



The Analysis on the Factors Which Affecting Price

Dispersion between Traditional Retail Channel and Internet Retail Channel

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Abstract

With network economy springing up and communication technology expanding fast, the retailing channels composed of Internet retail channel become the choice of many traditional retailers. Price dispersion always exists between traditional retail channel and Internet retail channel. In this text, we bring forward the model about traditional retail channel and internet retail channel based on classical hotelling linear city model. We find the price dispersion will be different when the parameters affecting the price in Internet retail channel are different. In some conditions, the price in Internet retail channel will be lower than in traditional retail channel, but in other conditions, the price in Internet retail channel will be higher than in traditional retail channel.

Keywords: Network economy, Retailing, Internet retail channel, Price dispersion

1. Introduction

The importance of the Internet as a marketplace has substantially grown over the past decade, even though expectations have been dramatically tempered since early 2000. A distinctive feature of doing business electronically is that transactions no longer require the physical coordination of buyers and sellers: market participants find each other at their screens. There are many aspects of market interaction which are affected by this online nature of trade. On the supply side, we may think of all kinds of cost reductions, resulting from new ways of organizing production and sales processes. On the demand side, the major impact of the Internet is on consumers' ability to acquire information about firms and their prices.

With the rapid growth of e-commerce, more and more conventional retailers (such as Wal-Mart, Carrefour, etc) have started selling online. It is interesting to see how these conventional retailers compete with online-only retailers on the Web. Online retailing promises the potentials of low barrier of entry, easy access to information, and low transaction costs. But elimination of intermediaries is not without disadvantage. The role of intermediaries is to efficiently create and satisfy demand, through advertising and customer education, providing market coverage, gathering market information, providing breadth of assortment, breaking bulk, processing orders, customer support, etc. So, traditional retail channel and Internet retail channel will exist in the same market for a long time.

According to the view of Vaian (Varian, Hal R., 1980, pp. 651-659), the price dispersion here, is defined as the distribution of prices of an item across sellers at a given point time. There is comprehensive price dispersion phenomenon in commodity market, while the reason of different commodity is distinct respectively. Obviously, the price difference of same products between traditional retail channel and Internet retail channel is the typical price dispersion phenomenon.

The study of our paper is related to the following two research fields. On the one hand, several studies have examined multi-channel supply chain. Rhee and Park (Rhee.B., Park, S.Y., 2000) study a hybrid channel design problem, assuming that there are two consumer segments: a price sensitive segment and a service sensitive segment. Chiang et al. (Chiang, W.D., Chhajed, 2004) examine a price-competition game in a dual channel supply chain (Boyaci, Boyaci, T., 2004) studies stocking decisions for both the manufacturer and retailer in multi-channel supply chain (Viswanathan, V., 2005, pp. 483-496) studies the competition across online, traditional and hybrid channels using a variant of circular city model. Tsay and Agrawal (Tsay, A.N., Agrawal., 2004, b) provide an excellent review of recent work in the area and examine different ways to adjust the manufacturer-reseller relationship.

On the other hand, the price dispersion phenomena have gained a lot of attention. (Stigler, Stigler, George J., 1961, pp. 213-237) considers that price dispersion phenomena is the result of imperfect price information. Salop and Stiglitz (Salop, Steven, Joseph E. Stiglitz., 1982, pp. 1121-1130) get the asymmetric pure strategy Nash equilibrium of when the

venders make prices. Karen Clay et al, (Karen, Ramayya, Ramayya Krishnam, Eric Wolff. 2001, pp. 521-539). Sholten, Patrick and Adam Smith (Sholten, Patrick, Adam Smith., 2002) study the durative problem of price dispersion.

Our paper focuses on research of factors which affect price dispersion between traditional retail channel and Internet retail channel. This paper is organized as follows. In Section 2, we describe the retailer decision model when only traditional retail channel exists in the market. In Section 3, we discuss different factors how to affect price dispersion between traditional retail channel and Internet retail channel. In Section 4, we summarize our key findings.

2. The retailer decision model when only traditional retail channel exists in the market

The analysis of our paper is based on the classical Hotelling (Hotelling, Harold., 1929, pp. 41-57) linear city model. We consider two traditional retailers which selling the same product exist in two extremes of the city. We consider that consumers distribute at $[0, 1]$ interval uniformly, 0 and 1 denotes two extremes of the city. Two traditional retailers are located at 0 and 1 respectively. Consumers buy at most one unit of the product. The consumer's maximal willing-to-pay is V . For each unit travelled; consumers incur a linear cost $t > 0$. Here we suppose that V is so large that consumers at least will buy one product from one retailer.

Without loss of generality, two retailers are assumed to be identical in terms of selling costs and purchasing costs and these costs are set to zero. So the result of market competition is, two retailers will sell the product at the same price and occupy the market uniformly. When we study price dispersion between traditional retail channel and Internet retail channel, two traditional retailers' price P is to be exogenous. The utility a consumer gets from buying the product from the retailer located at 0 is given by $V - tx - P$. Similarly, the utility a consumer gets from buying the product from the retailer located at 1 is given by $V - t(1 - x) - P$.

We describe market share of the traditional retailers in Figure 1.

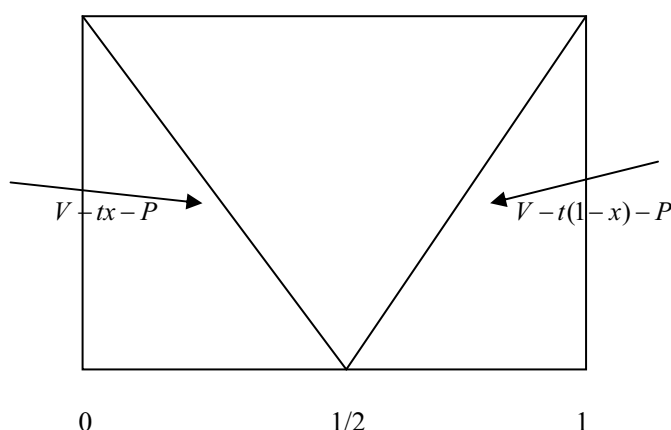


Figure 1. Market share of the traditional retailers

According to above analysis, we know easily that market share of each traditional retailer is $\frac{1}{2}$,

And profit of each traditional retailer is $\frac{1}{2}P$.

3. The Analysis of price dispersion if internet retail channel enters

For firms, the Internet may be used as an alternative retail channel to gain market share. But not all the traditional retailers have the ability to set up an Internet retail channel. The success of an Internet retail channel is related mainly to three factors: (1) capital; (2) technology; (3) logistics system. In our paper, we consider only the retailer located at 0 can have the ability to set up an Internet retail channel. The fixed cost to set up an Internet retail channel is f .

When buying in a firm's online shop, the willingness-to-pay is multiplied by a factor λ . If

$\lambda < 1$ ($\lambda > 1$), then the consumer's willingness-to-pay is lower (larger) for an online purchase compared to a purchase in a traditional retailer. The product price in Internet retail channel is P_e , so the utility a consumer gets from buying the product online is given by $\lambda V - P_e$. That is to say, the utility a consumer gets from buying the product Internet retail channel is different from traditional retail channel. Compared to traditional retail channel, the Internet retail channel has its advantages and disadvantages. Its advantages are:

- (1) Direct control of distribution and pricing can lead to higher profit margins.
- (2) More flexibility in experimenting with product attributes.
- (3) Closer contact with customers.

Its disadvantages are:

- (1) Delays in direct delivery.
- (2) Potential mismatch of the catalog description and performance of the product.
- (3) The inconveniences of returning products which does not fit the consumer's needs

So, λ can be interpreted as consumer's willingness to tolerate the inconveniences of the Internet retail channel. If the consumer prefers to buying products in the Internet retail channel, then the value of λ is high. Contrarily, then the value of λ is low.

Because the product price in the traditional retail channel has some stickiness, the price is not adjusted easily. We can suppose that the product price P in the traditional retail channel will not change when the Internet retail channel enters into the market.

We describe market share change of the two retailers when the Internet retail channel enters into the market in Figure2.

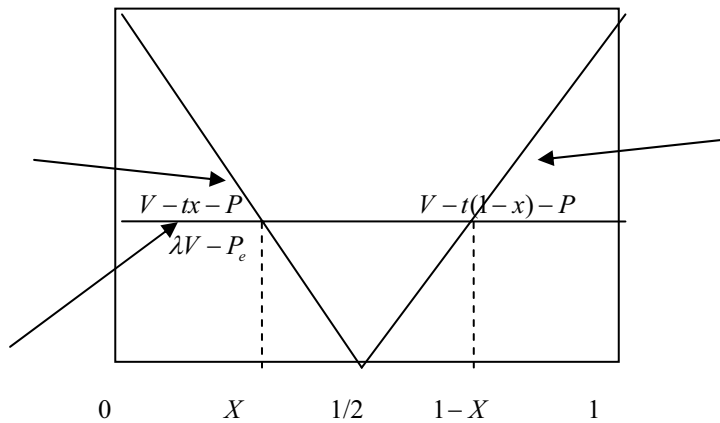


Figure 2. Market shares of the two retailers when the Internet retail channel enters into the market

According to Figure 2, where $V - tx - P = \lambda V - P_e$, we can rewrite the equation as $X = \frac{(V - P) - (\lambda V - P_e)}{t}$. So, market share of the retailer located at 1 is X when the retailer located at 0 has set up an Internet retail channel, namely $\frac{(V - P) - (\lambda V - P_e)}{t}$. The retailer located at 0 gains market share through Internet retail channel is $1 - 2X$, namely $1 - \frac{2(V - P) - 2(\lambda V - P_e)}{t}$. Obviously, market share gained in all by the retailer located at 0, is $1 - \frac{(V - P) - (\lambda V - P_e)}{t}$.

The retailer located at 0 gains market share through traditional retail channel is

$$\Pi_1 = X \times P = \left[\frac{(V - P) - (\lambda V - P_e)}{t} \right] \times P.$$

The retailer located at 0 gains market share through Internet retail channel is

$$\Pi_2 = (1 - 2X) \times P_e = \left[1 - \frac{2(V - P) - 2(\lambda V - P_e)}{t} \right] \times P_e - f.$$

So, the total profit of the retailer located at 0 is

$$\Pi = \left[\frac{(V - P) - (\lambda V - P_e)}{t} \right] \times P + \left[1 - \frac{2(V - P) - 2(\lambda V - P_e)}{t} \right] \times P_e - f.$$

When $\frac{\partial \Pi}{\partial P_e} = 0$, we can get the optimal price P_e^* . P_e^* is optimal to the retailer located at 0. When $\frac{\partial \Pi}{\partial P} = 0$, we have:

$$\left[1 - \frac{2(V - P) - 2(\lambda V - P_e)}{t} \right] - \frac{4P_e}{t} + \frac{P}{t} = 0.$$

We can obtain

$$P_e^* = \frac{3P + (2\lambda - 2)V + t}{4}.$$

We can see, after the traditional retailer located at 0 has set up an Internet retail channel, the product price will be different between online and the traditional retailer. That is to say, the price dispersion phenomenon occurs. If $(2\lambda - 2)V + t > P$, the product price in the Internet retail channel is higher than in traditional retail channel. If $(2\lambda - 2)V + t < P$, the product price in the Internet retail channel is lower than in traditional retail channel. If $(2\lambda - 2)V + t = P$, the product price in the Internet retail channel is equal to in traditional retail channel, but the possibility of this situation is little. Thus it can be seen, the price dispersion always exists between traditional retail channel and Internet retail channel.

In the following text, we mainly analyze two factors (λ, t) how to affect the price dispersion. When t is fixed, if $\lambda > \frac{P-t}{2V} + 1$, then the product price in the Internet retail channel is higher than in traditional retail channel. When t is fixed, if $\lambda < \frac{P-t}{2V} + 1$, then the product price in the Internet retail channel is lower than in traditional retail channel.

But the value of λ is related to consumer's willingness to tolerate the inconveniences of the Internet retail channel. That is to say, (1) If the market is big cities, the most consumers are the young people who prefers to buy products online, then the value of λ will be high. If the market is the country or the town, the most consumers living here prefer to buy products from traditional retailers, then the value of λ will be low. (2) If the products can be compared well and truly by consumers' seeing and hearing, then the value of λ will be high. These products include books, CDs and etc; and if it is more difficult to assess how well a particular product fits a consumer's needs, then the value of λ will be low. These products include clothing, furniture and etc. (3) If the Internet retail channel is in possession of advanced logistics system, the product can be sent to consumers quickly, at the same time consumers can return defective products easily, then λ is high. Contrarily, then λ is low.

When λ is fixed, if $t > P - (2\lambda - 2)V$, then the product price in the Internet retail channel is higher than in traditional retail channel; When λ is fixed, if $t < P - (2\lambda - 2)V$, then the product price in the Internet retail channel is lower than in traditional retail channel. Here the value of t is can be considered as travelling costs, and these costs are related to consumers' health, consumers' time cost and etc. (1) If the consumers in the target market are healthy and convenient, then the value of t will be low; but if the consumers in the target market are old and sick, especially handicapped, then the value of t will be high. (2) If the consumers in the target market are busy and rich, so their time costs are high, then the value of t will be high. But if the consumers in the target market are idle and poor, so their time costs are low, then the value of t will be low.

4. Conclusion

The Internet and especially Internet-based comparison-shopping services have significantly lowered the effort required by consumers to learn about prices across a wide variety of retailers. Price dispersion always exists between traditional retail channel and Internet retail channel. Price dispersion for homogeneous products is itself a sign of market power. This paper not only studies the factors how to affect the price dispersion, but also provides the discriminance. This theoretical analysis not only complements previous research on price dispersion but also bridges the gap between previous the oritical predictions and empirical findings in Internet-enabled markets.

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