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Application of Independent Finance Certification Agency in the Decision Process of Vendor Selection

Luan Chunxiao

Accounting School, Harbin University of Commerce
Zxxing2012@126.com

Abstract

This paper introduces independent finance certification agency to supervise the vendor selection process under the circumstance of the dynamic and incomplete information market.

Using the signaling theory under unsymmetric information of game theory, a multidime nsion signaling model of the strategic choice is established. The game model is set up and the equilibrium calculated out following the description of the key elements of the buyer and vendor in above market. Upon separating equilibrium, the provider dispatches the signal stands for his actual category to maintain the performance of the market. Upon pool equilibrium, the inefficient provider rather than efficient one occupies the core position which results in loss of the latter. Case result shows that the buyer can adopt the signals from the Independent finance certification agency as a significant element when making decision. As a result the introduction of independent finance certification agency can effectively and efficiently supervise the vendor selection process in incomplete information market.

Keywords: *We would like to encourage you to list your keywords in this section.*

1. Introduction

In the current high competitive world, firms emerge and disappear at increasing rate. These firms, to some extent, comprise millions of supply chain. Every chain has its one core enterprise and several or hundreds of members. Generally speaking, the reason why these firms exist in the market is to make profits, and with regards to the functions of these firms, scholars abstract them to three functions, respectively, purchasing or procurement, manufacture and sale. In traditional views, these functions are independent and separate, even isolated department. With the development of enterprise practice and operation theory, companies have been realizing that these functions are serving at the same objects, which is to pass value to the consumer that is end user. Some scholars describe it as value chain management. Whether it is a supply chain or value chain, the first function greatly arouse awareness of companies. Accordingly, the companies' executives increasingly realize the strategic meaning of purchasing, which result in such a wrong but , to some degree,sound point of view that vendors or suppliers management is deemed as all parts of purchasing management and purchasing management is deemed as all parts of supply chain management. This is to say that supplier management is deemed as supply chain management. Although the functions of those managers in charge of supply chain department in some companies are merely to select, contract with, supervise and evaluate their suppliers or vendors, we should not confuse with these definitions but we should attach great importance to the strategic meaning of suppliers management.

It is a commonsense that in some companies procurement costs would occupy between 60% and 70% of all manufacturing expenses. How to make a sound decision to choose suppliers becomes a quite difficult and strategic process for those purchasing manager.

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(Herbcring *et al*.,1993). In recent years scholars tried to use math methods like DEA and AHP to research the problems to select suitable suppliers. Ittner *et al*.(1999) believed that the companies would not get efficient product quality provided that the process to choose supplier was not standard and scientific . To reach such a good situation, H.Yigin *et al*.(2007) established a good system as expert framework to choose suppliers on time. For Taking part in domestic and foreign markets, sourcing managers are more and more concerned with the vendors which have passed through certification by some authorities like ISO or Accounting or financing agencies. Simpson(2002) put for worth the complex relationship between these agencies and the departments of supplier selection in the companies. Gotzamani K, *et al.*(2006) described the advantages of co-relationship with the suppliers and the independent finance certification agencies (IFCA). Maki Busch, *et al*. (2008) found in produce market some finance agency emerged as a market independent governance mechanism, and he described their organizational framework, operations and discrepancy between those organizational and functional independence like ISO.

Despite there are some literatures focused on the overall application of independent certification agencies to assist companies to choose the suitable suppliers, the limitation of the suppliers selection in reality is apparent , the reason is that every company has its commercial confidentiality and need to certify the information trustworthiness offered. Thus the government agencies and can efficiently convey the relevant information from enterprise (Sarkis J. *et al*., 2002; Morris S.*et al*., 1995; Alejandro M.*et al*., 2002), which would facilitate the process of the supplier selection.

There is a social recognition to be certified through independent finance certification agency, and the implicit agreement has the effect on which the sole purchaser could not present and verify. With the prompt growth of Chinese independent finance certification agencies, some speculators may require the certification through improper, even illegal ways, which, in some degree, becomes a potential barrier for those purchasers to decide who should be the eligible suppliers in the market. As we all know, the decision-making progress would be more difficult when the information available is incorrect, vague, incomplete or misleading (Morris, 1995; Yan Hai, *et al*.,2012) . We note that some math formula like signaling game theory was applied to illustrate the phenomena (Cooper, *et al*.,2003). Ahumada O. Villalobos J.R. al.(2009) presented the category of signal in application of planning supply chain models to improve the effect of advised participates in the market. Just like Finance service supply chain in produce market is not only demand chain but also a function network made up of various individual agricultural production operators, wholesalers, retailers and final consumers, which is not the same as Pledge by Warehouse Receipts. Based on signaling game theory, Robinson(2005) designed a kind of profit sharing contract of equilibriums, where the profit-sharing parameter works as a signal to convey information. Some analyze the signaling game in return service implementation under e-commer and find the conditions that encourage the seller to show the true signal. On the given conditions there are possible equilibriums whose efficiencies are decreasing, respectively semi-separating equilibrium and pooling equilibrium.

Without elaboration, independent agencies play great role in the process of suppliers selection, scholars used a great deal of quantitative and qualitative methods to define, demonstrate, clarify the process to indicate the inner rule, despite little literatures were focused on game theory models, especially signal game. Meanwhile there are few literatures which apply signaling game to the process of supplier choosing under the circumstance of introduction of independent finance certification agencies. This is a rather new perspective to review not only the application of signaling game but also the introduction of independent agencies. Admittedly, the focus of this paper is quite

discrepant with that existing literature objective to establish a kind of supplier decision strategy under which people will attach considerable importance to the independent finance certification agency. In the paper, the signaling game model was applied to interpret the effect of the existence of independent finance certification agencies in the market with incomplete information which is described as equilibrium in the model.

2. Methodologies and Theory

Due to the incomplete information dynamics of the market environment, the math model is set up after analysis of the nature of the purchasers and the venders in the market with application method of the signaling game. The game grade considered is described by limitation on payoffs of all game-participates. Utility function of participate 1 is such that little transfers in the signals demand little transfers in corresponding to depart from him indifferently, and the acts of participate 2 are one angle and its rewards are highly concave on his own acts. In the study, it is guessed that: participate 1 stands for the supplier and participate 2 stands for purchaser; Ω stands for the supplier's category space, so the meaning of symbol as follows:

$$\Omega = \{L, H\} \tag{1}$$

$$\Omega = L \tag{2}$$

$$\Omega = H \tag{3}$$

Formula (2) stands for the inefficient vendor and (3) stands for the efficient one. Due to the incomplete information in the market, we make an assumption that merely the vendor understand his category category the buyer fails to be familiar with the category of the vendor but the possibility of Ω is a rather common knowledge. This paper indicates W as the buyer's evaluation to vendors and ε as the scale the vendors acquired from the independent finance certification agency and C(Ω,ε) as the buyer's cost paying to the independent finance certification agency. The supplier gives a signal, subsequently the buyer responses with suppose upon the signal. The category of supplier is identified by nature N in line with the specific probability. After being familiar with its own category the supplier selects the signal ε to the buyer, which would be either in conformity with the actual situation or not. And when the buyer receives the vendor's right signal ε, he would make a decision of action, where the $w(\varepsilon)$ would be written to represent the assessment.

So $U_s(\Omega, \varepsilon)$ stands for the vendor utility.

$$U_s(\Omega, \varepsilon) = \omega(\varepsilon) - C(\Omega, \varepsilon) \tag{4}$$

$$C(\Omega, \varepsilon) = \varepsilon / \Omega \tag{5}$$

3. Equilibrium Analysis

Many scholars analyze the limitation of equilibrium analysis method whereas under certain conditions, the equilibrium analysis is still a kind of powerful tool of analysis.

In separating equilibrium We note the scale of certification as ε^*, so the reality can be put forward as

$$\varepsilon(\Omega) = \begin{cases} \varepsilon_1 < \varepsilon^* \\ \varepsilon_2 \geq \varepsilon^* \end{cases} \tag{6}$$

Because of $U_s(\Omega, \varepsilon) = \omega(\varepsilon) - C(\Omega, \varepsilon)$, *so*

$$\varepsilon(\Omega) = \begin{cases} 0 & \text{if } \Omega = L \\ \varepsilon^* & \Omega = H \end{cases} \tag{7}$$

And here backward induction algorithm is applied to calculate sub-perfect Bayes Equilibrium in the formula. In the next step of the signaling game, the buyer accepts the signal and supposes:

$$p\{\Omega = L \mid \varepsilon = 0\} = 1 \tag{8}$$

$$p\{\Omega = H \mid \varepsilon = \varepsilon^*\} = 1 \tag{9}$$

That is only the signal sent by the supplier is low category (which is insufficient), and the buyer assures that the suppliers belongs to narrow category (insufficient), and vice versa. That does means that the buyer responses thoroughly in line with the signal he accepts, so the strategy is

$$\omega(\varepsilon) = \begin{cases} L & \text{i}^{\varepsilon = 0} \\ H & \varepsilon = e^* \end{cases}. \tag{10}$$

In the first status of signal game, the supplier forecasts the suppose of the buyer and maximizes accordingly the utility $U_s(\Omega, \varepsilon)$. If the supplier is category (2), the fundamental and sufficient situation that the statement is in accordance with his true situation is $\varepsilon^* \geq L(H-L)$. If the supplier is category(3), the fundamental and sufficient situation that the statement is in accordance with his actual situation is $\varepsilon^* \leq H(H-L)$.

As is all known, merely on the case of $C(L,\varepsilon) > C(H,\varepsilon)$ happens , which means that the marginal expenses for the high category buyer to maintrain the certification of explicit scale would be not more than that for the high-category supplier) does ε makes with the signaling effect. It is, to some extent, arguable that once formula(5) happens, then $\varepsilon^* \in [L(H-L), H(H-L)]$ will happen, the separating equilibrium will be put to truthd and so as that:

$$\varepsilon(\Omega) = \begin{cases} 0 & \text{if } \Omega = L \\ \varepsilon^* & \Omega = H \end{cases}, \tag{11}$$

$$p\{\Omega = L \mid \varepsilon = 0\} = 1, \tag{12}$$

$$p\{\Omega = H \mid \varepsilon = \varepsilon^*\} = 1 \tag{13}$$

$$\omega(\varepsilon) = \begin{cases} L & if^{\varepsilon = 0} \\ H & \varepsilon = \varepsilon^* \end{cases} \tag{14}$$

Therefore here can be demonstrated that once the scale of finance certification which the granter is going to acquire is arrived at the interval $\langle L(H-L), H(H-L) \rangle$, the vendor will select the certifying which may be in conformity with his own category.

In the pool equilibrium it is not the unique as the separating equilibrium, and some vendors with low category will give a quite high signal (which means the message) so as to catch the maximum beneficial effect. Therefore the suppose of the buyer in such an equilibrium is

$$p\{\Omega = L \mid \varepsilon \geq \varepsilon^*\} = q \tag{15}$$

$$p\{\Omega = H \mid \varepsilon \geq \varepsilon^*\} = 1 - q \tag{16}$$

$$p\{\Omega = L \mid \varepsilon < \varepsilon^*\} = 1 \tag{17}$$

$$\omega(\varepsilon) = \begin{cases} qL + (1-q)H = H + (L-H)q, & if\ \varepsilon \geq \varepsilon^* \\ L & \varepsilon < \varepsilon^* \end{cases} \tag{18}$$

In the first step of the game, the situation that the giver selects the higher-level certification is that the effect of such behavior would be more than undoing.

Once (2) and $U_s(L, \varepsilon \geq \varepsilon^*) > U_s(L, \varepsilon < \varepsilon^*)$, then

$$H + (L-H)q - \frac{\varepsilon^*}{L} > L \tag{19}$$

$$\varepsilon^* \leq L(H-L)(1-q). \tag{20}$$

When (3) and $U_s(H,\varepsilon \geq \varepsilon^*) > U_s(H,\varepsilon < \varepsilon^*)$, then

$$H + (L-H)q - \frac{\varepsilon^*}{\mathrm{H}} > L \tag{21}$$

$$\varepsilon^* \leq H(H-L)(1-q) \tag{22}$$

So the actual signal was presented as the actual circumstance just like the pool equilibrium is being realized:

$$\varepsilon = \varepsilon^* \tag{23}$$

$$p\{\Omega = L \mid \varepsilon < \varepsilon^*\} = 1 \tag{24}$$

$$p\{\Omega = L \mid \varepsilon \geq \varepsilon^*\} = q \tag{25}$$

$$w(\varepsilon) = \begin{cases} L & \text{if } \varepsilon < \varepsilon^* \\ H + (L-H)q & \varepsilon \geq \varepsilon^* \end{cases} \tag{26}$$

$$\text{where } \varepsilon^* \leq L(H-L)(1-q) \tag{27}$$

It is apparent that the result of the pool equilibrium of the low-category(inefficient) provider will make up still probably core position, and the high-category(efficient) provider would result in the sun if loss of $(L-H)q$..

4. Case Study

An automotive manufacturer is scheduled to effectively integrate part of its business operation with the upstream suppliers, and one of the determination criteria to evaluate the competence of providers is whether authenticated through the independent finance certification agency in the market with the incomplete information. Before the analysis of this case with above all kinds of discussion the paper simplifies the related parameters as follows:

the high-category (efficient) giver, H=10;

the low-category (inefficient) provider, L=5;

Under the circumstance, the expense for efficient giver and inefficient provider to be authenticated is presente in formula(28) and formula (29); As far as the utility of the efficient and inefficient provider are concerned, the following suppose is put for formula (30) and formula (31).

$$C(L,\varepsilon) = \frac{\varepsilon}{10} \tag{28}$$

$$C(H,\varepsilon) = \frac{\varepsilon}{5} \tag{29}$$

$$U_H = 10 - \frac{\varepsilon}{10} \tag{30}$$

$$U_L = 5 - \frac{\varepsilon}{5} \tag{31}$$

For the signal-giver to deliver the true signal, which means message, then the result must be

$$U_L = 10 - \frac{\varepsilon^*}{5} \leq 5 \tag{32}$$

thus $\varepsilon^* \geq 25$

$$U_H = 10 - \frac{\varepsilon^*}{10} \geq 5 \tag{33}$$

thus $\varepsilon^* \leq 50$

Thus once $\varepsilon^* \in [25,50]$, the separating equilibrium is realized, and then

$$w^*(\varepsilon) = \begin{cases} 5 & \varepsilon < \varepsilon^* \\ 10 & \varepsilon \geq \varepsilon^* \end{cases} \tag{34}$$

Under the situation of pool equilibrium, the situation will be as following as the signal-provider gives the signal which the party has passed trough the more advanced and suitable certification:

$$U_L = 10 - 5q - \frac{\varepsilon^*}{5} \geq 5 \tag{35}$$

so, here can be put forward: (36)

$$\varepsilon^* \leq 25(1-q)$$

$$U_H = 10 - 5q - \frac{\varepsilon^*}{10} \geq 5 \tag{37}$$

So, it goes the value as:

$$\varepsilon^* \leq 50(1-q).$$

After the It means that the pool equilibrium is arrived when

$\varepsilon^* \leq 25(1-q)$ and

$$w^*(\varepsilon) = \begin{cases} 5 & \varepsilon < \varepsilon^* \\ 10 - 5q & \varepsilon \geq \varepsilon^* \end{cases} \tag{38}$$

It is the common-sense that if in the circumstance of the pool or separating equilibrium, the quite consenting scale of certification ε^* would be realized at a consistent step interval which is concerned with the expense of finance certification, the utility function of finance signal provider is made up of the signal and the expense of certification.

5. Conclusion

It can be found that there is a huge potential rule on finance signal passing from the certification agency to the all participant of the whole chain because of the specific complex nature of finance service. Indeed, supplier selection process can be deemed as a service chain process. There are endogenous and exogenous dimensions to analyze market finance signal. Endogenous elements of finance signals in produce market are divided into several aspects. So does Exogenous ones, and meanwhile there are hinge on three principles such as marketing environment, natural environment, and policy environment of finance certification supervision.

With increasingly advancement of the active market mechanism, the whole market can be classified into two categories, one is the market with pool equilibrium and the other is the market with separating equilibrium. These two market segments have their effect on each other and the whole market participants. Under separating equilibrium, the signal delivered by the provider represents his true category, which, to great extent, is the exact equilibrium anticipated by the purchaser of the product or service supply chain. And the other separating market is a more modern and advanced market, in which if the scale of finance certification is put forward to the interval of $\langle L(H-L), H(H-L) \rangle$,the separating equilibrium would be realized, the provider should be the truth-teller, consequently the performance of the whole market would be duly maintained.

Although finance certification service of the supply chain has its special distinction such as uncertainty, structure-complexity, imbalance of power, and vulnerability, the truth-teller of certification agencies accounts for the majority of the whole independent agencies, or the whole market credit would be in terrible situation, which would be a catastrophe to not only the market economy but also the state consistency and stability, which is concerned by another scholars. Separating equilibrium is the most effective and

satisfactory equilibrium. According to pool equilibrium, the provider should tell a lie or cheat the buyer with the probability q.

According to the related regulation the direct mechanism with incentive compatibility it is to be rebuilt by the holy gamer in pooling market. But some dishonest vendor's action in the market with incomplete information with probability q would have a great deal of effect on the actual efficient providers with the loss $(L-H)q$.

To deal with such an issue, some countermeasures could be applied by the provider as follows: at the outset, it is essential to attach great significance to the performance history of those independent finance certification agencies and try their best to choose the providers who have been certificated by the competent agencies; Another is to centered on the collecting and analyzing of all sorts of information of the providers, meanwhile pay the cost to tell the lie much bigger than to tell the truth, that means $C(L,\varepsilon) > C(H,\varepsilon)$.

The result of this paper stands that independent finance certification agency gives some good package of criteria of the vendors or suppliers and some convenience to the decision process of supplier selection. Purchasers or buyers could accept the provider's signals from independent finance certification agency as a significant element in his decision and these agencies should be cited in the process of game.

The contributions of the paper can be extended by future study efforts. Great consideration should be given to the special impact of independent finance certification agency to the whole society, and thus a four party game composed of the purchaser, supplier, finance certification agency and whole society would be studied in the future, which is apparently more complicated and more challengeable. The same extension of the model could be the functions of the agency to the quality, logistics, safety, even personnel. All these interesting gaps need to be researched and filled in by more scholars with the interdisciplinary cooperation and coordination.

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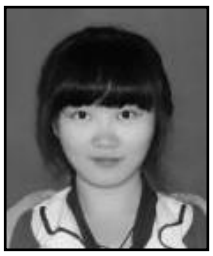
References

1. M. E. Herbcriing, "The rediscovery of modern purchasing", International Journal of Purchasing and Materials Management, vol. 29, no. 4, **(1993)**, pp. 48-53.
2. D. C. Ittner, F. D. Larcker, V. Nagar and V. M. Rajan, "Supplier Selection, Monitoring Practices and Firm Performance", Acc. Public Policy, vol. 18, **(1999)**, pp. 253-281.
3. H. Yigin, H. Taskinz, I. H. Cedimogluz and B. Topal, "Supplier Selection: an Expert System Approach", Production Planning & Control, vol. 18, no. 1, **(2007)**, pp. 16-24.
4. P. M. Simpson, J. A. Siguaw and S. C. White, "Measuring the Performance of Supplier: an Analysis of Evaluation Process", The Journal of Supply Chain Management: A Global Review of Purchasing and Supply, **(2002)**, pp. 29-45.
5. K. Gotzamani, Y. Theodorakioglou and G. Tsiolvas, "Supplier Management and Its Relationship to Buyers' Quality Management", The Journal of Supply Chain Management, vol. 11, no. 2, **(2006)**, pp. 148-159.
6. M. Busch and L. Hatanaka, "Third-Party Certification in the Global Agrifood System: An Objective or Socially Mediated Governance Mechanism?", Sociologia Ruralis, vol. 48, no. 1, **(2008)**, pp. 73-91.
7. J. Sarkis and S. Talluri, "A model for strategic supplier selection", Journal of Supply Chain Management, vol. 38, **(2002)**, pp. 18-28.
8. S. Morris, "The Common Prior Assumption in Economic Theory", Economics and Philosophy, vol. 11, no. 2, **(1995)**, pp. 227-253.

9. A. M. Manelli, "An Effective Algorithm For Computing Equilibrium Outcome of a Class of Signaling Games", International Journal of Information Technology & Decision Making, vol. 11, no. 2, (2002), pp. 209-228.
10. T. Schulteis, A. Perea and H. Peters, "Revision of conjectures about the opponent's utilities in signaling games", Economic Theory, vol. 30, no. 4, **(2009)**, pp. 373-384.
11. D. R. Vincent, "Repeated Singnalling Games and Dynamic Trading Relationships", International Economic Review, vol. 39, no. 2, **(1998)**, pp. 275-293.
12. D. J. Cooper and J. H. Kagel, "Lesson Learned:Generalizing Learning across Games", American Economic Review, vol. 93, no. 2, **(2010)**, pp. 202-207.
13. A. O. Villalobos, Jr., "Application of planning models in supply chain: A review", European Journal of Operational Research, vol. 4, **(2009)**, pp. 1-20.
14. P. Battigalli, "Rationalizationc in Signaling Games: Theory and Applications", International Game Theory Review, vol. 18, no. 1, **(2006)**, pp. 67-93.
15. H. Yan and Z. J. Wang, "Web Services Composition Optimization Based on Semi-Markov Decision Process", Advances in Information Sciences and Service Sciences, vol. 2, **(2012)**, pp. 182 -190.
16. E. Prater, M. Biehl and M. A. Smith, "International supply chain agility, tradeoffs between flexibility and uncertainty", International Journal of Operations and Production Management, vol. 21, **(2001)**, pp. 823-839.
17. C. J. Robinson and M. K. Malhot, "Two-commodity reliability evaluation for a stochastic-flow network with node failure", Computers and Operations Research, vol. 3, **(2005)**, pp. 1929-1939.
18. S. Deshmukh and V. Pasion, "A framework for Measurement of Quality of Service in Supply Chains", Supply Chain Management, vol. 11, **(2006)**, pp. 82-94.
19. R. Balachandran, "Quality Implications of Warranties in a Supply Chain", Management Science, vol. 51, **(2005)**, pp. 1266-1270.
20. X. Zhang, Q. H. Zhao and G. P. Xia, "Research on Integrated Optimization Problem in a Multi-product Supply Chain Based on Markov Decision Processes", Journal of Convergence Information Technology, vol. 1, **(2012)**, pp. 45-53.

Author



Luan Chunxiao, Female, she was born in April, 1993, Chinese, undergraduate in Accounting School, Harbin University of Commerce, zxxing2012@126.com

