	0.266*** (0.027)
<i>BEST*CONV</i>	0.145*** (0.014)			0.145*** (0.014)	0.145*** (0.014)
<i>BEST*ONLINE</i>		0.232*** (0.011)	0.234*** (0.012)	0.232*** (0.010)	0.235*** (0.010)
<i>AREA*CONV</i>	-0.004 (0.017)			-0.004 (0.017)	-0.004 (0.017)
<i>CATS*ONLINE</i>		0.002 (0.058)		-0.000 (0.013)	
<i>VISITS*ONLINE</i>			-0.003 (0.105)		-0.000 (0.015)
<i>BEST*AREA*CONV</i>	0.102*** (0.015)			0.102*** (0.015)	0.102*** (0.015)
<i>BEST*CATS*ONLINE</i>		-0.017 (0.013)		-0.017 (0.015)	
<i>BEST*VISITS*ONLINE</i>			-0.020 (0.015)		-0.020 (0.017)
<i>SALES</i>	0.004 (0.016)	-0.001 (0.148)	0.011 (0.235)	0.004 (0.019)	0.004 (0.019)
No. of observations	148	111	111	259	259
R-squared	0.549	0.813	0.813	0.852	0.852
F-statistic	34.63	91.08	91.19	159.35	159.39

Standard errors in parentheses

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level