The effects of transaction cost on market transparency when Hotelling market

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Abstract
The relationship between market transparency and transaction cost have not yet to be discussed in the previous literatures. In this paper we adopt a similar Hotelling market approach and extended Schultz’s [4] demand function in a transaction cost way. Results of this paper, we concluded two proposition;

1. while companies pay higher transaction costs lead to higher market transparency.
2. increasing market transparency leads to lowest prices and lowest profits.

From the consumer’s side, the social surplus increased while their transaction cost decrease. This research shows the impact of transaction cost on market transparency. A discussion of the finding, meaningful implications and suggestions for future research are all presented.

Keywords : Transaction cost, market transparency, Hotelling market, marketing.

1. Introduction

In the classical economics theory, it is assumed that information is symmetric in the market. Since both buyers and sellers are assumed to have the same amount of information, the market is full transparency.
and without any transaction cost. In reality markets are often inefficient (e.g., information asymmetry) and uncertain (e.g., product and process uncertainty) (Coase [18]). Under this situation, the extra cost will increase such as buyer or seller to promote transaction-related incur transaction activities cost. In addition, a full transparency represents higher information and a lower transaction cost. Therefore, higher transparency can reduce the information asymmetry and transaction cost in transaction process. For example, the sellers can through the advertisements to increase market transparency to promotion their product. Advertisements are used to announce sales. As more transparency on the consumer side, so consumers are better informed about prices and product characteristics, are usually thought to promote competition (Schultz [4]).

As Adam Smith addressed two centuries ago, “The real price of anything is the toil and trouble of acquiring it”. In other words, the total consumer cost includes the purchasing time, energy, psychic and other non-monetary costs. A consumer evaluates these elements together with the monetary cost to form a total consumer cost (Kotler [15]). These are useful in understanding the consumer’s transaction cost. Therefore, in accordance with the concept of real price, \( p_{\text{real}} \) (i.e., total expenditure) from Adam Smith, that the total cost of a buyer to purchase a product will be \( p_{\text{real}} = p_m + E \), where \( p_m \) is the product price (i.e., monetary), \( E \) is the extra cost in proportion for buyers to pay, which is identical with transaction cost. On the other hand, sellers also need to provide some extra cost in proportion such as service, information and psychical evidence costs that associated with buyers. The following example will support the point: more consumers would be drawn and attracted to the sellers who offer free services such as free parking. Above example has clearly pointed out that a consumer would estimate which offer delivers the most value. Consumers are value-maximizing, within the same amounts of time costs and energy cost (Kotler [15]). Whether or not the offer lives up to the value expectation affects both satisfaction and repurchasing probability.

Market transparency and transaction cost have not been discussed by researchers before, we consider the effects on transaction cost and competition of increased market transparency on the consumer side in a Hotelling market – following the lead of Schultz [4], he considers a homogeneous market where product characteristics as well as prices are not obvious to all consumers. The present paper attempts to measure
the relationship between the transaction cost and the transparency market in difference concept to provide the future empirical research on consuming markets.

The remained of this paper is organized as follows: Section 2 reviews the relevant literature. Section 3 modeling assumptions, derives the equilibrium outcomes and the main issues addressed are the effect on transaction cost, profits and prices of market transparency. Section 4 conclusions with a summary of propositions and managerial implications and areas for future research. All derivations are presented in the Appendix.

2. Literature review

2.1 Consumer transaction processes

when a consumer purchases a product from a seller, he/she must go through a decision marking process. This process is called a transaction process. Marketing theory has developed a “stages model” of the buying decision process. A typical consumer decision process passes through five stages: problem recognition, information search, evaluation of alternative, purchase decision and post-purchase behavior (Kotler [15]). Another approach, called the Consumer Resource Life Cycle (CRLC), divides the linkage between a company and its consumers into four major stages: requirement, acquisition, stewardship and retirement (Ives and Learmonth [2]). Another mercantile model (MM) decomposes is purchase determination, purchase consumption and post-purchase interaction (Kalakota and Whinston [19]). In fact, these models all propose a similar process by which a consumer interacts with a seller. Liang and Huang [21]) integrated the transaction process of the CRLC and Mercantile Model (MM) into a seven-step process: search, comparison, examination, negotiation, order and payment, delivery, and post-services, say Transaction Cost Model (TP). Lovelock and Wirtz [3] showed the Purchase Process For Services (PPS) has three identifiable stages: the pre-purchase stage, the service encounter stage and the post-purchase stage. Each stage contains two or more steps such as the pre-purchase stage (include awareness of need, search and alternative evaluation); the service encounter stage (include request service and service delivery); and the post-purchase stage (include service performance and future intentions). The major emphases of these models are the consumers need to search for relevant product or service
information and compare prices or other attributes.

Thus, in a transaction process that the consumer will incur extra cost (e.g., distance and transportation costs, see Klimenko [11]). The costs involve with such transaction-related activities are called transaction cost. One particular aspect that we examine here is the costs associated with the transaction process. On the other hand, if all other factors are equal, a consumer will go with a location where has lower transaction cost (Liang and Huang [21]). For example, assume sellers offer product’s information or free parking, the buyers will be more informed about product and satisfy about service. The point of these examples is clear. We believe that consumers estimate which offer will deliver the most value. Consumers care value-maximizing within the same amounts of time costs and energy cost. Whether or not the offer lives up to the value expectation affects both satisfaction and repurchasing probability. In Table 1, we summarize these previous studies according to transaction process structures used and these identify mechanisms to encourage transaction cost.

2.2 Transaction cost theory

Over the past decade, transaction cost analysis has received an increased amount of attention from a broad range of audiences. Transaction costs are the “cost of running the system” and include such ex ante costs as drafting and negotiating contracts and such ex post costs as monitoring and enforcing agreements (Rindfleisch and Heide [1]). A transaction is a process by which a good or service is transferred across a technologically separable interface (Williamson [14]). Buyers and sellers are engaged in a double-search process in the marketplace. The process of search involves uncertainly because producers are not certain of consumers’ needs, and consumers are not certain that they will be able to find what they want (Stern et al [9]). There are many factors that may affect a consumer’s decision to purchase from location stores—the monetary cost (e.g., product’s price) and the non-monetary cost (e.g., buyer’s time, energy and psychics sacrifice). Transaction cost theoretically explains why a transaction subject chooses a particular form of transaction instead of others. The basic principle of transaction cost is that consumers like to conduct transactions in a way that minimizes their transaction cost (Liang and Huang [21]). The assumption of economics principle is the market is fully transparent and
Table 1
Comparison of several customer decision models

<table>
<thead>
<tr>
<th>Five-stage model</th>
<th>CRLC</th>
<th>MM</th>
<th>TP</th>
<th>PPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem recognition ↓</td>
<td>Establish requirement</td>
<td>Specify attributes</td>
<td></td>
<td>Awareness of need</td>
</tr>
<tr>
<td>Information search ↓</td>
<td>Search</td>
<td>Search</td>
<td>Search</td>
<td></td>
</tr>
<tr>
<td>Alternative evaluation ↓</td>
<td>Comparison</td>
<td>Bargaining</td>
<td>Comparison</td>
<td>Alternative evaluation</td>
</tr>
<tr>
<td>Purchase decision ↓</td>
<td>Select source</td>
<td>Authorize and pay</td>
<td>Order</td>
<td>Request service</td>
</tr>
<tr>
<td></td>
<td>Acquire</td>
<td>Test and accept</td>
<td>Authorize payment</td>
<td>Delivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receipt</td>
<td>Service delivery</td>
</tr>
<tr>
<td>Post-purchase behavior</td>
<td>Integrate Monitor Upgrade Maintain Transfer or dispose Account for</td>
<td>Post-service</td>
<td>Post-service</td>
<td>Service Performance Future intentions</td>
</tr>
</tbody>
</table>


without any transaction cost in the transaction process. However, in reality word, market is often not transparent. In order to proceed with a transaction, consumers must conduct activity such as searching for information, negotiating payments terms and monitoring the on-going process to ensure a favorable deal (Coase [18]). For instance, the consumers need to compare the location, price and product characteristics among sellers in order to reduce their costs.

The transaction cost may be affected by several factors including uncertainty and asset specificity. Uncertainty refers to the cost associates with the unexpected outcome and asymmetry information (or market transparency). Asset specificity refers to durable investments that are undertaken in support of particular transaction, the opportunity cost of
which investment is much lower in best alternative uses or by alternative users' (Williamson [14]). A higher level of uncertainty or asset specificity generally implies a higher transaction cost. Transaction cost has been applied to analyze many issues such as finance analysis (Fehle [5]); emissions trading (Pan and Regemorter [7]) and environmental policy (Netusil and Braden [13]). However, previous marketing studies have been ignoring the influence of transaction decision process and price competition.

2.3 Market transparency

Schultz [4] identified market transparency with the fraction of consumers, who are informed about prices and product characteristics and he addressed when in a Hotelling market, from consumer’s side, with endogenous choice of product characteristics increasing, the market transparency on the consumer side leads to less product differentiation and lesser prices and profits. Therefore, higher transparency can reduce the information asymmetry for consumers and leads to less product characteristics, lower prices and lower profits when the transaction cost is pay by the seller. Gehring and Stenbacka [20] showed that the presence of sufficiently significant switching costs, which are increasing in the degree of product characteristics. The switch is post-purchase behavior such as transfer or dispose will incur some post-purchase cost (see, Ives and Learmonth [2]). Dudey [10] contributed studies of considering firm’s geographic location choice in a model of homogeneous goods with a fix number of locations and consumers with limited price information. Consumers are imperfectly informed about product’s quality and high prices signal high quality. Boone and Potters [8] study a symmetric Cournot-Nash model to differentiated goods while transparency is interpreted by some consumers who are aware of all exiting products in the market.

When information plays an important role creates the link between market transparency and transaction cost. McEachern [23] argued that the transaction costs are the costs of time and information required to carry out market exchange. For instance, advertising affects the consumers’ demand because it makes them aware of attractive product offers at other locations (Bester and Petrakis [6]). Thus, the main purpose of the advertisement is to provide product’s information. In this paper, transparency is an exogenous feature of the model. A previous study about
information of prices and products are provided through advertising by the firms (Bester and Petrakis [6]) proves it reduces information search cost of consumer. For example, supermarkets and department stores use newspapers and mail to announce the price of food, clothing or appliances. Therefore, all consumers can be well informed about the availability and the characteristic of product to reduce its transaction cost (e.g., search cost).

3. The model

This study is based on Schultz’s information type assumption, mainly applied in Schultz’s [4] demand function model. We consider the transaction cost rather than a traditional product price and assume the consumers have unit demand, namely, a consumer buys at most one unit of the good. There is a consumer x is location at \( x \in [0, 1] \). There are two firms, labeled A and B. Firstly, these two firms choose locations, \( a \) and \( 1 - b \), respectively, where \( a + b < 1 \).

Let \( p_{ma} \) and \( p_{mb} \) denoting the monetary prices charged by the two firms A and B, respectively. If \( s \) denotes the surplus enjoyed by each consumer while he is consuming the good, the utility of a consumer locating at \( x \) is

\[
 s - p_{ma} - t(x - a)^2, \\
\]

if the consumer purchases goods from firm A, and

\[
 s - p_{mb} - t(1 - b - x)^2, \\
\]

if this consumers purchase goods from firm B. The parameter \( t > 0 \) measures the degree of production differentiation.

Consider now there is a consumer have ability and willingness to pay the total expenditure \( p_{real} \) buying products from firm A’s or B’s product. Accordingly, the previous concept of real price, from equations (1) and (2), the monetary prices can be rewritten as \( p_{ma} = p_{real} - \lambda_a E_a \) and \( p_{mb} = p_{real} - \lambda_b E_b \), where assume \( E_a \) is a part of the transaction cost bore by firms A to pay and \( \lambda_a \) is an efficiency index of transaction cost denoting the consumers be affected to spend. The item \( \lambda_a E_a \) represents the transaction cost cut down by consumers to pay, when the consumer buy from firm A, \((E_b, \lambda_b \text{ and } \lambda_b E_b \text{ are similarity by firm B})\). Substituting \( p_{ma} = p_{real} - \lambda_a E_a \) and \( p_{mb} = p_{real} - \lambda_b E_b \), into equation (1) and equation (2), we can rewrite
the equations as:

\[ s - (p^{\text{real}} - \lambda a E_a) - t(x - a)^2, \]  

\tag{1a}

and

\[ s - (p^{\text{real}} - \lambda a E_a) - t(1 - b - x)^2, \]  

\tag{2a}

where \( p^{\text{real}} \) are constant.

From (1a) and (2a), Schultz [4] explained that there is a consumer knows the price and location of the firms are indifferent between buying from firm A, if the consumer locates at (see, Appendix).

\[ x = x(E_a, E_b, a, b) \equiv \frac{1 + a - b}{2} + \frac{\lambda(E_a - E_b)}{2t(1 - a - b)}, \]  

\tag{3}

where \( \lambda_a = \lambda_b = \lambda \), assumes the affection of the firm transaction cost expending are the same.

In many markets, firms are able to conduct discriminatory strategies based on whether a customer prefers a competitions’ product or their own (Wallace [16]). Using the concept and according to Schultz’s [4] information types are uniformly distributed on locations. There are two different information types of consumers: some consumers \( \phi \) are informed about firms’ prices and location, while others \( (1 - \phi) \) are uninformed; thus, the demand for firm A’s product is

\[ D = \phi x(E_a, E_b, a, b) + \frac{(1 - \phi)}{2}, \]  

\tag{4}

where the variable \( \phi \) represents the degree of market transparency, the higher is \( \phi \), the more transparent is the market, so the demand to firm B is \( (1 - D) \), \( 0 < \phi < 1 \).

Firstly, consumers from expectations about firm’s locations and transaction cost. Then firms choose locations, learn how to get to the other location and finally choose how much transaction cost to pay. Some consumers learn the locations and transaction cost. Based on knowledge or transaction cost, consumers decide from which firm to buy. A consumer can only go to one firm. Then transactions take place (i.e., Schultz [4]).

3.1 Reaction function

We assume the firms’ marginal cost is zero. Firm A’s problem involves selecting \( E_a \) so as to maximize its own profit

\[ \max_{E_a} \pi_a = (p^{\text{real}} - \lambda E_a)D, \]  

\tag{5}
and the firm B’s profit is

$$\max_{E_b} \pi_b = (p_{\text{real}} - \lambda E_b)(1 - D).$$

(6)

The first-order condition for equations (5) and (6) are $\partial \pi_a / \partial E_a$ and $\partial \pi_b / \partial E_b$, and set these amount equal to zero, respectively. From the simultaneous equation (5) to (6), we obtain the reaction function of transaction cost:

$$E_a(a, b, \phi) = \frac{(a + b - 1)(3 + a\phi - b\phi)t + 3\phi p_{\text{real}}}{3\phi},$$

(7)

$$E_b(a, b, \phi) = \frac{(a + b - 1)(3 - a\phi + b\phi)t + 3\phi p_{\text{real}}}{3\phi}.$$  

(8)

In order to show the influence of $\phi$, we differentiate $E_a$ and $E_b$ with respect to $\phi$ and set these amount equal to zero, respectively. We are given

$$\frac{\partial E_a}{\partial \phi} = \frac{(1 - 2a)t - \frac{5t\phi(2a - 3a^2 - 2b + 2ab + b^2)}{18}}{2\phi} = 0,$$

(9)

$$\frac{\partial E_b}{\partial \phi} = \frac{(1 - 2b)t - \frac{5t\phi(2a - a^2 - 2b + 2ab + b^2)}{18}}{2\phi} = 0.$$  

(10)

When choosing locations, the firms take transaction cost into account their affected, cf. equation (9) and (10).
From the simultaneous equation (9) to (10), we obtain the equilibrium locations $a^*$ and $b^*$ are
$$a^* = b^* = \frac{2\phi - 1}{4\phi} < 0, \quad \text{if } 0.5 < \phi,$$
(11)
where the firm are symmetrically located. Akgün [22] showed the output is produced efficiently only in symmetric industries. A similar logic applies to the case of the firms in location. If $0.5 < \phi$, then $a^*$ and $b^*$ are increasing in $\phi$, the firms location will be closer in a transparent market to consumers. On the other hand, all consumers’ can reduce their transaction cost (e.g., transportation cost). We found as all consumers’ transaction cost decrease that it is improve in welfares.

Moreover, substituting $a^*$ and $b^*$ into equations (7) and (8), results optimal transaction costs
$$E^*_a = E^*_b = E^* = \frac{2\phi^2 p_{\text{real}} - t}{2\lambda\phi^2},$$
(12)
resolving the optimization problem (5) and (6) with respect to firms’ profit, we substitute the equilibrium location $a^*$ and $b^*$ and the optimal transaction costs $E^*$ into equations (5) and (6), we give the optimal profits by firm A, $\pi^*_a$ and firm B, $\pi^*_b$ as:
$$\pi^*_a = \pi^*_b = \pi^* = \frac{t}{4\phi^2}.$$
(13)

From (13) that the profit decrease in $\phi$; therefore, the firm increases the transaction costs which enable make market transparency increasing, leads to higher information on the consumer side, lower profit of firm. The welfare (e.g., profits) loss of firms from an increase in transparency is mirrored by the similar welfare gain for consumers and the similar transaction costs less for consumers. Wallace [16] studied the ability to discrimination customization will enhances social welfare under preference-based. Because of the $\lambda$ is an efficiency index of transaction cost denoting the consumers be affected to spend (e.g., preference-based on firm). Therefore, we consider the effect of $\lambda$ on equilibrium transaction costs from equation (12); as $\lambda$ increases, the transaction costs payment of firms can decrease.

Using the result of equation (12), we can derived the equilibrium prices
$$p_{ma} = p_{mb} = \frac{1}{2\phi^2},$$
(14)
where \( p_{ma} = p_{\text{real}} - \lambda E_a \) and \( p_{mb} = p_{\text{real}} - \lambda E_b \). Similarly, from equation (14) the prices are decreasing in \( \phi \). It is interesting to find that under the transaction cost assumption, the price competition is greater. Thus, increasing transparency from transaction cost paid by firm, leads to more intensified competition for firm’s prices.

4. Conclusion

In this paper we follow a similar Hotelling market approach and use Schultz [4] framework but extend the previous research in a transaction cost analysis. This paper reports following two propositions:

**Proposition 1.** Increasing firm’s transaction cost to pay leads to higher market transparency.

**Proposition 2.** Increasing market transparency leads to lowest prices and lowest profits. The social surplus increasing with the decreasing in transaction cost on the consumer side.

This paper shows, as firms are increasing the marketing information for the consumers, their will raise the transaction cost expenditure to increase market’s transparency. These findings are interpretable in terms of the relative transaction cost and market transparency.

The explicit consideration of transaction cost has obtained a number of meaningful managerial insights as follows:

i. Members in the marketing channel have to attract consumers through better service or merchandising and increases the transaction cost paid by consumers (e.g., the switch cost inside consumers) and pursue strong consumer’s loyalties.

ii. The firms benefit from taking the advantages of transaction cost is when consumers who reduce expenses, as firms lower consumers’ searching and time cost by helping them to locate products though may incur expenditures.

iii. Bester and Petrakis [6] have studied the case where information about prices and products are provided through firm advertisement. A better advertisement strategy for market transparency to reduce the transaction costs would be made if manager understood how to deliver information about process and product characteristics to certain consumers.
iv. Firms pay attention to the transaction cost efficiency index of consumers will affect consumers’ purchase decision, too.

Future research would examine the generalization of these results. Such as, if all the consumers are informed about prices but some are unsure about product characteristics. Or if the transaction costs on the consumer side to pay or if the real prices (i.e., total consumer cost) are not constant, due to the easily change of consumers’ purchasing behavior. For example, the Internet contains much useful information to stimulate the purchasing behavior and lower transaction cost as well as switching some cost to consumers. On the Internet, choice is not only ubiquitous, but also electronically record in great detail (Bucklin and Lattin [17]). Therefore, research on the topic of the transaction cost of empirical information is obtained and the transaction cost under the Internet will be a rich area in the future. Finally, similar to Chen’s [12] research, future research could set up a dynamic mathematical model to study the impact of transaction cost.

Appendix

Assuming a consumer in location $x$, who is indifferent between buying from firm A or B, we have:

$$s - (p_{\text{real}} - \lambda_a E_a) - t(x - a)^2 = s - (p_{\text{real}} - \lambda_b E_b) - t(1 - b - x)^2$$

$$\iff x(E_a, E_b, a, b) \equiv \frac{1 + a - b}{2} + \frac{\lambda_a E_a - \lambda_b E_b}{2t(1 - a - b)}, \quad (A1)$$

where $p_{ma} = p_{\text{real}} - \lambda_a E_a$ and $p_{mb} = p_{\text{real}} - \lambda_b E_b$.

References


Received December, 2005