

5-26-2012

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## Recommended Citation

CHEN, Wen-jing and HE, Gang, "Analysis of E-Business and Traditional Business Based on the Modified Akerlof Model" (2012).  
*Eleventh Wuhan International Conference on e-Business*. 99.  
<http://aisel.aisnet.org/whiceb2011/99>

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# Analysis of E-Business and Traditional Business Based on the Modified Akerlof Model

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**Abstract:** In this paper, E-business and traditional business is investigated based on the modified Akerlof model to explain the reason why the E-business has developed rapidly in case of information asymmetry; on the other hand, adverse selections appear in the traditional business. In the end, the corresponding suggestions are put forward on coordinated development of the E-business and traditional business.

Keywords: Akerlof model, E-business, traditional business, asymmetric information

## 1. INTRODUCTION

E-business has become a hot topic of business activities in the process of globalization. E-business has the advantages of low-cost, high efficiency, low-price etc. Meanwhile, it has serious information asymmetry and risk between the buyers and sellers. The credit system has become a bottleneck in the development of E-business in China.

Many scholars study the asymmetric information and risk. For example, Knight F. H put forward the question of the relation between uncertain risk and profit in 1921<sup>[1]</sup>. After him, Von Neumann, J., and O. Morgenstern (1944) set up the expected utility theory<sup>[2]</sup>. Afterwards, K. J. Arrow proposes the theories of “risk attitude” and risk attitude’s measurements<sup>[3]</sup>.

On the basis of them, George A. Akerlof proposes the theory of “The Market for ‘Lemons’<sup>[4]</sup>. He thinks that in the second-hand car market, the seller has more information of the quality of the second-hand car than the buyer does under the condition of the asymmetric information. But buyer can estimate the average qualities of second-hand car in the market according to his experience, and pays the price corresponding to the average qualities. So, the second-hand cars which quality is higher than the average quality will withdraw from the market. This is the first adverse selection. Because the second-hand car which quality is higher than the average quality withdraws from the market and it leads to the fact that the average quality of the second-hand car on the market become poorer. And the expected price of buyers will drop with it; more buyers will withdraw again. The same thing repeated. The second-hand car of high quality will totally be withdrawn from the market; the average quality of the second-hand car will be poorer and poorer gradually. In the course of n time’s adverse selections, the second-hand car market will disappear. Akerlof attempts to draw such a conclusion through his discussion: the commercial trade is difficult in the undeveloped countries.

Wilson (1980) generalizes the Akerlof model<sup>[5]</sup>. He pointed out that there are many kinds of Wallace Equilibrium distinguished by Pareto Criterion when the partialities of buyers are different. As the reverse choice exists, any strength in the market mechanism cannot simplify the commodity prices. The equilibrium nature generally determines economic system and market inertia during pricing.

Michael Spence (1972) investigated the information on the labor market<sup>[6]</sup>. Joseph E. Stiglitz (1975)

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analyzed economic behaviors in the market of product, capital and insurance in the condition of the uncompleted information, and the role of information in resource distribution (especially market failure caused by adverse selection and moral risk)<sup>[7]</sup>. All of above formed classical content the choice under the uncertain condition and the risk theory.

In China, Xie (2000) studied and summed up different understandings of the information economics among the foreign scholars<sup>[8]</sup>. Some scholars ponder over Akerlof Model according to concrete national conditions of China. For example, Ping (2000) think that the fake and forged markets of China exists different “roller chain” from Akerlof’s “fake and forged→Low price→Market wither”. It namely is “High price→Usury→Fake and forged”<sup>[9]</sup>.

Up till now, nobody dabbled in the concrete Akerlof model on the E-business market. So, the modified Akerlof Model of the E-business and traditional business of China separately are introduced in this paper, in order to explain why the E-business has developed rapidly in case of information asymmetry; on the other hand, adverse selection have appeared in the traditional business. In the end, the corresponding suggestions are put forward on coordinated development of the E-business and traditional business.

## 2. THE AKERLOF MODEL OF THE E-BUSINESS

According to Akerlof, the E-business in China will wither gradually for information asymmetric. But the fact is that the development of E-business much faster than traditional commerce. Akerlof Model can’t explain it and need to be revised.

Theorem 1: If the seller's utility function of the E-business is  $u_2 = M + c \cdot n$ , Budget constraint function is  $y_2 = M + p \cdot n$ , it exists intersection between supply and demand when  $\lim c = 0$ .

Proof: We assume that:

- a. Utility function is linear in order to simplify the analysis process;
- b. Constant marginal utility;
- c. Traders maximize expected utility in von Neumann-Morgenstern utility function;
- d. Traders 1 have n commodities X with quality q;
- e. The price of other goods is taken as 1;
- f. All income of buyers is used up to purchase goods X or other goods.

Assume that there are two types of traders on the market; one is buyer, the other is seller.

For the sellers, the principle of his decision-making is to achieve the desired profit, so he is more concerned about price than quality. Seller's utility function is:

$$u_2 = M + \sum_{i=1}^n c_i \quad \text{or} \quad u_2 = M + c \cdot n \quad (1)$$

Budget constraint function is:

$$y_2 = M + p \cdot n \quad (2)$$

The seller's utility is taken as the function of cost because of the quality of commodity X is uncertain for the buyer. The price of commodity at the online store is much lower than that at traditional store. It not be affected even if slightly lower quality. Buyers will take some risks in poor quality in exchange for the lower prices. The expectations of quality of buyer consist with seller. The most concerned of the buyer is the price. As the low cost in the online store, the seller can get a huge profit sold at lower prices.

Because (1) the cost  $c$  is determined for the seller and needn't take the expected utility function. (1) is the foundation of the decision-making of seller. By (2), we obtain:

$$M = y_2 - p \cdot n \tag{3}$$

Substitution into (1), we obtain:

$$u_2 = y_1 + (c - p) \cdot n \tag{4}$$

Further, the marginal costs of the commodities  $X$  online store are much lower than the traditional store. In particular, we assume  $\lim c=0$ . We obtain from (4):

$$u_2 = y_1 - p \cdot n \tag{5}$$

(5) shows that the seller would be willing to sell the commodities  $X$  when  $p > 0$ .  $p < 0$  has no economic sense.

The utility function of Buyer is:

$$u_1 = M + \frac{3}{2} \sum_{i=1}^n q_i \quad \text{or} \quad u_1 = M + \frac{3}{2} q \cdot n \tag{6}$$

$q_i$  is the quality of commodities  $X$  at online store,  $n$  is the quantity of  $X$  at online store,  $M$  is the consumption except  $X$ .

The budget constraint function of the buyer is:

$$y_1 = M + p \cdot n \tag{7}$$

$y_1$  is a single buyer's income,  $M$  is the average price of commodity  $X$  at online store.

Since the buyer is risk neutral, so the buyer's expected utility function is:

$$E(u_1) = M + \frac{3}{2} \sum_{i=1}^n E(q_i) = M + \frac{3}{2} u \cdot n \tag{8}$$

We assume that the average quality of  $X$  at online store learned by the buyers is  $u$ .

By (7), we can get:

$$M = y - pn \tag{9}$$

The above equation into (8), we obtain:

$$E(u_1) = y_1 + \left[ \frac{3}{2} u - p \right] n \tag{10}$$

The demand of the buyer is:

$$D_2 = \frac{y_2 - M}{p}, \quad \frac{3}{2} u \geq p \tag{11}$$

$$D_2 = 0, \quad \frac{3}{2} u \leq p \tag{12}$$

In other words, the buyer will buy the commodity  $X$  when  $\frac{3}{2}u \geq p$ . We can see that there exists intersection between supply and demand in this region. Although information of the quality of  $X$  between the seller and the buyer is asymmetric, transactions can still be reached.

The important amendment to Akerlof Model according to the characteristic of E-business is: What the seller cares for is the cost and price instead of quality. Because that the characteristic of E-business is cost much less than traditional business. We can draw an important conclusion: As long as the price  $u > p > c \approx 0$ , the seller will sell commodity  $X$  and make profits.

### 3. THE AKERLOF MODEL OF THE TRADITIONAL BUSINESS

Theorem 2: When the price elasticity of demand large and the quality elasticity of demand relatively small, the adverse selection appears in the traditional business, and finally leads to the shrinking of the market.

Proof: Here are a few assumptions:

- a. Large price elasticity of demand. Buyer will tolerant the lower quality than the higher price.
- b. Everyone pursuit individual utility maximization.
- c. The quality of the commodity  $X$  at online stores is lower than the traditional store. But it can be used normally.
- d. Different from the E-business, the price determined by the quality in traditional business. The buyer can also make decisions based on (10) in the conditions of relative certainty, when  $u$  represents a determined quality.

The buyer would go to traditional store to buy goods when  $\frac{p}{u} \leq \frac{3}{2}$ .

Similarly, the seller can only sell goods when  $\frac{p}{u} \geq 1$ .

We assume that the price of commodity  $X$  is uniform distribution between  $[0, 10]$ . According to rational assumption, the average market price in traditional store, 5, can be accepted by buyers. So the seller withdrawn from the traditional business while the price between  $[5, 10]$ , and buyers are turn to online store. The distribution of the price of commodity  $X$  from  $u[0, 10]$  degraded into  $u[0, 5]$ . Where,  $u$  is the uniform distribution. This is the first adverse selection in traditional business. When buyers see the price  $[0, 5]$  and can calculate the average price  $p = \frac{5}{2} \geq \frac{3}{2}$ , then sellers will exit the traditional business the price between

$\left[\frac{5}{2}, 3\right]$  and buyers will shift online store. This is the second adverse selection. After  $n$ th time's adverse selection, commodity  $X$  sales in traditional business gradually reduce. And the market will gradually shrink.

### 4. CONCLUSIONS

We can understand that it is simultaneous that expansion of E-business and wither of traditional business by modifying the Akerlof model of E-business and traditional business separately. That is to say, consumers in the traditional business changed their mind and buy online because of adverse selection. At the same time, the scale of E-business is being strengthened constantly because of the effect of synchronized choosing. This is unanimous with the realities in China. According to the China E-business Research Center, the transaction of the E-business market in China is more than 4.5 trillion, increase 22%. The transaction of the retail online market reached 513.1 billion Yuan, up 97.3%, accounting for 3% of the total retail sales of social commodities.

The model has been supported by actual data.

Although traditional business is still the main consumption pattern, the traditional business has certain advantages of consumer habits, shopping convenience, speed and service, etc. However, these advantages will loss with the development of E-business. Meanwhile, with the development of technology, the disadvantage of E-business compared to traditional business in asymmetric information will be greatly reduced. Meanwhile, E-business has the advantage of low-cost, high efficiency, low-price etc. Therefore, E-business has a bright future.

So, how the traditional business enterprises respond to the shock of E-business? This paper argues that traditional business must comply with the trend of information technology and network-based E-business. By creating their own online shops, traditional business enterprises can not only play with the advantages of a fixed place of traditional business, but also to fully absorb the benefits of E-business to achieve the integration of the marketing platform of the traditional business and E-business.

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