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Analysis on Open Account in China from the Perspective of Prisoners' Dilemma

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ABSTRACT
Open account is a common behavior in international trade. There are such cases that exporters suffered great loss when importers suddenly disappear even they had successful corporation previously. To avoid loss, consigner should stop corporation when he thinks his partner could not afford to fulfill the contract, which shows a great similarity with prisoners' dilemma. In prisoners' dilemma, according to backward induction, both players should not corporate in the beginning. However, most of the players will corporate at first, and tend to defect near the end. This paper contains current studies of open account and the result of interview done by the author. The experiment method used in this paper is interview of export traders by phone calls. Interviewees includes manager of risk control center of Xiamen ITG Group Corp, a Fortune 500 company. The interview has showed current situation of open account behavior in China, major methods of preventing loss, changes during the pandemic, and so on. In conclusion, the author suggest enterprises in China to seize the current opportunity, and use more open account to expand.

Keywords: *Public goods game; Open account, Prisoners' Dilemma*

1. INTRODUCTION

Open account is selling based on credit. After signing a contract, purchaser could takes away goods and then pays off before an arranged date. Open account often occurs when there are difficulties in selling, overproduction, or market becomes too competitive. By open account, buyers can reduce their pressure of capital turnover.

China's total export volume has increased from 10 trillion RMB to 30 trillion RMB in 13 years. As buyer's market forms, trading manner is shifting from document business to open account. Currently, approximately 70% of trading adopt open account [1]. For example, Xiamen ITG Group corp's total open account ratio has increased from 19% to 31% from 2019 to 2020. Except textile product, commodities including steel, coal, and other products' open account ratio has increased [2]. As consumers' purchasing power greatly decreased in COVID-19, open account becomes more risky for Chinese exporters. Some exporters suffered losses when their partner suddenly disappeared after receiving goods.

Prisoners' dilemma, put forward by Merrill Flood and Melvin Dresher in 1950, is a basic game in game theory. If the experiment is repeated many times and players could communicate previously, it is shown that most players will corporate at first and choose to override when the experiment is almost ending.

The process of game playing, deciding when to end corporation to gain greatest profit and suffer fewest loss, is similar to prisoners' dilemma's players playing process. In international trade, both would benefit by trading. However, importer benefit the most when they are trading by open account and importer refuse to pay, in this situation, the importer acquired both good and money. As a result, the importer will suffer credit loss and may be suited, which is punishment in game theory.

In the following paper, the author would briefly introduce prisoners' dilemma, explain and analyze the whole process of interview, analyze the risk report published by sinosure, and give suggestions for Chinese exporters.

2. LITERATURE REVIEW

Prisoners' dilemma was raised by Merrill Flood and Melvin Dresher in 1950, when the company they are working for, Rand Corporation, is trying to apply game theory to global nuclear strategy. According to Stanford Encyclopedia of Philosophy, prisoners' dilemma shows a situation that if the payoffs are not assumed to represent self-interest, a group whose members rationally pursue any goals may all meet less success than if they had not rationally pursued their goals individually. A closely related view is that the prisoner's dilemma game and its multi-player generalizations model familiar situations in which it is difficult to get rational, selfish agents to cooperate for their common good [3].

In the prisoners' dilemma, there are two players, A and B, they both have two choices, corporate or defect. Table1 shows the payoff of player A and B when making different choice.

Table 1. Payoff of player A and B in prisoners' dilemma (T>R>P>S)

A\B	Corporation	Defect
Corporation	R,R	S,T
Defect	T,S	P,P

3. INTERVIEW

3.1. Design of the interview

The interview would be held online, in the form of audio call. The author has written down following questions to ask, as shown in table 2. There are two interviewees, one is from Xiamen ITG Group Corp, mainly in charge of risk control, the other is from Shishi Huilitong International Trade Co. Ltd, he is the director of international trade department.

Table 2. Interview questions

Question 1	The company the interviewee is working for and his position
Question 2	What kind of products usually use open account?
Question 3	At what time open account behavior happens more frequently?
Question 4	Is there more or less open account during the pandemic?
Question 5	What kind of measures are usually taken to prevent loss?
Question 6	Usually, how many corporations is there previously when customers break the contract?

3.2. Result of the interview

In the interview of the manager of risk control of Xiamen ITG Group Corp, he mentions that it is usually articles of daily life that use open account, and that occurs up to 95% of the order. In Xiamen particularly, the biggest export industry is clothing, and open account makes up to 80% of the orders. Open account became more popular in China after 2001, when China enters WTO. The government set up China Export & Credit Insurance Corporation to encourage open account in order to seize market share. Local government would pay 80% of the compensation to the companies.

Bad debt ratio mainly depends on corporation's risk control ability and industry's situation (when systematic risk occurs, bad debt ratio increases generally.) Bad debt ratio is lower in 2020, less than 1% in Xiamen's export industry.

To author's surprise, time and area was irrelevant, meaning that there is not less open account behavior during the pandemic. Risk would raise, however, since many corporations have bankrupted due to tight capital flow in the beginning of pandemic. In the beginning of 2021, there were less problems. Moreover, because there are less suppliers and the demand still occur, there are approximately 50% more demand for products produced in China.

Although swindle happens to them every year, real customers rarely break the contract, especially foreign buyers. Due to a better credit system abroad, most of foreign customers would fulfill the contract. Most violations happens due to systematic risk. Such as Covid-19 and the 2018 bankrupt tide of textile industry in North America. Therefore, the number of previous corporations when violation occurs is meaningless.

Another interview is the interview of the director of international trade department of Shishi Huilitong International Trade Co. Ltd, an agency working for mainly minor enterprises and has 1 billion dollars export volume in 2020. He mentions that minor enterprises rarely use open account, because it is difficult for them to turn over the capital. Only around 1%-2% of the order is open account. They use multiple methods to reduce the risk of violation:

- Investigating the quantity of orders in the previous year.
- Reading the credit information given by China Export & Credit Insurance Corporation (sinosure), which will usually gives a safe limit that they can export to certain customer.
- Analyzing the information that salesman acquire, which has a stronger timeliness than the credit information.
- Having a risk reserve, usually by increasing the quoted price.
- Insurance sinosure (less for minor enterprises due to their unwillingness to afford the premium)

There are mainly two ways to recove loss:

- Applying for claims to sinosure.
- Applying for an arbitration, sometimes suiting.

3.3. Analysis of the interview

The interview mentioned that major enterprises and minor enterprises have big difference in open account. By comparing replies from two interviewee, the author figured out that big enterprises use open account more than small enterprises. For major enterprises, over 95% of exporting of daily necessities use open account, for minor enterprises, that ratio is below 2%. Also, small enterprises prefer not to insurance, because they do not want to afford the extra cost. Big enterprises prefer to insurance to pursue stability. Take Xiamen for example, major customers of sinosure are from communication industry, light industry, steel industry, textile industry, and garment industry.

According to manager from ITG, enterprises decides whether their customers are trustworthy or not mainly on credit information, which could be collected from field trip, and professional credit investigation companies' report. According to director from Huilitong, other methods of reducing risk they adopt is insurance and having risk reserve. Two interviewees adopt same method of recovering loss. If the order is insured, companies could apply for claims. If it is not, exporters could apply for an arbitration.

4. BUILDING A GAME MODEL

4.1. Introduction of this model

In this model, exporters and importers would be two players. Exporter is the first mover and importer is the second mover. Exporter can choose to trade or not, importer can choose to fulfill or violate the contract. Such simulates the situation of real life open account trading.

4.2. Exporter's initial trust

4.2.1. The risk for exporters

To make the most profit and reduce the pressure of capital flow, importers tend to open account. Open account brings risk to exporters, because they might lose both money and good if importer violates after the good is delivered. Especially systematic risk, which is often because of unpredictable natural disaster. This makes risk more uncontrollable.

4.2.2. Factors influencing the initial trust of buyer

Credit information: Credit information given by Sinosure is a referable information of customer's credibility. Sinosure also publish The Handbook of Country Risk annually, however, the information is only given on the unit of industry, and it is not timely. Some major industry would pay field visit to investigate their customer's condition, which gives a more accurate and timely credit information. Previous trade: For minor corporations that does not insurance, they would trade without OA previously to ensure their customer have the ability to fulfill the contract.

4.2.3. Benefit for exporter

Trading is beneficial for corporations without doubt. Open account benefits exporters in mainly two ways: helping corporations attracts more customers and raise the good price. Open account attracts more customers because it gives them a longer time to turnover the capital. Higher risk also gives exporters excuse to set a risk reserve, coming from the higher price when trading by OA.

4.3. Importer's payback

4.3.1. The risk for importers:

Risk only occurs when importers violate the contract, if they fulfill the contract, it is a normal trade, paying money and receiving goods. The payoff of violating the contract includes: losing credit and being suit. Like mentioned above, exporters depends on credit information to decide whether to open account or not. Violations could influence their credit information and less companies are willing to open account in the future. In addition, exporters usually recover fund by applying claims to sinosure or apply for an arbitration, which all goes to arbitration or rarely suit against the importers.

4.3.2. Benefit for exporters

Like mentioned above, trading by OA gives importers time to turnover the capital, having a chance to gain more benefit. When violating, there are no such benefit for normal importers, because it is usually unavoidable when systematic risk occurs. For swindlers, they acquired goods without paying, but have to face risks of losing credit or being suit.

5. ANALYSIS

5.1. Analysis of the model

Exporters could choose to trade by OA or not trade at all, importers could choose to fulfill or violate the contract.

Table 3. Payoff of exporters and importers in different situations of open account

Importers Exporters	Fulfill the contract (P2)	Violate the contract (1-P2)
Open account (P1)	e, u	-d, d-r
Advance payment (1-P1)	u, e	0, 0

Supposing the probability of exporters choose to open account is P1 and is decided by importers' initial trust, then the probability of no trade is 1-p1. The probability of importers fulfilling the contract is P2, then the probability of importers violating is 1-P2, decided by their ability and their willingness. As showed in table 3, e is the benefit for importers when trading successfully by OA, u is the benefit of exporters when trading successfully by non OA. d is the value of the good, and r is the payoff of violation for importers, which is considered as punishment. In this model, u>e>d-r>0>-d

Daily necessity has lower value than customized equipment, meaning that their d is lower, exporters will have lower loss if importers violate the contract, that correspond with the result of interview that most commodities use open account are daily necessity. For small enterprises, they export less good than big enterprises, also meaning that d is lower than big enterprises in this situation. In this case, d-r is smaller and 1-P2 is bigger, meaning that importers are less willing to violate the contract. That explains why they are unwilling to insure their order.

For normal companies, their reputations are usually connected with stock price, a bad reputation could make them lose many customers, their r is usually bigger than d and P2 is high. Both exporters and importers are willing to trade since they can earn e1 and e2, and it is unlikely that importers violate. This explains why interviewee from ITG claims that normal customers (other than swindlers) would fulfill the contract unless systematic risk occurs.

For swindlers, their r is lot lower than big industry, because they are harder to trace and does not needs a good reputation, resulting a low P2. When d-r is bigger than e2, they would choose to violate the contract. For exporters, they would not trade if they successfully separate swindlers to avoid losing d.

In generally speaking, we can see that whether exporters open account or not mainly depends on their judgement on importers' willingness and ability to fulfill the contract, which is identical with the interview. Exporters would try to open account to earn e2 than earning nothing. Normal corporations would try to fulfill the contract since modern system have already make it expensive to violate the contract.

5.2. Analysis of the Handbook of Country Risk 2020

The Handbook of Country Risk 2020 is published by sinosure, giving authoritative information about risks of different industry in 2020 to international trade companies.

5.2.1. Risks in 2019

Since the paper is about open account, the author would mainly analyze risks that affects open account.

The most significant influence of risk in 2020 must be the pandemic, bringing the biggest challenge since 1930s to all international trade companies. The pandemic has a wide influence on many industries, including agriculture, steel, and shipping industry.

5.2.2. Risks in agriculture

Factors influencing agriculture other than the pandemic includes natural disaster and trade frictions. Locust plague occurred in east Africa and south Asia, causing fluctuation in food price. According to the Handbook of Country Risk 2020, measures taken by governments to response the pandemic also intensify nationalism and deglobalization. Fluctuating food price and governments' restrictions toward agricultural products made it more difficult and risky to trade agricultural products internationally.

5.2.3. Risks in steel industry

Although the consumption of steel is constantly increasing around the world, export volume of steel is decreasing due to trade frictions. The problem of excess production capacity has been more serious since the economic has shrieked 3%-5% due to the pandemic. According to the Handbook of Country Risk 2020, steel industry's excess production capacity problem would intensify, the competition would be more intense, trade frictions would increase. This would force steel industry to use open account to make their product stand out in the crowded market.

For example, according to the Handbook of Country Risk 2020, British Steel has bankrupted due to the unstable political environment during Brexit. At a special time that Brexit may happen at any moment, European importers are unwilling to import British steel due to the unsure tariff barrier and the high tariff that might exist if the Brexit is "hard". Also because of Brexit, British Steel lost its free quota subsidy from EU, causing its monthly cost on energy to increase about one hundred million pound. High energy cost, the shrinking of whole steel industry, and the sudden demand from Europe, cause British Steel bankrupted in May, 2019.

5.2.4. Prediction of 2020

According to the Handbook of Country Risk 2020 [1], the pandemic has influence both supply and demand. For the supplier, which are exporters in this situation, producing activity has significantly decreased. Trades with concentration of capital has been greatly influenced by the fixed depreciation of fixed assets and lower productivity. Trades with concentration of labor is mainly influenced by insufficient labor, which slows the producing procedure and increase the product's unit cost. For the demander, the pandemic has both positive and negative effects. On the one hand, the pandemic has boost the demand of pharmaceuticals industry, game industry, and cloud computing industry, on the other hand, the pandemic has negative effect on the demand for transportation, food service industry, and tourism. Stricter quarantine procedure has influence the transportation of good, restrictions of transport service also decrease the efficiency of business negotiation and technical exchange.

Most of the industry that use open account is manufacturing industry, which belongs to trades with concentration of labor. The higher price and lower productivity of foreign enterprises bring Chinese enterprises a great chance. The interview has indicated that demand for Chinese manufacturing industry has increased over 50%, while the economic has recovered to 80% before the pandemic. For Chinese enterprises, it is a great chance to expand, since the market has less competition and higher risk, exporters could use less open account and adopt other safer trading method such as letter of credit. Traditional industry that use open account, such as food service industry has been greatly impact during the pandemic. Meanwhile, new industry such as cloud computing and game industry have risen. This also brings a chance for enterprises to expand to new industry and lower their risks.

5.3. Analysis of other risks

Apart from situations such as swindle and systematic risk mentioned above, risks could also occur in the following situations.

1. When exporters insure the order with the parent firm instead of subsidiary firm, which is the one that receive the good and should fulfill the contract. In this case, parent firm could abandon subsidiary firm to avoid debt, and bring loss to exporters.

2. Lack of a unified risk control department resulting in larger credit limit and chaos when consigning.

3. When export volume has reached the credit limit and exporters stop delivering good, the good will become inventory and increase their cost. More importantly, exporters have to suffer lost caused by depreciation of the goods. And if the good is not delivered, the accounts due is not insured [4].

6. CONCLUSION

The Handbook of Country Risk 2020 introduces that in 2019, risks have generally increase for exporters due to the shrinking economy around the world. For Chinese enterprises, 2020 means great chance. The interview informed that the demand still exist abroad, meanwhile, the supply has greatly decreased in many other countries. As a result, demand for Chinese good have raised over 50%. Chinese enterprises should seize this opportunity. However, since open account is a tradition in many industry such as daily necessity, enterprises should still OA.

Although 2020 has a lower bad debt ratio than before, enterprises should still be careful about loss, especially a new strain of Covid-19 is spreading in many countries. Investigation of customers, insure the order, raising the price are all effective methods of reducing risks. Moreover, it is also a good chance for companies to expand to new industries such as game, cloud computing, which has flourished during the pandemic.

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