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Models of China's E-Commerce in the Agricultural Sector: an Exploratory Study

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Abstract

We first review the current literature on the status quo of China's E-commerce in the agricultural sector. The model of farmers' selection of stakeholders in agricultural E-commerce is analyzed based on incomplete contract theory and right to entry theory. We conclude that the development of agricultural E-commerce follows a dynamic evolutionary model. To gain the largest profits from E-commerce in agriculture, the farmers need to dynamically adjust the cooperative relationships with the stakeholders under a constantly changing economic environment.

Keywords: *E-commerc in agricultural sector, Incomplete contract theory, Entry theory, Dynamically adjust*

1. Introduction

China has over 5 thousand years of agricultural civilization, and the central governments attach great importance to agricultural development since the founding of New China. After China's reform and opening-up, the central governments have issued No. 1 Document for 11 times. Hu Jintao's report delivered at the 18th National Congress of the Communist Party of China regarded "solving problems concerning agriculture, farmers and rural areas" as the top priority. Thus the "three rural issues" have become part of the national strategy. China's rural areas have made tremendous progress in recent years with grain yield increasing for 11 consecutive years and farmers' income growing at fast speed. Farmers' life has taken on a brand new outlook. As China's rural areas are opening up and farmers are becoming richer, China's agricultural sector is undergoing the transition from traditional agriculture mode to modern agriculture mode.

Although China is a large agricultural country, it is not an agricultural power. The three rural issues consist of the following aspects: (1) employment of farmers. In the general context of urbanization, farmers that have specific skills or strong physique go to urban areas to earn a living, leaving the elderly, children and women behind. The left-behind rural residents have no formal jobs and stable income, which creates many social problems. The main task at present is to develop local rural enterprises, transforming farmers into workers. This will contribute to agricultural modernization and provide a better life for the farmers; (2) lack of capital for developing agriculture and rural areas. China has already launched the policies in supportive of three rural issues including the financing policies.

However, the urban capital cannot go into the support of rural development due to high risk or lack of financing channels. Therefore, the development of agriculture, forestry, husbandry and fishing industry is hampered by the shortage of low cost capital. Moreover,

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the rural private capital is limited in quantity and high in cost and therefore carries a large risk; (3) rural-urban income gap and the issue of increasing farmers' income. Given the large rural-urban income gap at present, it is still necessary that "industry back-nurtures agriculture, and city back-nurtures rural areas". Due to governmental regulation of commodity prices, the pricing of some agricultural products cannot be completely marketized. Some agricultural products are undersold. In addition, the factors of distributors and logistics, information asymmetry, and the presence of too many intermediates between farmers and consumers result in disadvantaged position of farmers in the industrial chain. The farmers are facing great difficulties in increasing their income.

The dream of realizing the great rejuvenation of the Chinese nation is founded upon properly resolving the three rural issues and four modernizations. Increasing farmers' income is an important step for promoting modernization of China's agriculture, which can be driven by innovation. China has witnessed an enormous development of E-commerce in various sectors. Serving as an advanced productive force, E-commerce has great potential in improving industrialization of agriculture, agriculture structure adjustment, reducing the transaction cost in agriculture and expanding the market and sales channel of agricultural products. Thus the innovation in agriculture and the solutions to three rural issues are based on combining agriculture and E-commerce. Development of China's E-commerce in agriculture has encountered several challenges at present. We conduct a game analysis of the development model of agricultural E-commerce by using right to entry theory and propose a dynamic evolutionary mode of agricultural E-commerce.

2. Current Development Status of China's E-Commerce in Agriculture

For a very long time, the concepts of Internet and E-commerce are linked to Internet companies, finance, commerce and manufacturing industries. Very few people will think of E-commerce in agriculture. According to the statistics of China Internet Network Information Center (CNNIC), the number of China's Internet users was 649 million by the end of 2014 with an increase of 31.17 million in 2014 alone. The Internet penetration rate was 47.9%, which was higher by 2.1 percentage points compared with 2013. The number of Internet users and Internet penetration rate in China in the past 10 years are shown in Figure 1.

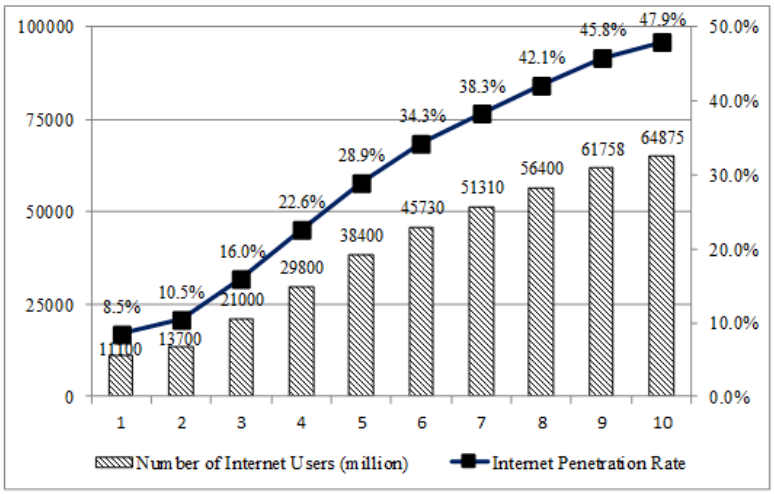

Figure 1. Number of Internet Users and Internet Penetration Rate

However, the Internet use in agriculture, forestry, husbandry and fishing industry accounted for only 2.1%; the number of Internet users engaged in agriculture, forestry,

husbandry and fishing industry accounted for 1.21%. By the end of 2014, the total population of mainland China was 1367.82 million (including 31 provinces, autonomous regions and municipalities directly under the central government and PLA enlisted soldiers in active service, but excluding Hong Kong, Macao Special Administrative Region and Taiwan and overseas Chinese). The rural permanent residents totaled 618.66 million, accounting for 45.23% of total population. However, the Internet users in rural areas only accounted for 27.5%. Therefore, increasing the number of Internet users in rural areas is crucial for promoting E-commerce in agriculture. The percentage of Internet users in urban and rural areas in 2013 and 2014 is shown in Figure 2.

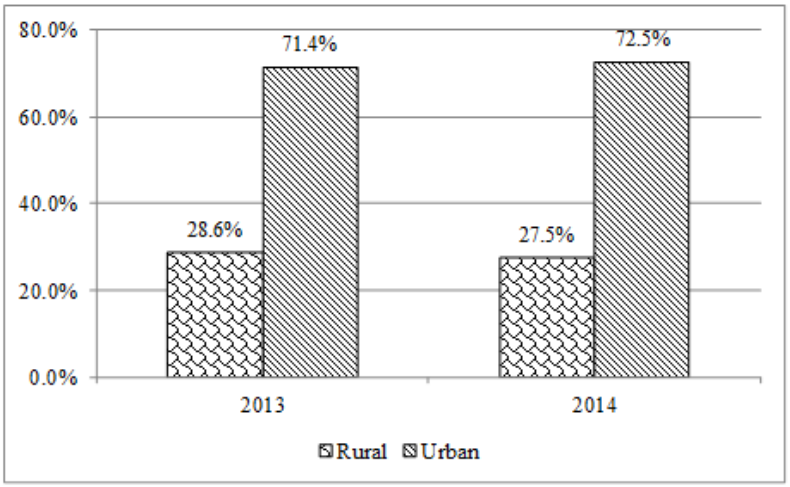

Figure 2. Percentage of Internet Users in Urban and Rural Areas in 2013 and 2014

E-commerce represents an advanced productive force and a revolution of commercial activities by information technology. E-commerce has been very active in various sectors, including government, higher learning institutions, scientific research institutions, and social service organizations. The penetration of E-commerce into agricultural sector is an inevitable trend. E-commerce in agriculture refers to the application of E-commerce in agricultural activities. In a narrow sense, it involves the use of Internet (including mobile communication network) for information services and the matching between demand and supply. From the perspective of farmers, it is the use of Internet for selling agricultural products and purchasing agricultural productive means. In the generalized size, E-commerce in agriculture also incorporates the aspects of marketing, technological research & development and popularization, knowledge training, seeking for employment information, purchasing articles for daily use and village affair management, all by using Internet.

Zhao [1], Zhang *et. al*. [2], Jiang [3] and Gong *et. al*. [4] investigated the applications of E-commerce in agriculture, identified the problems and proposed several countermeasures, which can be summarized into 3 categories: first, the guiding and promoting role played by the government. Almost all researchers regard this as one of the major strategies. They emphasized the importance of fiscal subsidy, favorable tax policies, other preferential policies and relevant laws and regulation in promoting E-commerce in agriculture. Moreover, the central government can achieve demonstration effect by informatization of the agriculture-related department. Secondly, construction of hardware, such as building agricultural E-commerce platform and agricultural databases. Some scholars highlighted the role of mobile communication operators in increasing Internet penetration in rural areas. Thirdly, construction of software, which focuses on changing the mind. This entails the emergence of farmers, rural brokers and farmers cooperative

organizations that are familiar with the use of Internet through training on agricultural E-commerce implementation capacity and cultivation of agricultural E-commerce talents. The leading enterprises should fulfill the driving role and make efforts to improve the supporting services environment including payment, logistics, credit, standardization and branding. Peng [5] divided China's E-commerce model in agriculture into M2M model (market to market model), strategic alliance model, intermediate model, and membership model. Li [6] proposed 3 models, namely, information alliance service provider model, farmer information service provider model (text message model, rural broker model, membership model), and enterprise information service provider model. Wang *et. al*. [7], on the basis of B2B and B2C, incorporated supply-selling intermediate to form a new B2B2C model. According to Yang *et. al*. [8], besides B2B, there were also P2C2B and P2G2B model, where P stands for individual peasants, C is cooperative, B is enterprises engaged in selling, circulation and processing of agricultural products, G is agriculture-related governmental department. Wu [9] devised the concept of B2F (business to farmer). Gan *et. al*. [10] conceptualized the future E-commerce model in agriculture, proposing the building of super-large agricultural E-commerce platform and E-commerce alliance. Once the "information flow" problem is settled by the use of Internet and mobile communication network, logistics will become the restricting factor in agricultural E-commerce. Ensuring the implementation of agricultural E-commerce by supply chain management was advocated by Yi [11], Yi *et. al*. [12], and Liu *et. al*. [13]. They made relevant discussions on logistics, collaborative logistics and integrated supply chain, which were all concerned with the role of the third party in selling agricultural products.

3. Problems Existing in China's E-Commerce in Agriculture

China still has a high illiteracy rate in rural areas, where the agricultural technology level is low, computer ownership is low and information circulation is poor. The circulation of agricultural products has too many links with high transaction cost and fractured supply chain. Farmers are facing great difficulties in increasing their income. China still has a long way to go before radically resolving the three rural issues. Individual farmers and small-scale rural operatives have poor ability in collecting and analyzing market information. All these have seriously restricted the development of E-commerce in agriculture, as summarized below [14-15].

(1) Low level of agricultural informatization. Many agricultural enterprises in China have low level of agricultural informatization with inadequate popularization of information network. There are only a limited number of websites related to agricultural E-commerce, and the on-line transaction functions are far from perfect. Management within the enterprises needs to be improved in terms of informatization level.

(2) Low awareness of using E-commerce. Many rural enterprises in China have poor knowledge about Internet, not to mention the acceptability and application. They are not fully clear about the concept of E-commerce in agriculture and lack the awareness, methods and technique in using Internet for modern management. Moreover, given the huge investment, long cycle and high maintenance load of E-commerce, many rural enterprises doubt whether E-commerce can bring huge business opportunities and profits.

(3) Poor awareness of what should be done with E-commerce. The core of information technology lies in information instead of technology; the core of E-commerce is businesses and not electronization. Internet opens up new channels for expanding businesses. However, some rural enterprises only care about hardware construction and immature high-tech. They do not seem to be aware of the importance of optimizing and integrating information resources inside and outside the enterprises. Therefore, they can hardly reap high efficiency and high profits from E-commerce.

(4) Incomplete E-commerce environment. The laws and regulations over banking, information industry, taxation, customs and finance related to E-commerce are far from

perfect. The market of agricultural products has low level of standardization and organization, which also lowers the trust of farmers towards E-commerce.

(5) Distinctive features of agricultural products. Agricultural products are seasonal products and should be stored with extreme caution. Therefore, the preservation, transportation and post-harvest treatment of agricultural products are more difficult compared with industrial products. This further aggravates the difficulty in implementing E-commerce in agriculture and causes suspicions as to whether E-commerce in agriculture is really feasible.

(6) Poor access to Internet resources. E-commerce in agriculture has a high operating cost due to scarcity of on-line resources, high cost of Internet services and high rent of special cables.

(7) Poor skills of practitioners engaged in agriculture. At present, agricultural practitioners in China have low cultural competence and information technology application skills. These are also the factors restricting the implementation of E-commerce in agriculture.

Although China's rural areas are backward in many aspects, the central government has been enhancing the support for agriculture through policies and fund. It is necessary to improve the infrastructures of agricultural informatization, farmers' cultural competence and information technology application skills, update the management concept of rural enterprises, optimize the E-commerce operating environment and reduce the cost of Internet services. One of the quick solutions is to find stakeholders who are willing to cooperate with farmers in agriculture. They will play an important role in building agricultural E-commerce platforms and leading the transition of management concept and model of rural enterprises so that the pace towards implementation E-commerce will be accelerated.

4. Analysis on the Model of E-Commerce in Agriculture

To resolve the above problems, the first step is to locate the potential stakeholders. We perform a game analysis over the cooperative model between the farmers and the stakeholders in E-commerce by using incomplete contract theory and right to entry theory based on Value Added Corporate Governance Theory[16].

Suppose farmer F has some agricultural products to sell via E-commerce, and he needs the assistance from stakeholder S (*eg*., a leader of a successful E-commerce enterprises in other sectors or governmental leaders). The stakeholder S will invest for this purpose, either in the form of material resources or special talents that possess the required skills to provide assistance. Thus the stakeholder S will share in the benefits of selling the products. Suppose the investment by S_j at time 0 is i_j, which represents the level of investment and the private investment made by the stakeholder. If there is only one stakeholder who invests and shares in the benefits, then the gains (Value Added) made at time 2 is V_i. V_i is a standard concave production function. If there are several stakeholders, then the final output *V* is determined by the combination of all these investments, which is supposed to be added up (obviously, there are more ways of combination, but the investments can be simply added up in most situations). Therefore, the Value Added created by investments made by n stakeholders is calculated as

$$V(i) = V(\sum_{j=1}^{n} i_j) \tag{1}$$

For function $V(i)$, $V'(i) > 0$ and $V''(i) < 0$. Figure. 3 depicts the sharing of gains among stakeholders. At time 0, stakeholders invest resources for selling the agricultural products, and they make adjustment of the level of investment between time 0 and time 1. At time 1, the stakeholders will bargain over the gains and make predictions of the gains.

At time 2, the stakeholders will share in the gains (Value Added) obtained by selling the agricultural products via E-commerce. Referring to incomplete contract theory proposed by Hart *et. al*. (1990) [17] and right to entry theory by Rajan *et. al*. (1998) [18], we use Shapley value to describe the bargaining with the farmer and the prediction of the gains.

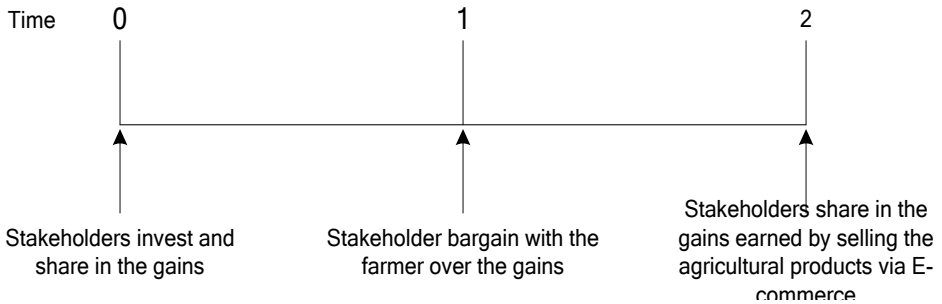

Figure 3. Stakeholders' Sharing of Gains

Shapley value represents the gains that will be distributed to the stakeholders (players). It provides the gains anticipated by player j by joining all possible subgroups after investment. That is, the player regards the composition of post hoc group as random. The probability of any sequences of group composition is equal. Letting A be the set of all possible subsets of I players, the gains anticipated by player j is

$$B_j = \sum_{A \mid j \in A} P(\mathrm{A})[R(\mathrm{A}) - R(\mathrm{A} \setminus \{j\})] \tag{2}$$

Since any sequences of group comparison are of equal probability, probability distribution $P(\mathrm{A})$ is obtained by the formula below:

$$p(\mathrm{A}) = \frac{(\mathrm{a}-1)!(\mathrm{I}-a)!}{\mathrm{I}!} \tag{3}$$

$a = |\mathrm{A}|$ is the number of players in set A ; I is the number of players engaged in bargaining; $R(\mathrm{A})$ is the output of set A; $R(\mathrm{A} \setminus \{\mathrm{j}\})$ is the output of set A excluding player j.

At time 2, the gains (Value Added) created will be distributed according to the contract signed at time 1. Suppose all the players are risk neutral, *i.e.*, all players will strive for more net gains at time 2. Here the right to entry theory proposed by Rajan and Zingales is adopted. We suppose that there are n stakeholders who invest and share in the gains, so there are a total of n+1 players bargaining over the gains (including the farmer himself). By using formula (2) and (3) it is derived that the net gains anticipated by stakeholder k is a function of the resources investment i_k that he makes. Suppose the average investment of n-1 stakeholders is $i^*(n)$, and the equilibrium of $i^*(n)$ depends on n. Thus the net gains anticipated by stakeholder k is calculated as follows.

$$\sum_{j=1}^{n} \frac{j}{n(n+1)} \{V[\mathrm{i}_k + (j-1)i^*(n)] - V[(j-1)i^*(n)]\} - \mathrm{i}_k \tag{4}$$

Every stakeholder hopes to get the maximum net gains, *i.e.* the maximization of formula (4). First-order derivative of formula (4) with respect to i_k is calculated. Utilizing the symmetry feature (Rajan *et. al*., 1998)[17], the Nash equilibrium of $i^*(n)$ is obtained as follows:

$$\sum_{j=1}^{n} \frac{j}{n(n+1)} V'[ji^*(n)] = 1 \tag{5}$$

According to formula (5), the inferences are derived as follows:

Inference 1: As the number n of stakeholders increases, the average post hoc investment made by the stakeholders $i^*(n)$ will decrease.

Proof of inference 1:

Because formula (5) holds true for any n, there is

$$\sum_{j=1}^{n} \frac{j}{n(n+1)} V'[ji^*(n)] = \sum_{j=1}^{n+1} \frac{j}{(n+1)(n+2)} V'[ji^*(n+1)] \tag{6}$$

Here is proof of inference 1 by contradiction. Inference 1 can be proved if formula (6) does not hold true if $i^*(n+1) \geq i^*(n)$. First, we prove the inference under the condition of $i^*(n+1) = i^*(n)$. Substitution of $i^*(n+1) = i^*(n)$ into formula (6) yields:

$$\begin{aligned}
&\sum_{j=1}^{n} \frac{j}{n(n+1)} V'[ji^*(n)] - \sum_{j=1}^{n+1} \frac{j}{(n+1)(n+2)} V'[ji^*(n+1)] \\
&= \sum_{j=1}^{n} \frac{j}{n(n+1)} V'[ji^*(n)] - \sum_{j=1}^{n+1} \frac{j}{(n+1)(n+2)} V'[ji^*(n)] \\
&= \sum_{j=1}^{n} \left[\frac{j}{n(n+1)} - \frac{j}{(n+1)(n+2)}\right] V'[ji^*(n)] - \frac{n+1}{(n+1)(n+2)} V'[(n+1)i^*(n)] \\
&= \sum_{j=1}^{n} \frac{2j}{n(n+1)(n+2)} V'[ji^*(n)] - \frac{1}{n+2} V'[(n+1)i^*(n)] \\
&= 0
\end{aligned}$$

Since $V(i)$ is a concave production function, the following is derived:

$$\begin{aligned}
&\sum_{j=1}^{n} \frac{2j}{n(n+1)(n+2)} V'[ji^*(n)] - \frac{1}{n+2} V'[(n+1)i^*(n)] \\
&> \sum_{j=1}^{n} \frac{2j}{n(n+1)(n+2)} V'[(n+1)i^*(n)] - \frac{1}{n+2} V'[(n+1)i^*(n)] \\
&= 0
\end{aligned}$$

Here arises the contradiction. It is noticed that the left side is smaller than the right side of formula (6) when $i^*(n+1) > i^*(n)$. Thus we prove by contradiction that inference 1 holds true when $i^*(n+1) < i^*(n)$.

In general situations, the increase of stakeholders will result in the increase of total post hoc investment $ni^*(n)$, *i.e.*

Inference 2: As the number of stakeholders increases, the total post hoc investment will increase.

We construct a general increased value output function for the proof of inference 2.

$$\text{Let } V(i) = ai - \frac{1}{2}i^2, \quad a > i$$

Substitution of $V'(i) = a - i$ into formula (5) yields:

$$\begin{aligned}
&\sum_{j=1}^{n} \frac{j}{n(n+1)}[a - ji^*(n)] \\
&= \sum_{j=1}^{n} \frac{ja}{n(n+1)} - \sum_{j=1}^{n} \frac{j^2}{n(n+1)} i^*(n) \\
&= \frac{(1+2+\ldots+\mathrm{n})\,\mathrm{a}}{n(n+1)} - \frac{1^2+2^2+\ldots+n^2}{n(n+1)} i^*(n) \\
&= \frac{a}{2} - \frac{2n+1}{6} i^*(\mathrm{n}) \\
&= 1
\end{aligned} \tag{7}$$

Formula (5) holds true for any n, and suppose that there are n-1 stakeholders. Then substitution of $V'(i) = a - i$ into formula (5) yields:

$$\begin{aligned}
&\sum_{j=1}^{n-1} \frac{j}{n(n-1)}[a - ji^*(n-1)] \\
&= \sum_{j=1}^{n-1} \frac{ja}{n(n-1)} - \sum_{j=1}^{n-1} \frac{j^2}{n(n-1)} i^*(n-1) \\
&= \frac{(1+2+\ldots+n-1)a}{n(n-1)} - \frac{1^2+2^2+\ldots+(\mathrm{n}-1)^2}{n(n-1)} i^*(n-1) \\
&= \frac{a}{2} - \frac{2n-1}{6} i^*(n-1) \\
&= 1
\end{aligned} \tag{8}$$

According to formula (7) and (8), there is

$$\frac{a}{2} - \frac{2n+1}{6} i^*(n) = \frac{a}{2} - \frac{2n-1}{6} i^*(n-1) \tag{9}$$

From formula (9) it is derived that

$$i^*(n) = \frac{2n-1}{2n+1} i^*(n-1) \tag{10}$$

Multiplying the two sides of formula (10) by n, there is

$$\begin{aligned}
ni^*(n) &= \frac{n(2n-1)}{2n+1} i^*(n-1) \\
&= \frac{2n^2-n}{2n+1} i^*(n-1) \\
&= \frac{(n-1)(2n+1)+1}{2n+1} i^*(n-1) \\
&= (n-1)i^*(n-1) + \frac{1}{2n+1} i^*(n-1)
\end{aligned} \tag{11}$$

According to formula (11), it is derived that $ni^*(n) > (n-1)i^*(n-1)$, thus inference 2 is proved.

Even though the total post hoc investment will increase as the number of stakeholders increases, it does not mean that the farmer is willing to share the gains with infinite number of stakeholders. This will lead to over-investment. Rajan *et. al*. (1998) proved that when total investment exceeds first best, there will be the problem of over-investment. In that case, the farmer will be left with a project with negative net gains, which is not conducive for further development.

Through bargaining, the net gains anticipated by each stakeholder can be considered a function. However, the sharing of gains by one stakeholder may have an adverse impact on the net gains of the other stakeholders.

Inference 3: When the number of stakeholders increases, there will be a decrease in net gains anticipated by the stakeholders.

We only prove inference 3 under two situations, *i.e.*, there are 1 or 2 stakeholders sharing in the gains. When there is 1 stakeholder, the net gains anticipated is expressed as

$$\frac{1}{2}[V(i_1) - V(0)] - i_1 \tag{12}$$

To maximize formula (12), substitution of $i_1 = i^*(1)$ into formula (12) yields

$$\frac{V[i^*(1)] - V(0)}{2} - i^*(1) \tag{13}$$

When there are two stakeholders, the net gains anticipated by stakeholder S_2 becomes

$$\frac{1}{6}[V(i_2) - V(0)] + \frac{1}{3}\{V[i_2 + i^*(2)] - V[i^*(2)]\} - i_2 \tag{14}$$

To maximize formula (14), substitution of $i_2 = i^*(2)$ into formula (14) yields

$$\frac{1}{3}V[2i^*(2)] - \frac{1}{6}V[i^*(2)] - \frac{1}{6}V(0) - i^*(2) \tag{15}$$

Because the maximum of $\{V[i^*(1)] - V(0)\}/2 - i^*(1)$ is obtained by $i^*(1)$, it is sure to obtain $\{V[i^*(1)] - V(0)\}/2 - i^*(1) \geq \{V[(2i^*(2)] - V(0)\}/2 - 2i^*(2)$. Moreover, since function $V(i)$ is concave production function, there is $\{V[2i^*(2)] - V(0)\}/6 < \{V[i^*(2)] - V(0)\}/3$, thus:

$$\begin{aligned}
&\frac{1}{3}V[2i^*(2)] - \frac{1}{6}V[i^*(2)] - \frac{1}{6}V(0) - i^*(2) \\
&< \frac{2}{3}V[2i^*(2)] - \frac{1}{3}V[i^*(2)] - \frac{1}{3}V(0) - 2i^*(2) \\
&= \frac{V[2i^*(2)] - V(0)}{2} - 2i^*(2) + \frac{1}{6}\{V[2i^*(2)] - V(0)\} - \frac{1}{3}\{V[i^*(2)] - V(0)\} \\
&< \frac{V[2i^*(2)] - V(0)}{2} - 2i^*(2) \\
&< \frac{V[i^*(1)] - V(0)}{2} - i^*(1)
\end{aligned}$$

We have proved that when there are two stakeholders, the gains anticipated by the stakeholder will be smaller as compared with the situation where there is 1 stakeholder. Thus inference 3 is proved. Rajan *et. al*. (1998) believed that when there are multiple stakeholders, they will compete fiercely for the gains, which leads to the reduction of anticipated gains.

The following conclusions are drawn from these three inferences:

First, for the farmer, the involvement of more stakeholders is not the better.

As more stakeholders are involved, the average investment made by each stakeholder will decrease, which is not conducive to optimizing resources allocation. The total investment should not exceed the first best as the number of stakeholders and total investment increase, otherwise there will be the problem of over-investment. Moreover, a greater number of stakeholders does not bring about better results, and the farmer will be troubled by the situation of too many stakeholders being engaged in the management.

Second, we analyze the dynamic evolutionary model of E-commerce in agriculture

from two aspects.

(1) Taking the standpoint of the farmer, the cooperation with stakeholders will increase total investment when other factors are dismissed. Thus more gains will be produced as long as the first best is not exceeded. The farmer will welcome the involvement of more stakeholders and make efforts to invite in new stakeholders.

(2) Taking the standpoint of stakeholders, if the involvement of new stakeholders decreases their anticipated gains, the original stakeholders will oppose to it and take actions to prevent the entry of more stakeholders. They may even compel the farmer not to cooperate with the new stakeholders or quit the cooperation themselves.

The farmer aims to get the maximal gains from selling the agricultural products via E-commerce. As long as the cooperation increases total investment, the farmer will be willing to see more stakeholders coming in. However, if the entry of more stakeholders causes the gains anticipated by the original stakeholders to decrease, the original stakeholders may quit, thus incurring loss to the farmer. Under this situation, the farmer will balance between the interests of different stakeholders and adjust his cooperation with the stakeholders so as to gain more profits. From this perspective, the development of agricultural E-commerce is dynamic.

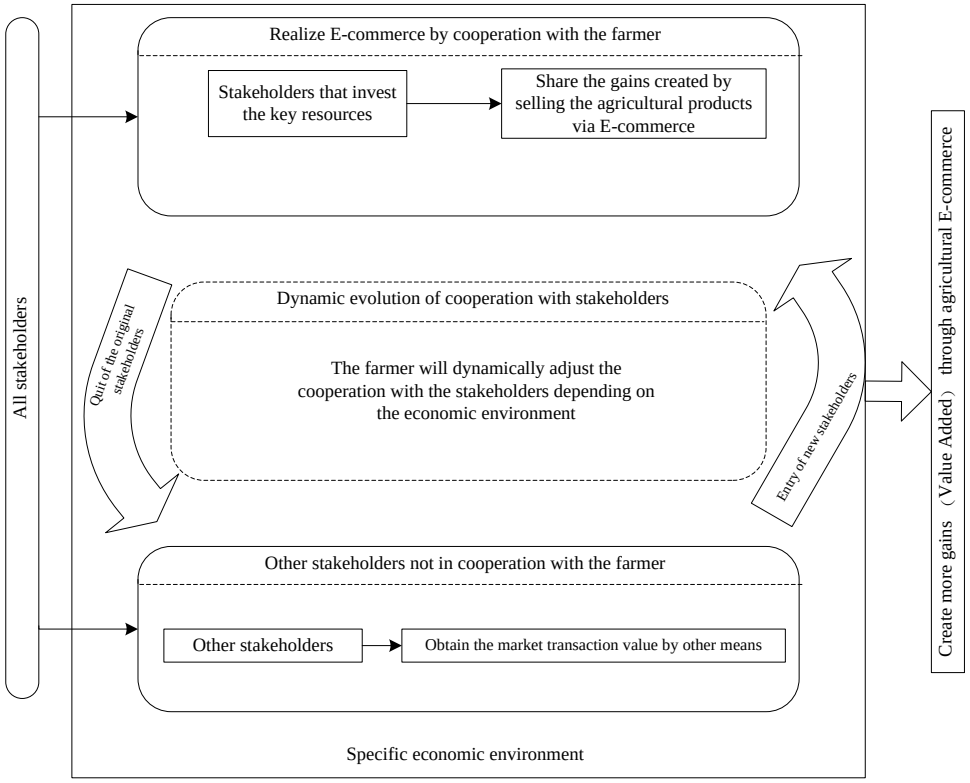

Figure 4. Dynamic Evolutionary Model of Agricultural E-Commerce

As shown in Figure. 4, the farmer first chooses the stakeholders that are willing to cooperate. These stakeholders will share in the gains reaped by selling the agricultural products via E-commerce. As the economic environment changes, the farmer will dynamically adjust the cooperation with the stakeholders with the purpose of maximizing the gains. This may probably lead to the quit of some original stakeholders and the entry of new stakeholders.

5. Conclusions

Based on literature review, we first analyze the problems existing in E-commerce in agriculture at present. Then a game analysis is performed over the cooperation between the farmer and the stakeholders by using incomplete contract theory and right to entry theory. It is found that agricultural E-commerce undergoes dynamic, evolutionary development. The farmer may decide to cooperate with new stakeholders with the goal of maximizing the gains, and in the meantime, some original stakeholders may quit. E-commerce in agriculture must follow a dynamic evolutionary model for it to adapt to the constantly changing economic environment.

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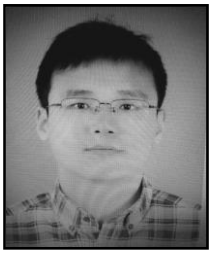

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