Price Competition in IT Outsourcing with Switching Costs

Y. ZHU
School of Economics, Hefei University of Technology, Hefei, Anhui, China

ABSTRACT: Switching costs play an important role in IT outsourcing price competition. With an infinite repeated game model, the paper examines how participants prices and profits are affected by their costs and switching costs. Incumbents could lock in customers at a price decided by the entrant costs but not its own costs, and earn extra profits summing up to the total switching costs, while entrants use bargain-then-rip-off strategy. Besides customers switching costs, there exist vendors switching costs. Switching costs can be transformed between customers and entrants, and reach equilibrium when the sum is minimum.
KEYWORD: Information Technology Outsourcing; Price Competition; Switching Costs

The information technology outsourcing (ITO) market has grown tremendously since the famous Kodak outsourcing case in 1989. According to the statistic made by XMG Global, the output value of ITO market reached $508 billion in 2012, with a growth rate of 9.5%.

When outsourcing their IT services, some firms have to accept the high prices proposed by their vendors, or they will suffer more if ceasing the current IT service or switching to other vendors. The extra costs can be framed under the concept of switching costs (Whitten & Wakfield 2006). Farrell & Shapiro (1988) states switching costs are created by relationship-specific assets for a buyer changes providers. Klemperer (1995) states switching cost results from a consumer's desire for compatibility between his current purchase and a previous investment. Burnham et al. (2003) defines switching costs as the onetime costs that customers associate with the process of switching from one provider to another.

Switching costs have a great influence on the price competition among vendors. Prices (and profits) are higher in an infinite-period market with consumer switching costs than without switching costs, and new entrants are more attracted by the market (Beggs & Klemperer 1992). To (1996) examines an infinite-period duopoly market with positive consumer switching costs and overlapping generations of consumers based on Beggs & Klemperer (1992), and finds that the two firms may alternate dominance from one period to the next, alternately charging high and low prices. Biglaiser et al. (2013) proves that low switching costs customers hinder entrants who find it more costly to attract high switching cost customers, help incumbents raising profits. Chen (1997) states firms are worse off engaging in the discriminatory pricing, while consumers need not necessarily benefit from it.

The former study based on the assumption that only customers have switching cost. However, vendors do have some kind of switching cost as well. The paper study the price competition in ITO market, in the case that both customers and vendors need to afford switching cost, using infinite repeated game model.

The rest of the article is organized as follows. In section 1, some characteristics that may influence price competition are discussed. In section 2, I build a model with one customer and two vendors, and give equilibrium results, taking both asymmetric vendors and symmetric vendors into account. Section 3 discusses conditions and influences of transformation of switching costs between customers and vendors. Section 4 concludes.

1 CHARACTERISTICS OF ITO COMPETITION

1.1 *Product homogeneity*

Product homogeneity means that there are no differences for customers to choose any IT vendor. What customers intend to outsource is some kind of IT services, not the technology and equipment that accomplish functions of such services. Customers care only about whether the outsourced IT services

can help improving their business activities, e.g. functions, activities flow, organization structure and response time. In this degree, all vendors provide customized IT services followed by the customers demands, and their productions are homogeneous even they provide different technology and equipment.

1.2 *Switching costs*

When customers outsource their IT operations and commit to a certain vendor, they will incur a variety of costs if they decide to change their vendor/s (Molina-Castillo et al. 2012). Klemperer (1987) divides switching costs into transaction costs, learning costs and artificial or contractual costs. Burnham et al. (2003) organizes switching costs into three types (procedural switching costs, financial switching costs and relational switching costs) and eight sub-facets. Whitten & Wakefield (2006) gives eight factors of switching costs in ITO domain: uncertainty costs, post-switching behavioral and cognitive costs, set-up costs, hiring and retraining costs, management system upgrade costs, lost benefit costs, search and evaluation costs, sunk costs.

The former literatures give an in-depth insight into customers switching costs. Similarly, vendors also have some kind of switching costs. Vendors switching costs refer to the onetime costs that afforded by vendors associate with the process of customers switching from one vendor to another. Such switching costs are afforded by entrants but not incumbents, as the switching procedure happens between customers and entrants.

Vendors switching costs include at least:

a) Search and evaluation costs are the time and effort costs associated with the search and evaluation needed to make an entering decision.

b) Learning costs are the time and effort costs associated with learning new skills and knowledge about customers.

c) Financial costs are the onetime financial outlays that incurred in switching process.

d) Relational costs are the time and effort costs associated with building new outsourcing relationships.

1.3 *Price discrimination*

Most of the switching costs literatures assume that vendors offer same prices to all customers in any given period. However, vendors would often like to price discriminate between their old locked-in customers, and customers locked-in to a rival. In ITO market, customers demand different IT services and apply distinctive standard to measure the value and cost of IT services. This gives good opportunities for vendors to implement price discriminate as customers can hardly compare with each other.

2 THE MODEL

2.1 *Basic Assumptions*

The paper uses an infinite repeated game model. Suppose there are two vendors and one customer. The vendor who contract with the customer in the last period is called the incumbent, and the other the entrant. In each period, the incumbent and the entrant propose outsourcing prices distinctively, and the customer selects one to maximum profits.

The customer has a reservation value of U and will get zero if not outsourcing. Let p_i represents the price proposed by the incumbent, which is constant for a certain vendor, and p_e represents price proposed by the entrant, which is also constant for a certain vendor. Once switching the vendor, the customer has switching costs S_c and the entrant has switching costs S_e. Vendors have costs C, and C^1, C^2 denote costs owned by vendor 1 and vendor 2. Both vendors and the customer have discount rate β.

There are three assumptions here:

a) $0 \le p_i, p_e \le U$, which means the customer must have a positive profit if outsourcing.

b) $p_i \ge C$, which means the incumbent price must excess cost, as the incumbent profit must be no less than zero.

c) If the customer gets same profit from either vendor, he will choose the incumbent.

2.2 *Results with asymmetric vendors*

When in the equilibrium state, the customer net present value (NPV) of profit must be the same whether switching vendor or not, or the customer will choose higher profit. In the rest of the article, profit refers to NPV of profit if not being specific mentioned. Suppose vendor 1 is the incumbent and the first equilibrium condition can be given out.

$$\frac{\left(U-p_i^1\right)}{1-\beta}=\left(U-p_e^2-S_c\right)+\frac{\beta\left(U-p_i^2\right)}{1-\beta} \quad (1)$$

The left side represents the customer profit when continuing contract with the incumbent and the right side represents the profit when switching to the entrant. According to assumption c), customer will keep up with the incumbent.

Before giving the second equilibrium condition, a proposition about the entrant profit will be given as the basis.

Proposition 1: the entrant net present value of profit is zero in price competition with switching costs.

Proof:

Firstly, the entrant profit $\pi_e \geq 0$, or the entrant will quit competition.

Secondly, prove $\pi_e \leq 0$ with the reduction to absurdity. Suppose $\pi_e = \varepsilon > 0$, and

$$\pi_e = (p_e - S_e - C_e) + \beta \frac{p_i - C_e}{1-\beta} = p_e + \frac{\beta p_i}{1-\beta} - S_e - \frac{C_e}{1-\beta} \quad (2)$$

where C_e = the entrant cost.

The incumbent will set the price correspondingly, and we can get the equation below form equation (1), (2):

$$\pi_i + \frac{C_i}{1-\beta} = \pi_e + S_e + S_c + \frac{C_e}{1-\beta} = \varepsilon + S_e + S_c + \frac{C_e}{1-\beta} \quad (3)$$

where C_i = the incumbent cost.

The customer profit when choosing the incumbent is

$$\pi_{c,i} = \frac{U}{1-\beta} - \left(\pi_i + \frac{C_i}{1-\beta}\right) = \frac{U}{1-\beta} - \left(\varepsilon + S_e + S_c + \frac{C_e}{1-\beta}\right) \quad (4)$$

and the customer profit when choosing the entrant is

$$\pi_{c,e} = \frac{U}{1-\beta} - \left(\pi_e + S_e + \frac{C_e}{1-\beta}\right) - S_c \quad (5)$$

Such status is not stable. If the entrant lowers his price and makes $0 \leq \pi_e < \varepsilon$, it is obviously that $\pi_{c,i} < \pi_{c,e}$ and the customer will choose the entrant. To sum up, when the entrant profit excesses zero, the entrant has a tendency to attract the customer with a lower price thus makes the system unstable.

Finally, as $\pi_e \geq 0$ and $\pi_e \leq 0$, we can get that $\pi_e = 0$.

Now I can give the second equilibrium condition from proposition 1:

$$\pi_e^2 = p_e^2 - S_e^2 - C^2 + \frac{\beta}{1-\beta}\left(p_i^2 - C^2\right) = 0 \quad (6)$$

The first two equilibrium conditions are on the condition that vendor 1 is the incumbent. Similarly, there are another two equilibrium conditions on the condition that vendor 2 is the incumbent:

$$\frac{p_i^2}{1-\beta} = p_e^1 + S_c + \frac{\beta p_i^1}{1-\beta} \quad (7)$$

$$\pi_e^1 = p_e^1 - S_e^1 - C^1 + \frac{\beta}{1-\beta}\left(p_i^1 - C^1\right) = 0 \quad (8)$$

Equation (7) is derived from equation (1) and is simplified.

The equilibrium results are as follows:

$$p_i^1 = (1-\beta)\left(S_c + S_e^2\right) + C^2 \quad (9)$$

$$p_i^2 = (1-\beta)\left(S_c + S_e^1\right) + C^1 \quad (10)$$

$$p_e^1 = S_e^1 + \frac{C^2}{1-\beta} - \frac{\beta p_i^1}{1-\beta} = \frac{C^1 - \beta C^2}{1-\beta} + S_e^1 - \beta\left(S_c + S_e^2\right) \quad (11)$$

$$p_e^2 = \frac{C^2 - \beta C^1}{1-\beta} + S_e^2 - \beta\left(S_c + S_e^1\right) \quad (12)$$

Equation (9), (12) is equilibrium result when vendor 1 is the incumbent and vendor 2 is the entrant, and (10), (11) is the result in opposite condition.

Proposition 2: There is a pure-strategy weak Nash equilibrium to the game: the incumbent set the price at p_i and the entrant set the price at p_e from equation (9)-(12).

Incumbents can lock in customers, and earn extra profit. The entrant will attract customer at a lower price and make up for the losing profit after incumbent. The result is similar to some former studies (Chen 1997; Beggs & Klemperer 1992)

Proposition 3: The incumbent price has no correlation with its own costs and switching costs, but has a positive correlation with the entrant costs and switching costs.

Proposition 3 may instruct vendors how to set a price.

2.3 *Results with symmetric vendors*

Let vendors have the same costs and switching costs to analyze the influence of switching costs no regarding to distinctions between vendors. From the above conclusion we have:

$$p_i = C + (1-\beta)(S_c + S_e) \quad (13)$$

$$p_e = C + (1-\beta)S_e - \beta S_c \quad (14)$$

The incumbent price is positively correlated with switching costs, while the entrant price has a negative correlation with the customer switching costs and a positive correlation with the vendor switching costs. This can help both customers and vendors competing in the market. Customers should ask vendors to provide universal equipment and standard technology in order to reduce switching costs. As a result, customers costs that are equal to vendors price will reduce. Incumbents can increase prices by patent and technical monopoly, and earn more lock-in profit.

The incumbent price has a negative correlation with discount rate β. As discount rate decrease, which means income of current time is more important, vendors will ask a higher price.

The profit of the incumbent is

$$\pi_i = \frac{p_i - C}{1-\beta} = S_c + S_e \quad (15)$$

It is different with the study of Biglaiser and Crémer (2011), which proves incumbent profit to be

S / (1 - β), because they consider that entrant won't set a price lower than cost.

3 TRANSFORMATION OF SWITCHING COSTS

Customers switching costs and vendors switching costs may transform mutually. For example, entrant can use technology and user interface similar to those before to decrease customers switching costs, while vendor's switching costs will increase because of unfamiliar developing methods. The transforming process won't be further discussed due to the space restriction.

Obviously, customers and entrants can accept the transformation only if customers profits don't reduce (From Proposition 1, entrant's profit is equal to zero). Incumbents can't take part in as the transforming process happens between customers and entrants.

Using the former symmetric model, let ΔS_c and ΔS_e denote the change of the customer switching costs and the vendor switching costs. The customer profit change is no less than zero means $\Delta p_i \leq 0$, and the transformation condition is: $\Delta S_c + \Delta S_e \leq 0$.

Proposition 4: Customers switching costs and vendors switching costs may transform mutually, and reach equilibrium when the sum of which are minimum.

Customers will be glad to see the transformation as their profit will increase. Entrants may use it to raise entering possibility, while incumbents have to lower price passively to keep lock-in.

4 CONCLUSION

In IT outsourcing market, associating with the process of customers switching from one vendor to another, there exist switching costs afforded by both customers and vendors. Customers switching costs have been studied, and vendors switching costs include search and evaluation costs, learning costs, financial costs and relational costs.

Switching costs have a great influence on the price competitions in ITO. Incumbents can set a price higher than costs to lock in customers; and the entrant will attract customer with a lower profit than that when incumbent. The incumbent's price has no correlation with its own costs and switching costs, but has a positive correlation with the entrant's costs and switching costs.

Customers switching costs and vendors switching costs may transform mutually, and reach equilibrium when the sum of which are minimum. Customers can use the transformation to increase profits.

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