A Study on Credit System of Cross-Border E-Commerce from the Perspective of the Game Theory

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Abstract: To improve the uncertainty of transaction in cross-border E-commerce, this paper analyses the practices of all the parties concerned cross-border E-commerce from the perspective of the game theory, and analyses the sources of fraud by seller by creating infinitely repeated game modal for cross-border E-commerce, proposing that some measures should be taken to solve the problem of credit in cross-border E-commerce, such as cultivating credit consciousness, establishing long-term cooperative business relation, reinforcing supervision from the third party and increasing the cost of fraud.

1 INTRODUCTION

With the rapid development of information technology, E-commerce has swept every corner of the world, all business has been facing new transformation, and E-commerce has become an important way of consumption in our daily life. After the financial crisis broke out in 2008, global market demand has been shrinking dramatically, which have inflicted a severe impact on the exports of China. Meanwhile, cross-border trade have also undergone irreversible changes, and traditional big deal international trade has now increasingly been taken place by trade order with the characteristics of small batch, more deals and fast delivery. In order to adapt themselves to the new environment, exporting enterprises make an attempt to choose cross-border E-commerce with online trade as its core and fast and convenient service as its advantage, finding new markets and cutting cost distribute risks. Chinese government also brought forward favorable policy for E-commerce for several times. In July 2013, Chinese government issued "national six-points package" to supporting cross-border E-commerce, in 2014, a unified export customs clearance system for cross-border E-business which can be applied to the whole nation have been developed and is now running online in Dongguan. A series of policies have accelerated the development of cross-border E-commerce of China. With those favorable conditions, huge amounts of new businesses have emerged in cross-border E-commerce, and trade scale increased rapidly. According to the statistics from China E-commerce study center, the volume of E-commerce exceeded USD ＄ 200 billion, with export in retail sales of cross-border E-commerce reached USD ＄ 15 billion. Till 2013, more than 5000 companies engaged in cross-border E-commerce and over 200,000 companies conduct cross-border E-commerce by all kinds of platforms, and a large number of small and medium size businesses joint this industry with 90% of newly registered user are small and medium size enterprises and self-employed business. In 2013, Report on cross-border E-commerce by PayPal have shown that online shopping demand for goods made in China of the five biggest target markets, namely, the U.S, the U.K, Germany, Australia and Brazil, will reach RMB144.4 billion in 2018.

As cross-border E-commerce has dual nature: international trade and E-commerce, likewise, the blocks that resist the development of these two kinds of trades are also the blocks for cross-border E-commerce but with more powerful influences. Researches by Wang Lin and Yang Jian shows that such factors as marketing capability, logistics, payments, tariff policy and regulation of cross-border E-commerce have great impacts on the development of cross-border E-commerce, and regulation on cross-border Ecommerce which

contains credit regulation has the greatest influence.(Wang & Yang, 2014) As a form of E-commerce, cross-border E-commerce has received limited recognition by consumer, and the complexity of E-commerce makes it difficult for consumer to trust cross-border E-commerce.(Meuter & Meute, 2000) However, trust is the prerequisite for consumer to trade with the sellers on line and has become the major blocks that influence steady development of cross-border E-commerce.(Jarvenpaa, Tractinsky & Vitale, 2001) If problems arose by trust can't be solve as soon as possible, they will definitely become a bottleneck for the development of cross-border E-commerce. Therefore, it is necessary to analyze the source of trust problem and figure out the solutions to the problem.

When conducting cross-border E-commerce, in order to attain their goal and benefit, all the parties concerned take into consideration the policy of other parties when they are making their own policy and then take the policy which is most favorable to them.(Yang, 2013) Therefore, cross-border E-commerce falls into the category of typical non-cooperative game issue. From the perspective of ration, every policy seller takes is in the hope of closing a deal with buyers and being the first choice for buyers. Likewise, buyers trade online repeatedly , and they make choice before every trade close, thus, the game between buyer and seller can be considered as a process of repeated game. Take that as the basis, this paper tries to study the credit issue from the perspective of game theory and creates infinite repeated game modal for cross-border E-commerce, proposing suggestions on the establishment and improvement in credit system of cross-border E-commerce.

2 ANALYZING THE CREDIT OF CROSS-BORDER E-COMMERCE FROM THE PERSPECTIVE OF THE GAME THEORY

2.1 The Definition of Credit and Fraud

All the parties' behavior is rational when they conduct transaction through cross-border E-commerce. Should a party, motivated by illegally possession of other party's property in ways of fabricating facts, concealing the true and taking advantages of other party's trust, fails to perform or under-performs his obligation even though the

payment or delivery have been made by other party concerned, then his behavior is defined as fraud. Conversely, if a party fulfills all obligation imposed on him under the agreement, his behavior is defined as good faith. For example, the seller provides the buyer with products or service which is conforming to the description and excellent in quality with reasonable price, the seller's behavior is called as credit, in reverse, if the seller provides products and service which are not in conforming to his description or have quality defect, such behavior can be called as fraud.

2.2 Analysing the Behaviour of Game of Transaction Parties in Cross-Border E-commerce

Every cross-border E-commerce transaction can be considered as a game. Sellers may choose between honesty and fraud in the process of transaction, and consumers may choose between deal or no deal. According to existing regulations on the credit evaluating of cross-border E-commerce, both buyer and seller make reviews and rating on each other's products, service, and behaviour after a transaction closed, and those reviews can be read and referred by following transaction parties. Therefore, transaction parties have to take into consideration how other parties concerned review the transaction when making decisions, then take specific policy. Subsequent buyers ' may not be willing to trade with the sellers who have credit issue which can be referred from the reviews by the proceeding buyers, plus, the difficulties and risks in settling disputes of cross-border E-commerce also prevent them from trading. The consequence is that buys' interest in transaction diminishes greatly, and then they turn to other sellers, which is not a result that all the buyers expect.

Buyers can learn about sellers' credit information by referring to seller's information, transaction records and rating, and sellers are also aware that buyers may make a choice between deal or no deal when they learn their condition. Buyers do not trade with any seller in question by cross-border E-commerce. Knowing that buyers do not trade with the buyers who conceal information, the sellers provide as much information as possible on proceeding transaction records and credit ratings. As it is more risky than other ways of shopping online to trade by cross-border commerce, credit seems more important than price to the buyers. Therefore, if a buyer finds that the buyer provide products and service with good quality, which constitutes pleasant

trade experience for him, then this seller will be the first choice for the buyer who wants to buy the goods again later on. This is the aim that all the buyers work for. Seller may not receive good reviews even though he choose to be honest, but he will be definitely reviewed poorly if he conceals information for fraud transaction, which will have impact on the decisions by the following buyers, consequently, no buyers will trade with the seller.

3 ANALYZING THE GAME BETWEEN TRANSACTION PARTIES OF CROSS-BORDER E-COMMERCE CREDIT SYSTEM

3.1 Basic Assumption on Infinitely Repeated Game Modal

Cross-border E-commerce is a complicated process, basing on the previous description, we make the following assumption for better analysing the gaming behaviour of every party concerned.

Assumption①: In cross-border E-commerce, the seller is able to provide products repeatedly, and possess a number of potential buyers, therefore, we can assume that there are only two parties concerned in cross-border E-commerce, namely the buyer and the seller. The seller can only make a choice between to trade or not to trade, and the buyer can only make decision between selling the quality products at reasonable price with sincerity or selling inferior ones by fraud.

Assumption②: Every party concerned is rational economic man who pursues maximum benefit. Information on transactions between the parties is asymmetrical, which means that both buyer and seller can't access to complete information of each other, but trading information is accessible for buyer by referring to the trade records and take it into consideration when making decision: the buyer choose to trade with the buyer who always trade with good faith, in contrary, the buyer may drop the deal if there is any record of fraud of the seller.

Assumption③:In the process of transaction, what policy will be taken by the parties concerned is not known to each other, and all the parties concerned make decision at the same time, and the static game is conducted between the two parties.

Assumption④:The transaction is under effective supervision. For example, the government or the E-

commerce platform stipulates relevant law and regulation to punish deceiver, and the seller will be punished for fraud. The punishment can be direct economic losses or such indirect losses as the loss of reputation.

3.2 Create Infinitely Repeated Game Modal and Its Resolution

Based on the above mentioned assumption, a payoff matrix of infinitely repeated game modal is established as shown in table 1.

Table 1 payoff matrix

Seller buyer	credit	fraud
Deal	V_h, P_h	V_c, P_C-C
No deal	0, 0	$0, -C$

In table 1, V_h，V_c represent the benefit that the buyer obtains when the seller trade with credit and with fraud, $V_h>0$，$V_c<0$. P_h，P_c represent the benefit that the seller gets when he choose to trade with honesty and fraud in the condition that the buyer chooses to trade with him. Both P_h and P_C are greater than zero and $P_c>P_h$. C represents seller's losses resulting from the penalty by the supervisor because of the fraud during the transaction. If the seller chooses to be honest, and the buyer chooses to trade with him, then the buyer will gain V_h, and the seller will gain P_h. If the seller chooses to be honest, while the buyer chooses not to trade with the seller, then both parties gain nothing. If the buyer chooses to cheat during the transaction, while the seller chooses to trade with him, the benefit that the seller gains will be P_C-C, and the buyer gains V_c , and $V_c<0$. If the buyer chooses fraud the buyer chooses not to trade with him , then the benefit that the seller gains from fraud is P_C , however he will be punished by the supervisor, and the losses is $-C$, thus the net benefits of the seller is P_C-C.

According to the assumptions, all the parties concerned pursuit maximum benefits, therefore, if the seller has traded with fraud in the past at least once, and the record of the transaction is shared, the buyer will choose not to trade with him upon learning the information. Meanwhile, the buyer believes that the seller will continue to cheat, so the buyer will not choose to trade with the seller later on. As long as the seller cheats once, a rational buyer will not trade with him anymore. If the seller always chooses to be honest and operates with

sincerity, then a rational buyer will choose to trade with him and is likely to choose trade with the seller again. The equilibrium will be that (credit, trade), the benefit that the seller gains is P_h, and the buyer gains V_h. In the situation that the buyer chooses not to trade, while the seller chooses to cheat, the benefit the seller gains is $-C$. Therefore, rational seller will choose honest policy to guarantee his maximum benefit.

In the condition that the buyer chooses to trade, the buyer makes the following decision.

(1) The seller choose to cheat, the benefit the seller gains is $P_C - C$ from this transaction. As a rational buyer will not trade with the seller, then the seller will not gain any benefit anymore, then the total benefit that the seller gains is $P_C - C$.

(2) If the seller chooses honest policy and continues to do so in every transaction, then the seller gains P_h. The total benefit that the seller gains is the sum of discount of the benefit from every transaction. Set the discounting factor as δ（$0 < \delta < 1$）. When the buyers carry a game with the seller as a group, set the number of potential buyers as n, B_i, i= {1，2，3，…}, B_i represent the 1th buyers, then the discount value of total benefit that the seller gains is:

$$P_h + \delta^1 P_h + \delta^2 P_h + \delta^3 P_h + \ldots + \delta^n P_h$$

Equals:

$$P_h（1-\delta^n）/（1-\delta）$$

Only when the discount value of total benefit that the seller gains is greater than that of total benefit gains by fraud $P_C - C$ will the seller choose not to deceptive policy. If the discount value of total benefit equals to $P_C - C$, there is still possibility that the seller take deceptive policy. That means to satisfy:

$$P_h（1-\delta^n）/（1-\delta）> P_C - C$$

When n tends to be infinite, $P_h /（1-\delta）> P_C - C$, and conclude that $\delta > 1 - P_h /（P_C - C）$.

Therefore in order to make equilibrium of this modal, which means that to make the seller choose honest, the following condition should be satisfied:

$$\delta + P_h /（P_C - C）-1 > 0$$

As $0 < \delta < 1$, to ensure that the above mentioned equation is greater than zero, which means P_h is greater than $P_C - C$ and when then condition that $P_h /（P_C - C）> 1$ is satisfied, the seller will not choose fraud.

Therefore, as long as the seller gains more benefit by trading with honesty than by fraud, the decision making combination (credit, buy) will reach Nash equilibrium.

3.3 The Conclusion of The Analysis on Infinite Repeated Game Modal

By the proceeding analysis, the following conclusion can be drew:

(1) When $\delta + P_h /（P_C - C）-1 > 0$，which means $\delta > 1 - P_h /（P_C - C）$, the modal reaches equilibrium. $\delta < 1$，then $1 - P_h /（P_C - C）< 1$, $P_h > 0$，$P_C - C > 0$. Which means that the benefit seller gains will not be zero no matter which policy, honesty or fraud, the buyer takes in a transaction.

(2) When P_h is greater than $P_C - C$, which means that in cross-border E-commerce, if the benefit that the seller gains when taking honest policy is less than that when taking dishonest policy, the rational seller will choose fraud. The greater the punishment on fraud, the bigger the value of C will be, and the less confidence the seller will lose. In a conclusion, in cross-border E-commerce, the reason why the seller chooses fraud operation is that fraud in transaction is still lucrative in a number of transactions. Only by the supervision from the government or the third party and the increase in cost of fraud operation, which makes the benefit gains after many times of fraud less than that gains from honest operation, will the seller keep honest policy in transaction. In addition, if the buyer discovers seller's dishonest operation, the seller will cease trading with the buyer and not choose the seller later on. Only by keeping credit records and operating with integrity will a buyer be chosen by the buyers as a trade partner in the future. which is telling us that problems of credit can be solved when the seller and the buyer establish concept of long-term cooperation and the seller keep operating honestly.-

4 SUGGESTIONS ON ESTABLISHING CREDIT SYSTEM OF CROSS-BORDER E-COMMERCE

(1) Reinforce education in credit and establish concept of long-term cooperation between buyers and sellers.

From the analysis on infinite repeated game modal, a conclusion can be drew that honesty is the basis for cross-border E-commerce transaction, seller participating in cross-border E-commerce should establish concepts of honest operation and long-term cooperation, which contributes to long-

term benefit and steady development of cross-border E-commerce transaction. Because of the uncertainty of the identity of the parties concerned in cross-border E-commerce transaction, the complicity of trade procedure and the difficulty in protecting consumers' rights, leading to weak credit consciousness of all the parties concerned in cross-border Ecommerce transaction. What's more, a large number of enterprises in China, especially small or medium size enterprises and self-employed operators, usually pursuit short-term benefit instead of development in long run. Additionally, there exists many problems in credit rating system of cross-border E-commerce transaction, which makes the seller take chances to cheat during transaction. However, with the transformation of present credit rating system of cross-border E-commerce transaction, the buyers' past records of dishonest operation will get them unable to continue their business online. Likewise, for the buyers who cheat online, they have to make over in order to enter the market.

To ensure the rapid development of cross-border E-commerce, the government should promote integrity education and strengthen people's credit awareness. Meanwhile, a series policy should be enacted to support enterprises that are in the market of cross-border E-commerce, avoiding those enterprises from sacrificing long-term development for immediate interests just because they lack the ability for further development. For those buyers who always with integrity, the government should give preference. Thus, more and more buyers will highlight long-term object, which requires them to emphasizing establishing credit in cross-border E-commerce market.

(2) Improve credit system of both buyers and sellers and enhance the credibility of credit information.

In cross-border E-commerce transaction, the buyers make decision by referring to seller's past trade records, therefore, an improved credit rating system of both parties is one of the reason why the parties concerned insist on honest trade. However, in order to receive favourable reviews, some seller employ " Online Water Army" to post false comments on the Internet, which have a negative influence on the effect of credit in cross-border E-commerce transaction. The effective ways to solve this problem include: to establish an opened, shared, perfect credit rating system, to require every users to acquire real-name authentication, to link the virtual trading parties in E-commerce transaction to actual trading parties in reality, minimizing the impacts of anonymity during transaction.(Xu, 2010)

(3) Strengthen supervision from other parties and establish severe punitive system and proper incentive system.

The government should establish an improved cross-border law system and normal economic system, enforce supervision, and improve the probability of disclosing fraud. Meanwhile, a severe punitive system should be established, and the cost of fraud thus will be increased, turning $P_C > 0$ into $P_C \leq 0$, preventing sellers from cheating but pursuing maximum benefit. Besides, the government should establish a proper incentive system, the enterprises who operate with good faith will be awarded, increasing the value of P_h, so as to encourage them to keep trading with sincerity.

Cross-border E-commerce platform is the precondition for E-commerce transaction, it not only provide the trading parties with service, but also record and identify transactions between the parties concerned and then pass the information to relative credit management platform. Therefore, it is necessary for cross-border E-commerce platform to improve its skills, deterring the party who intends to cheat by powerful supervision. The more powerful the supervision is, the more likely parties concerned take the decision of (credit, trade). It is advisable to ensure that the price of goods is proportional to punishment, which makes the cost of punishment is expensive enough to exceed the benefit that gains by dishonest operation, thus increasing the possibility for parties concerned to take honest policy.(Ding & Song, 2007)

(4) Accelerate the establishment of a transparent and unimpeded information circulation channel.

True and effective information is of great importance for the good faith of parties in cross-border E-commerce. Cross-border E-commerce involves transaction parties from home and abroad, and there is enormous amount of information on the Internet, and there is great information asymmetry in this market, which increase the uncertainty of transaction. From this perspective, to establish a transparent and unimpeded information circulation channel will be the key to restrain the parties concerned from cheating. By passing information and improving the transparency of deceivers' information, realizing a virtuous circle self-purifying and credit system.

Therefore, Chinese cross-border E-commerce platform should address the problem of reviews management and reinforce the supervision and regulation on the phenomenon of blocking,

eliminating poor reviews by buyers. It is advisable that buyers' reviews are managed by an independent department instead of managing by on sellers' own. It is suggested to adopt Amazon's credit rating system which allow the following sellers to vote for the previous buyer, the review most voted will be post on top of all the reviews, while those reviews that do not receive any votes can be eliminated. But the prerequisite for this system is to establish a true credit rating system, or it will be taken advantage by deceivers.

5 CONCLUSIONS

By analysing the gaming behaviour of parties concerned in cross-border E-commerce through establishing infinite repeated game modal, this research proposes measures to the credit problems of cross-border E-commerce: reinforce education in credit and establish concept of long-term cooperation between buyers and sellers, improve credit system of both buyers and sellers and enhance the credibility of credit information, strengthen supervision from other parties and establish severe punitive system and proper incentive system, accelerate the establishment of a transparent and unimpeded information circulation channel. As single game modal was adapted to analysis the resource of credit problem in cross-border E-business in this research, the limitation of this modal is that such important factors as morality and critics have not been analysed, which makes it uncompleted in the suggestions in establishment of credit system of cross-border E-business. In the following research, the author plans to make a further analysis on the establishment of credit system in cross-border E-commerce from a broader perspective of pure strategy game modal, mixed strategy game modal, fuzzy game modal, and extract the basic factors contributing to credit system in cross-border E-commerce.

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