

Repeated Game Analysis of Trade Friction between China and India

Xiaoxiao Liu

East China University of Political Science and Law, Beijing 201620, China.

Abstract: As two emerging economies with similar development stages, China and India have broad prospects for cooperation. However, with the deepening of trade cooperation between the two countries, India has initiated more and more trade relief measures against China. Trade friction between the two countries has increased, which has caused great losses to China's export trade. Based on the repeated game model theory, this research finds that the trade friction between China and India is not conducive to the long-term interests of both sides, and the best choice for both sides is to adopt cooperative strategies.

Keywords: China and India; Repeated Game; Trade Friction; Prisoner's Dilemma

1. Introduction

China is bearing a greater risk of trade friction. With the rapid development of China's foreign trade, the number of people sued in trade remedy cases has gradually increased. At the same time, the number of people sued in trade remedy cases in China is far greater than the number of complaints. According to the statistics of China trade remedy information network, a total of 6888 original cases of trade remedy were filed in the world from 1995 to 2020.^[1] In 2020, a total of 422 trade remedy cases were filed, which reached the peak of the number of cases filed since 1995. From the distribution of the defendants, China ranked first in the world with 27% of the total number of defendants. China has sufficient labor resources to facilitate labor-intensive industries to participate in international trade activities. The rapid growth of China's exports has had some impact on the original interest pattern, which not only threatens the economic interests of developed countries, but also makes developing countries suffer a certain impact. These were easy to cause trade friction. In the past time, trade frictions were mainly between developed countries and developing countries. However, in recent years, trade frictions among developing countries also occurred frequently. As two major emerging economies in the world with similar development, China and India have broad prospects for cooperation. China has also become the largest trade partner of India.^[2] However, after China's successful accession to the world trade organization, and with the deepening of trade cooperation between the two countries. India and other developing countries launched a series of trade restriction measures against China more and more frequently, such as import ban, quota, license and so on (Chen Peiqiu,2015). What's more, the amount involved in trade restriction measures against China increased year by year, which caused great losses to China's export trade. This research used the repeated game model to explore and analyze the long-term impact of trade friction between China and India, and combined the repeated prisoner's dilemma game theory to put forward reasonable suggestions for China's future countermeasures.

2. Model hypothesis

Repeated game is a dynamic game which the same structure of the game repeats many times. Theoretically, it needs to meet three basic hypotheses: first, there is no material connection between stage games, that is, the game in the previous stage does not change the structure of the later stage; Second, all participants can observe the history of the game in the past, and can base choice on the other participants' action-history other participants; Third, the total income of the participants is the sum of the discounted values of the game payments in all stages or the weighted average value(Xie shiyu, 2002). Repeated games can change people's behavior and make them inclined to choose cooperative strategies greatly, because participants are not only concern about immediate interests, but also

they concern about long-term interests. In order to calculate the long-term interests, the static prisoner dilemma game needs to be described with the help of the following table. As shown in the table. [3]

Table 1 The static prisoner dilemma game

Player 1 Player 2	cooperation (C)	Uncooperative (D)
cooperation (C)	(R,R)	(S,T)
Uncooperative (D)	(T,S)	(P,P)

In the prisoner dilemma game, two players have two strategies (cooperation is C, Uncooperative is D). If both sides of the game adopt the cooperation strategy, each side will get the interest R. On the contrary, if the two players choose the uncooperative strategy, each player will get the interest P. If the two players choose different strategies, the one who chooses to cooperate will get the benefit of S, while another who chooses not to cooperate will get the interest of T. Obviously, we have $T > R > P > S$. At the same time, the total value of both players that choose the cooperation strategy is greater than the total value of one player's cooperation, the other player's uncooperative and the total value of both players' uncooperative strategy, that is, $2R > T + S$, $2T > 2P$. [4] The optimal strategy (revenue maximization) is the uncooperative strategy. When the player chooses uncooperative, but the other player chooses cooperation strategy, the maximum gain of the player is T. However, if the two players do not cooperate in the game, their total interest is 2P.

In the complex and pluralistic international politics, especially in the game of great powers, as long as two countries exist, the game will be infinite. Now it is assumed that the two sides of the players play the prisoner's dilemma game for an infinite number of times. If both players choose the uncooperative strategy, each player will be paid P. On the contrary, if the two players continue to cooperate from the beginning, the income flow of each period will be R. Imagine that the two players have been cooperating before, but at a certain time of point t, what is the value to each players of continuing to maintain cooperation forever? To calculate this value, a discount factor needs to be introduced δ , that is, the ratio of the gains from the next game into the current interests. The bigger δ means that players pay more attention to the future. The present value of the total interests of the player is:

$$V = R + \delta^1 R + \delta^2 R + \delta^3 R + \delta^4 R + \dots = R / (1 - \delta)$$

3. Model Analysis

In the repeated prisoner's dilemma, the game is repeated, so each player has the opportunity to "punish" another player for the uncooperative behavior in the previous round. At this time, cooperation may appear as a balanced result. The triggering strategy is that the two players first try to cooperate, and once the other player is found not to cooperate, they will also adopt the uncooperative strategy to retaliate. Easy to prove, if the δ is large enough, the trigger strategy will not only constitute a Nash equilibrium, but also constitute a refined Nash equilibrium. Specifically, it is assumed that China and India choose the trigger strategy, that is, once India is found to adopt the uncooperative strategy in the process of good cooperation, China will never cooperate with India. Assuming that the two countries have always adopt the cooperation strategy, the China can get interest R in period t, and then get interest R in each period, then the discount value of the income flow is $R / (1 - \delta)$. However, if the India chooses to destroy the cooperation at this stage, the China will suffer a loss and get T. And from the next stage, the Chinese side will never cooperate with the Indian side. At this time, the best result that the India can get is never to cooperate. Then the India can only get interest P at each stage, and the discount value of the total income flow is $T + P (\delta / (1 - \delta))$. If the value of δ satisfies $R / (1 - \delta) \geq T + P [\delta / (1 - \delta)]$, the best choice for India is to maintain cooperation all the time, rather than adopt a uncooperative strategy halfway. That is to say, as long as $\delta \geq (T - R) / (T - P)$, it is best for everyone to choose the trigger strategy. The above conditions can be restated as: $\delta (R - P) / (1 - \delta) \geq T - R$, where $T - R$ on the right side of the inequality represents the added value of the current income brought by a certain choice of uncooperative, and on the left side of the inequality $\delta (R - P) / (1 - \delta)$ represents the discounted value of future losses caused by this non cooperative behavior (where R-P is the loss of each period).

Therefore, the cooperation between the two players of the game depends on whether the long-term interests can withstand the

temptation of the immediate interests and the degree of patience. Specifically, the degree of patience is the importance of future interests. The greater the temptation of single uncooperative, the greater the immediate interests brought by adopting uncooperative strategies compared with the long-term interests brought by adopting cooperation strategies, the greater the possibility of participants choose non-cooperation strategies. In addition, the temptation brought by the uncooperative strategy and the long-term interests brought by the cooperative strategy, the more important the future interests, the greater the possibility of adopting the cooperative strategy. This shows that the cooperation between China and India mainly depends on whether the long-term benefits can withstand the temptation of immediate benefits and the degree of patience.

4. Conclusion and Policy Recommendations

The results of this research can well explain that India's desire to boycott Chinese products is unrealistic and not conducive to its long-term interests. Although India and China have similar development stages, India still lags far behind China in terms of industrial chain perfection, technological level and other supporting facilities. Some core areas still need to rely on China, and India is difficult to get rid of the influence of "made in China" in the short term. According to the trade data and economic conditions of the two countries, most of India's products exported to China are raw materials with low technical content. Most of China's products exported to India are precision manufactured products with high technical content and high added value. (Liu Yuanyuan, 2016).^[5] This is also the reason why China has a large surplus in the bilateral trade between China and India. If India engages in trade friction, the losses of India will be far greater than the harm that India will bring to China.

Based on the above conclusions, this research puts forward two Suggestions from the perspective of the trade friction between China and India is not conducive to the long-term interests of both countries.

(1) Actively counterattack and resort to the WTO dispute settlement mechanism.

Active counterattack is a powerful weapon for countries in the world, especially in the face of developing countries such as China. To deal with bilateral international trade friction, safeguard their legitimate rights and interests, and balance the unfair foreign trade policies of developed countries (Ma Xiaoteng, 2018), active counterattack is very useful. It is also a reasonable countermeasure that is extremely in line with the tit for Tat strategy. From the historical experience of economic and trade exchanges with India, ^[6]China's temporary concessions will often lead to more and more illegal violations by India. Therefore, the Chinese government should fight back in a timely and appropriate manner, and keep flexible and fight without breaking on the premise of not expanding the incident, so as to better deal with the possible game between China and India.

(2) Based on long-term interests, adopt gradual strategy.

The Chinese government must base itself on the long-term interests. When India adopts a cooperation strategy and takes a positive attitude towards the establishment of Sino Indian relations, China should consider the average income of cooperation with India and maintain long-term economic and trade relations with the mind of "embracing all rivers". At the same time, the gradual settlement of Sino Indian trade disputes can better grasp the measure of establishing diplomatic relations with India and avoid provoking incidents, thus affecting China's long-term interests.

References

- [1] Chen PQ, (2015). "Analysis on trade friction between China and developing countries". Money China. Vol. 23, p.25.
- [2] Liu YY, (2016). "Study on the influencing factors of Sino Indian trade friction". Yunnan University of Finance and Economics.
- [3] Li G, and Lu YQ, (2019). "Game analysis of prisoner's dilemma in knowledge sharing of virtual community -- Based on complete information static and repeated game". Library. Vol. 2, p.92-96.
- [4] Ma XT, (2018). "An analysis of the causes and Countermeasures of Sino US trade war -- from the perspective of repeated game theory". Times Finance. Vol. 33, p.12-14.
- [5] Wang Y, (2016). "Comparison of trigger strategy and rotation strategy in repeated game". Market Forum. Vol.2, p.48-50.
- [6] Xie SY, (2002). "Economy Game". Fudan University Press.