Modeling Choice Behavior of Delivery Provider of Online Auctioneer

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Abstract

Digital technology has provided a new paradigm of our society and changed our lives interaction with the Internet. As an efficient and flexible sales channel, companies can use auction sites to liquidate unwanted inventory, as well as to assist in pricing new products, acquiring new markets for low-margin items, and reaching markets that would be too costly using traditional distribution methods. Online auction is a new type of shopping methods due to the convenient internet. In Taiwan, many e-commerce-related deliveries are operated by third party logistics providers. In the electronic commerce dealing, the service of delivering consumers' orders to buyers can be seen as the last mile of logistics service, especially for the individual online auction through the C2C transaction. This paper explores the structure of logistic for retailing delivery and post service for online auction. The data were collected from 317 surveyed students who have ever purchased goods via online auction. We divided these respondents into two distinct segments by shopping frequency for online auction. Then we applied multinomial logit model to understand what relevant factors would affect online auction sellers' choice behavior of logistic in delivery service. Finally, we discussed the findings from managerial perspective and suggest directions for future research.

Keywords: retailing delivery, choice behavior, logit model

1. Introduction

Digital technology has provided a new paradigm for our society and changed our lives through interaction with the Internet. As an efficient and flexible sales channel, companies can use auction sites to liquidate unwanted inventory, as well as to assist in pricing new products, acquiring new markets for low-margin items, and reaching markets that would be too costly using traditional distribution methods. The development of e-commerce is an efficient business model which enables new relationship between consumers and suppliers. In particular, the online auction market is growing between 50% and 60% and obviously becoming a noticeable market. However, how to deliver goods to customers becomes one of the challenges for the sellers. In Taiwan, convenience stores have integrated the e-commerce with the logistics system of convenience stores to a new retail delivery model: "Online shopping in an electronic store and pick-up goods in a convenience store".

The retailing delivery (RD) system provides an easy online shopping process, safe method of payment and quick delivery service for e-retailing (Huang & Feng 2009). The main retailing delivery providers in Taiwan are 7-11.com and CVS.com. Previous researches proposed that the location of the convenience store and logistics service quality are major factors to influence consumers' choice behavior (Huang, Kuo & Xu, 2009). Since customers are the main resources of gaining profits, how to develop the differentiating strategies to maintain the existing customers with customer satisfaction and to obtain new customers becomes an important issue for convenience stores (Sharma, Grewal, and Levy, 1995). This paper had two aims: one is to examine the factors influencing the choice behaviour of retailing delivery service; the other is to describe a way in which a logit model is used to develop a marketing strategy for retailing delivery service choice behavior in the logistics market.

2. Basic idea and framework for retailing delivery of electronic commerce

Online shoppers (consumers) make their orders at their office or home anticipating quicker delivery than offline purchasing, and timely delivery at convenient times. Feng and Huang (2009) pointed out that consumers can place orders at any time any where through the Internet in the online environment, so that the orders are unpredictable and dynamic, but the delivery service response is expected to be fast. Therefore, e-retailing needs a quick-response logistics system to support the order deliveries.

In Taiwan, most of the e-commerce-related delivery is operated by the third-party logistics provider (3PL). Because of the need for an information system and timely delivery system, low logistics operations cost and there are many convenience stores in Taiwan, 3PL providers have had to improve the flow of information both internally and externally and integrate their logistics services into the retail delivery (RD) provided by convenience stores. A new RD model proposed: "Online shopping with pick-ups at convenience stores." The RD services have made many remarkable successes in portal sites such as Yahoo.com and Pchome.com.

The new RD providers in Taiwan are 7-11.com and CVS.com. CVS.com is a joint venture by four convenience stores including Family.com, Hi-Life.com, Okcvs.com and Nikomart.com that began service in the beginning of 2000, while 7-11.com joined the market at the end of 2000. Because the safe payment method and the quick delivery, RD services by convenience stores have played an important role in the e-commerce logistics in Taiwan. The relationship of online auction of RD includes three functions: (1) e-map, (2) delivery system and (3) pick-up point.

The RD system provides an easy online shopping process, a safety payment method, pick-up points of convenience stores and quick delivery service for online consumers. The RD system has two characteristics: consumers can shop online even without a credit card and it provides consumers with a self pick-up approach through convenience stores. The procedure that combines online auction with online sellers, online buyers and RD system is illustrated below:

1. Online shopping

The online sellers in Taiwan mostly have provided RD service (e.g., home delivery and pickup at the convenience store). In the part of pick-up at the convenience store, the sellers have the right to decide their RD provider, 7-11.com or CVS.com. Then the online consumers trade with the sellers who provided the pick-up point of convenience store where the consumers want to pick-up goods.

2. Choose a pick-up point

After finishing the transaction, 7-11.com or CVS.com will be shown on the website. The buyer should select the pick-up point on the e-map provided by the RD system.

3. Packing process

After the seller confirms the orders, the seller would finish the packing process (e.g., pick goods, print invoice and package), and dispatch the goods to the selected convenience store (e.g., Family.com, Hi-Life.com, Okcvs.com), that is provided by CVS.com system or wait the delivery centre to receive the goods and transport the goods to the delivery centre, that is provided by 7-11.com system.

4. Delivery process

The delivery centre of CVS.com system collects the orders form different convenience stores and transports the orders to the convenience store (pick-up point of the orders) and then replies the completed information to the system and online sellers. The delivery centre of 7-11.com system also receives information from sellers' place and transports the orders to the 7-11 convenience stores (pick-up point of the orders) and then replies the completed information to the system and online sellers.

5. Picking-up Goods

According to the reply information, the system will notify the buyer by e-mail or cell phone massage about the pick-up status of goods.

In General, the consumers order the goods on D day the seller will proceed to pack and dispatch the goods on the D+1 day, and the consumers can pick the goods from the convenience store on the afternoon of the D+3 day, or the D+5 day if there it involves a weekend. The procedure that combines online auction with online sellers, online buyers, and RD system is illustrated below and shown in Figure 1.

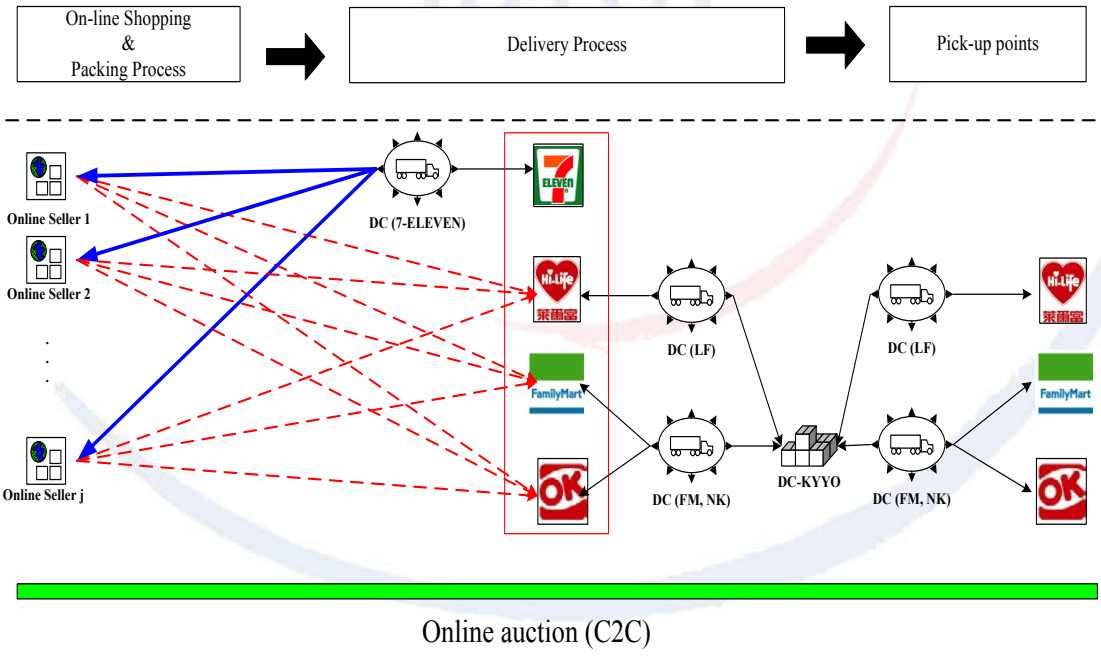

Figure 1. Relationship of online auction of RD

3. Methodology

Choice behavior can be characterized by a decision process, which is informed by perceptions and beliefs based on available information, and influenced by affect, attitudes, motives, and preferences. The logit model is based on the notion that an individual derives utility by choosing an alternative. The utilities U are latent variables and the observable preference indicators y are manifestations of the underlying utilities. The utilities are assumed to be a function of a set of explanatory variables X, which describe the decision-maker n and the alternative i. The resulting utility equation can be written the following:

$$U_{in} = V(X_{in};\beta) + \varepsilon_{in} \quad (1)$$

where U_{in} is the utility of alternative $i[i = 1,\dots,j_n]$ for decision-maker $n[n = 1,\dots,N]$ (U_n is a vector of utilities for decision-maker *n*); X_n is a vector of explanatory variables describing alternative *i* and decision-maker *n* (X_n is a matrix of explanatory variables describing all alternatives and decision-maker *n*); β is a vector of unknown parameters; V (called the systematic utility) is a function of the explanatory variables and unknown parameters β; and ε_{in} is a random disturbance for *i* and *n* (ε_n is the vector of random disturbances, which is distributed $\varepsilon_n \sim D(\theta_\varepsilon)$, where θ_ε are unknown parameters).

Decision-maker *n* chooses *i* if and only if $U_{in} \geq U_{jn}$ for all $j \in C_n$, where C_n is the set of J_n alternatives faced by *n*. The choice probability equation is then:

$$P(i|X_n;\beta,\theta_\varepsilon) = Prob[U_{in} \geq U_{jn}, \forall j \in C_n]. \quad (2)$$

The utility of alternative i prefer the utility of alternative j in individual k can be showed as follow:

$$U_{ik} > U_{jk} \quad i, j \in A_k \quad i \neq j$$

The utility function of U_{ik} can be showed as follow:

$$U_{ik} = V_{ik} + \varepsilon_{ik} \quad (3)$$

The probability choice behavior model can be showed as follow:

$$P(i \mid A_k) = P(U_{ik} > U_{jk}, \ \forall j \in A_k)$$

$$= P(V_{ik} + \varepsilon_{ik} > V_{jk} + \varepsilon_{jk}, \ \forall j \in A_k)$$

$$= P(V_{ik} - V_{jk} > \varepsilon_{jk} - \varepsilon_{ik}, \ \forall j \in A_k) \quad (4)$$

It assumed that all of the disturbances are independently and identically distributed (IID) and have the same Gumbel distribution, the GMNL model as follow:

$$P(i \mid A_k) = \frac{e^{V_{ik}}}{\sum_{J_k=1}^{J_k} e^{V_{jk}}} \quad (5)$$

where J_k denotes the number of alternative A_k.

4. Data and analysis results

The target sample in this study is the online-shoppers who have ever purchased online auction market, and pick-up goods at the convenience store. The data used in this study were collected via a Web survey. In order to reduce the possibility of multiple submissions by one person, cookie technology was used to ensure that each respondent answered the questionnaire only once. During the survey of five-week period, in the final survey we retrieved 317. Among the sample data, more than 65.2% of respondents are female, 61.1% are 18-29 years old. More than 71.4% of the respondents are unmarried. In terms of education level, 55.3% of respondents are educated at the college/university level. In terms of income level, more than 33.3% makes less than NT$ 30,000 per month. More than 41.3% of respondents live in northern Taiwan. Furthermore, about 31.2% of the respondents are students. About 67.7% of the respondents have 3 years or more experience in online shopping when they fill in the questionnaire.

Discrete choice analysis assumes that decision-makers select the alternative with the highest utility. Thus, the utility of an alternative includes a deterministic portion which is a function of the attributes of the alternative and characteristics of the decision-maker and a random component which represents unobservable components of the utility function. The characteristics variables of participants are socioeconomic variables, like gender, age, marital status, education level, monthly income level, area, and occupation. In this research, we use the binary logit model to analyze items that influence customers in choosing the post or retailing delivery service. This choice set of post or retailing delivery is shown as Figure 2.

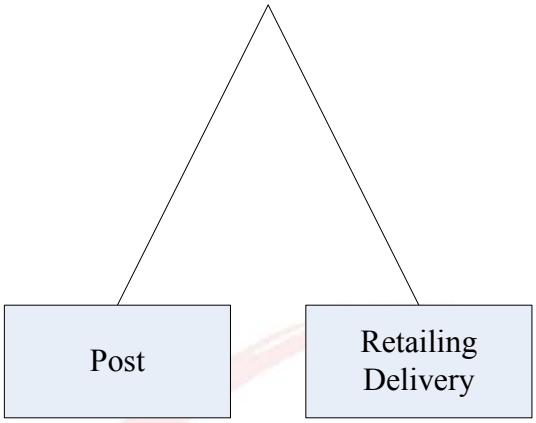

Figure 2 The choice set of post or retailing delivery

The choice model is estimated using the NLOGIT 3.0 software and the Maximum Likelihood method. All estimates have plausible signs (except the dummy for marital status, education, area and occupation in the model for respondents). The costs were combined with income variables in various ways. The estimated coefficients for the binary logit model are shown in Table 1.

Table 1 The Estimation Results of Binary Logit Model

Variable	Model Structure		
	Binary Logit Model		
	Coefficient	t-value	P-value
Constant (Post)	0.18387	1.16761	0.24297
Attributes of respondents			
Delivery charge/INCOME	-0.80720	-1.82019**	0.06873*
Dummy for Area-of-Southern Taiwan	0.57759	2.79906**	0.00513*
Dummy for Occupation-of-Employee of company	-0.36246	-1.80812**	0.07059*
Latent variables for LSQ			
Information Quality	0.72766	2.08570**	0.03701*
Convenience	1.74381	5.26166**	0.00000*
Observations	317		
Log-likelihood	-397.9004		
"Rho^2" w.r.t. 0	0.1898		

Notes: ** t-value >1.645; * p<0.1.

The likelihood ratio for the best results of binary logit model is 0.1898. That means the variables which have significant effect on the binary logit model have powerful explanation. And the calibration results reveal that: the variables for gender, age, marital status, and education can be removed, because their estimates are clearly insignificant now. The variables for area have a negatives impact on retailing delivery service choice behavior: people live in southern Taiwan prefer to post delivery service

to be the retail delivery service, possibly because the post in southern Taiwan play more importance role than convenience stores. Employees of a company have a higher probability to choose retail delivery service, implying that they consider not only the brand preference but also the distance from the living circle.

In this study we present the application results of applying the choice behavior. These results are compared to actual outcomes. We also report the results of policy simulation runs in which one variable is changed and everything else is assumed to remain constant. All simulation results reported here are obtained using the binary logit model. Below are the outcomes for simulations in each of which a single (policy) variable is changed. The model system has been used for the following policy runs: a 10% (30%) increase (decrease) in the retail delivery (post). The main outcomes for this system are in Table 2. The results are expressed as percentage differences relative to the base run. These results therefore give predictions of the impact of the respective policy measures only. The choice behavior model itself is sensitive to changes in price. For retail delivery and post, to decrease 10% of price construct will increase the market share by 1.848% and 2.121%. If retail delivery decrease 30% of price construct will increase the market share by 5.367%.

Next, we analyze elasticity issue using by the results of logit model. The Price elasticity[1] of demand measures the percentage change in quantity demanded caused by a percent change in price. As such, it measures the extent of movement along the demand curve. The cross elasticity of demand or cross-price elasticity[2] of demand measures the responsiveness of the demand for a good to a change in the price of another good. It is measured as the percentage change in demand for the first good that occurs in response to a percentage change in price of the second good. According to the (6) and (7), the direct elasticity for both the post and retail delivery were -0.031 and -0.382 respectively; and it was obvious that the impact to market share from retail delivery sales price would be larger. Cross elasticity for post and retail delivery were 0.035and 0.193 respectively; and this was obvious that the price rising for the post had less impact to the market share of retail delivery; nonetheless, the price rising for retail delivery would influence more on the market share for post.

Table 2 Simulation results for different price policies

[1] The formula used to calculate the coefficient cross elasticity of demand is:

$$E_d = \frac{P}{Q_d} \times \frac{dQ_d}{dP} \quad (6)$$

[2] The formula used to calculate the coefficient cross elasticity of demand is:

$$E_{XY} = \frac{\frac{\Delta Q_{dX}}{Q_{dX}}}{\frac{\Delta P_y}{P_y}} = \frac{\Delta Q_{Xd}}{\Delta P_y} \cdot \frac{P_y}{Q_{Xd}} \quad (7)$$

	retail delivery	post
base	35.53%	64.47%
retail delivery		
Price↑10%	34.88% (↓1.832%)	65.12 % (↑1.832%)
Price↑30%	32.86% (↓5.783%)	67.14 % (↑5.783%)
Price↓10%	33.47 % (↑1.848%)	66.53% (↓1.848%)
Price↓30%	35.27 % (↑5.367%)	64.73% (↓5.367%)
psot		
Price↓10%	37.66% (↓2.121%)	62.34 % (↑2.121%)
Price↓30%	35.24% (↓6.434%)	64.76% (↑6.344%)

5. Conclusions and limitations

Digital technology has provided a new paradigm of our society and changed our lives interaction with the Internet. As an efficient and flexible sales channel, companies can use auction sites to liquidate unwanted inventory, as well as to assist in pricing new products, acquiring new markets for low-margin items, and reaching markets that would be too costly using traditional distribution methods. Online auction is a new type of shopping methods due to the convenient internet. In Taiwan, many e-commerce-related deliveries are operated by third party logistics providers. In the electronic commerce dealing, the service of delivering consumers' orders to buyers can be seen as the last mile of logistics service, especially for the individual online auction through the C2C transaction. This paper explores the structure of logistic for retailing delivery and post service for online auction.

According to analysis results, market share for this post was about 65% and that for the retail delivery was about 35%. Direct elasticity for both the post and retail delivery was -0.031 and -0.382 respectively; and it was obvious that the impact to market share from retail delivery sales price would be larger. Cross elasticity for post and retail delivery were 0.035and 0.193 respectively; and this was obvious that the price rising for the post had less impact to the market share of retail delivery; nonetheless, the price rising for retail delivery would influence more on the market share for post.

From the simulation results, we know information quality and convenience are more sensitive to changes in the market share. The present findings have both managerial and research implications. For managers of the delivery providers, how to offer the consumer satisfied quality becomes the essential running methods of the service

industry businessmen. Therefore, establishing a great relationship with customers has become very important. Moreover, how to maintain a great relationship with customers also becomes an important issue for the service industry businessmen. Our data are all focused and gathered in Taiwan, so the conceptual framework proposed by us is suitable for Taiwanese people. But consumers with different culture may not be explained by this conceptual framework. Future research can collect samples from other countries and compare the difference.

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