



The Influence of US Tariff Increase on Guangdong Province Export Trade

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ABSTRACT

Since the Sino-US trade war began, it is interesting to understand how the U.S.-China Trade War influences Guangdong's export trade. This paper establishes a vector autoregressive model among the average tariff rate of Chinese products in imports from the U.S., the scale of Guangdong's exports to the U.S. and the direct investment of the U.S. to Guangdong Province. The results show that the reduction of the average tariff rate in the U.S. has a positive effect on Guangdong's export trade.

Keywords: National Tariff, Export trade, Vector autoregression model

1. INTRODUCTION

The trade dispute between China and the U.S. began in March 2018 when the former U.S. President Donald Trump imposed tariffs on Chinese imports based on the "301 investigation". Guangdong, a major Chinese export province, has been affected by imposed tariffs from the U.S. for a long time.

At present, after several rounds of economic and trading negotiations between China and the U.S, the tariff growth level of the two sides has slowed down slightly from the initial stage, but in essence it still remains high, posing a huge challenge to the international economic and trading field. On the one hand, there's a need in the research of increasing tariff that can provide in-depth knowledge and theoretical understanding in this field. On the other hand, the analysis of the current situation, impact and countermeasures of tariff increment in the whole industry and Guangdong province's export trade plays a key role in the development and steady growth of trade in the emerging economies market.

1.1. National and international literature

1.1.1. Status of US research

Regarding the benefit of trade liberalization, it can be traced to 2001. The experiment of 16 bilateral trade among OECD countries with a general equilibrium model shows that the relative contribution of trade liberalization is three times that of transport costs, which

highlights the promotion effect of tariff on international economy and trade. [2] After the first phase of the agreement came into effect, the average U.S. tariff on Chinese imports dropped from 21% (2019.9) to 19.3% (2020.2), but it is still high compared to the average tariff of 3.1% (2018.1). [1]

1.1.2. Current status of domestic research

1.1.2.1. Trade Status

Prior to the trade war, the total exports of Guangdong fluctuated and increased, among which the growth rate of primary products and industrial manufactured exports fluctuated down. [10] The economic growth rate of Guangdong Province slowed down year by year but still remained in the leading position. Since 2010, the major trade has gradually changed from processing trade to the general trade. [9]

1.1.2.2. Impact Studies

The effect of U.S. tariff increment is limited to the effective protection within the U.S. [4] Enterprise resource planning may be a reason for the trade war. The high-tech industry in Guangdong Province, exemplified by Huawei, is affected by trade frictions between China and the U.S. and key technologies in the enterprise network business, and the underlying ecology of Huawei is at greater risk of U.S. sanctions. [3] While the trade imbalance with China has been alleviated, the U.S. tariff

increment has not resulted in trade and structural improvements. [11]

1.1.2.3. Countermeasure Research

From a political and legal perspectives, the Biden administration has reintroduced international multilateralism after governing and is likely to inherit the new embedded liberalism of the Obama administration. [8] In terms of policy innovation, some scholars advocate "One Belt, One Road" and to establish a free trade market to realize a dual circulation of domestic and international trade. [15] In the "post-epidemic" era, as the influence of unilateralism on globalization is gaining momentum, we should pay attention to the trade status of countries such as Africa, and actively seek new partners. [16]

2. RESEARCH AIMS AND METHODOLOGY

2.1. Aim of the research

This study aims to examine the influence of the U.S. tariff increment on the export trade of Guangdong Province. A vector autoregressive (VAR) model is constructed in this research to study the average tariff rate and exports of Guangdong Province to the U.S. The covariables in this study include Foreign direct investment and Gross domestic product.

2.2. Research methods

This study applies the quantitative approach as the research method, which is able to prompt the conclusion based on statistical evidence. To be specific, the study adopts econometric models for analysis. In this paper, a vector autoregressive (VAR) model is constructed to analyse and test the regression results of the two variables of Average Tariff Rate and Export.

The literature research method is also applied in this research for building the foundation of this study. To be specific, this study will examine current literature to understand the impact of tariffs on the growth of world trade and the tariff process in the US-China trade war in detail.

3. EMPIRICAL ANALYSIS OF THE IMPACT OF TARIFF INCREASE ON THE EXPORT TRADE OF GUANGDONG

3.1. The impact of tariffs on export trade

From the importing country perspectives, the increase in tariff rate will have to buy domestic products due to the high cost of imported goods, making local enterprises in the importing country benefit from it. [13] From the perspective of the exporting country, higher tariffs cause a reduction in the number of orders. If the exporting

country's government does not provide subsidies, producers in the exporting country will have to shift their export strategy to hedge their risks. Tariffs, as an important component of trade costs, have a dampening effect on the export margin and thus have a negative effect on export trade.[12]

3.2. Econometric model analysis

According to the above analysis, increasing the average tariff rate will directly lead to an increase in the cost of Chinese export goods. In existing literature, some scholars took the perspective of product technology and argued that the higher the technical complexity of the product, the weaker the inhibiting effect of tariff barriers on its exports.[14] Some other scholars used the general trade model to analyse the extent to which exports are affected by different trade modes. [7] To complement existing literature, this paper takes Guangdong Province as the research object and intends to test the impact of the U.S. tariff increase on the export trade of Guangdong Province. As we all know, Guangdong Province has the leading growth rate of foreign trade in China. In the special context of "trade war", it is of great academic value and practical significance to study the impact of U.S. tariff increase on China's export trade in Guangdong Province.

In terms of data analysis, this research establishes vector autoregression model with the annual export value of Guangdong Province to the United States (Export), the average tariff rate of goods imported from China by the United States (TR), the amount of foreign direct investment used by Guangdong Province from the United States (FDI), and the gross domestic product of Guangdong Province (GDP) to analyse the dynamic relationship between the average tariff rate of US imports of Chinese goods, the total US direct investment in Guangdong Province and China's export trade to the US.

3.2.1. Variable selection and data source

Export: Total exports from Guangdong Province to the U.S. are used to represent the level of Guangdong Province's export trade. Data is obtained from the Guangdong Provincial Statistical Yearbook.

Rate: This paper uses the average tariff rate of U.S. imports of Chinese goods to indicate the level of Guangdong Province affected by it. The data is obtained from the World Bank database.

FDI: This paper includes U.S. direct investment in Guangdong Province in the model and represents it with the actual amount of U.S. foreign direct investment in Guangdong Province. The data is obtained from the Guangdong Statistical Yearbook.

3.2.2. Construction of the vector autoregressive model

The vector autoregressive model is a type of economic statistical model that can be manipulated and does not require a theoretical foundation. Models based on economic theories are often subject to assumptions, which leads to a challenge in accurately illustrate the realistic dynamic relationships between variables from a qualitative perspective. Economic problems usually use unstructured models as well as real and valid economic data to examine the relationships between relevant variables. Therefore, in this paper, due to Stata with VAR package, the model is processed and analysed by Stata.

3.2.3. Econometric analysis

3.2.3.1. Stability check

We tested first-order differencing of the variables, in order to avoid the phenomenon of "pseudo-regression" which affects the reliability and accuracy of the empirical findings of this paper,. It was found that drate, dllexport, and dFDI were non-stationary, and the results are shown in the table 1. Therefore, the cointegration test should be proceeded to analyse the quantitative relationships among the non-stationary economic variables.

Table 1. Unit root test results

Variable	Name	ADF statistic values	P-value	Conclusion
drate	Average tariff rate Guangdong	-0.797	0.1878	Non-stationary
dllexport	's total exports to the United States	-0.902	0.1002	Smooth and stable
dFDI	Total U.S. Direct Investment	-1.662	0.1470	Non-stationary

3.2.3.2. Optimal lag order selection

After completed the first-order differencing of the variables, the optimal lag order p is determined according to the information criterion. The results are summarised in Table 2, which shows that most of the information criteria point to the fourth order lag term, and the information criterion is minimized when p=4 (those with an asterisk in the table 6). Therefore, the optimal lag order is 4 for regression estimation using the variables after the first-order difference.

Table 2. Optimal lag order determination results

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	23.3244				.000018	-2.3911	-2.37649	-2.24406*
1	34.2122	21.776	9	0.010	.000015*	-2.55474	-2.55474	-2.02505
2	41.4521	14.48	9	0.106	.000021	-2.30382	-2.30382	-1.37687
3	46.3849	9.8656	9	0.361	.000049	-1.78148	-1.78148	-4.57257
4	63.8353	34.901*	9	0.000	.000046	-2.9218*	-2.73179*	-1.01031

3.2.3.3. Johansen cointegration test

Johansen's test can be performed to examine whether the linear combination of non-stationary series has a long-term cointegration relationship. [6] The results of the trace test indicated that there was a linearly

uncorrelated cointegrating vector. As shown in the results of the maximum eigenvalue test, when rank=0, the statistic is 31.92 greater than the critical value 20.97, which indicated that the original hypothesis rank=0 could be rejected; when rank=1, the statistic is 8.82 less than the critical value 14.07, which indicated that the original hypothesis rank=1 could be accepted.

Table 3. Results of cointegration test

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	30	42.22489	-	43.2208	29.68
1	35	58.183207	0.84702	11.3042*	15.41
2	38	62.593058	0.40477	2.4845	3.76
3	39	63.835291	0.13597		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	30	42.22489	-	31.9166	20.97
1	35	58.183207	0.84702	8.8197	14.07
2	38	62.593058	0.40477	2.4845	3.76
3	39	63.835291	0.13597		

3.2.3.4. Regression analysis results

As discussed before, the optimal lag order p was chosen to be 4 for the VAR regression, and the results are shown in the table 4. The coefficients of all three variables are negative, which indicates negative relationships. When using $drate$ as the explanatory variable, the estimated coefficient of the explanatory variable $dllexport$ is negative at .05 level of significance, indicating that the decrease in export value will further increase the tariff rate. This suggests that the US tariff rise will not only have a negative effect on export volume and foreign investment, but will also create a vicious cycle that will have a long-term impact on the export trade of Guangdong Province.

Table 4. VAR regression results

Explained variables	Explanator y variables	Coef.	P-value
$drate$	$drate$	-.8622975	0.007
	$dllexport$	-1.184325	0.001
	$dFDI$	-.1253052	0.561
	-cons	.1000692	0.199
$dllexport$	$drate$	-.1671873	0.400
	$dllexport$	-.606441	0.005
	$dFDI$	-.0660588	0.620
	-cons	.0157731	0.743
$dFDI$	$drate$	-.0005703	0.999
	$dllexport$	-.6255552	0.079
	$dFDI$.3359281	0.124
	-cons	.1918859	0.015

3.2.3.5. Granger causality test

The Granger causality test was used in this study to see if there is a link between the average tariff rate and the total exports of Guangdong Province to the U.S. When testing the original hypothesis " $drate$ is not the Granger cause of $dllexport$ ", the chi-square value was 7.5414, corresponding to the p-value is 0.057, and the original hypothesis was rejected at .10 significance level. The statistics indicated that the average tariff rate is the Granger cause of the total exports of Guangdong Province, and there's a correlation between the two

variables. Therefore, the change of tariff will lead to the change of export trade volume. Similarly, the hypothesis " $dFDI$ is not the Granger cause of $dllexport$ " can be rejected at 5% significance level, indicating that the growth of US direct investment in Guangdong Province will result in an increase in Guangdong exports to the US.

Table 5. Results of Granger's causality test

Equation	Excluded	Chi2	df	Prob>chi ²
$drate$	$dllexport$	13.509	3	0.004
$drate$	$dFDI$	5.6177	3	0.132
$drate$	ALL	17.006	6	0.009
$dllexport$	$drate$	7.5414	3	0.057
$dllexport$	$dFDI$	9.6136	3	0.022
$dllexport$	ALL	13.75	6	0.033
$dFDI$	$drate$	2.7707	3	0.428
$dFDI$	$dllexport$	7.9484	3	0.047
$dFDI$	ALL	12.56	6	0.051

3.2.3.6. VAR model stability test

In addition to the Granger causality test, it is also necessary to assess the smoothness of the vector autoregressive system in order to do impulse response analysis. In the figure 1 the eigenvalues all lie within the unit root, indicating that the VAR system is stable. One of the roots is very close to the unit circle, which indicates that some shocks have strong persistence.

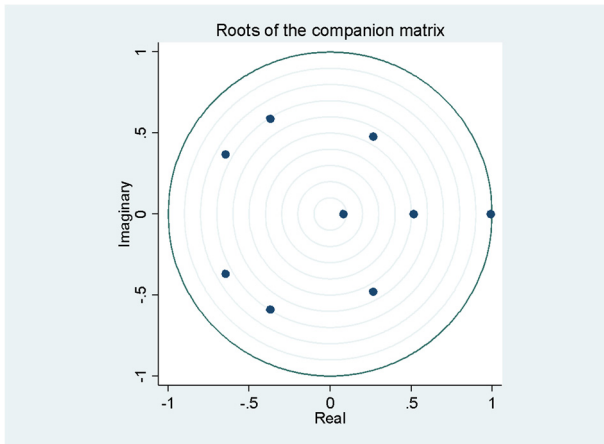


Figure 1 Graph of the stability test results of the VAR model

3.2.3.7. Impulse Response Results

In this research, we examined the impulse response analysis plots of the average tariff rate of U.S. imports of Chinese products and U.S. direct investment in Guangdong Province on the total exports of Guangdong Province to the U.S. The following two pictures shows the dynamic change path of $dlnextport$ when $drate$ and $dFDI$ undergo a one-standard deviation change to predict the future direction of the relevant variables. The horizontal axis represents the number of periods and the vertical axis represents the degree of response after a shock. Only 20 periods are presented in the centre of the figure since the model reaches a plateau at period 20.

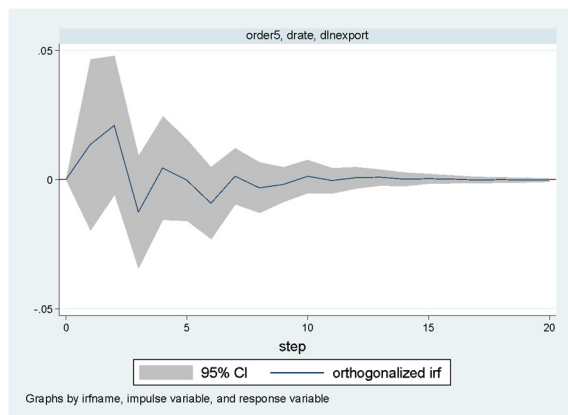


Figure 2 Impulse response analysis of $drate$ to $dlnextport$

After being subjected to a one standard deviation shock from $rate$, $lnexport$ displays a steady negative effect throughout the period in figure 2. To be specific, after a $rate$ shock to $lnexport$ at the start of the first period, the impulse response value climbs quickly to 0.02 near the peak, and then the positive effect falls off a cliff to negative. In the third period, the impulse value reaches a minimum of about -0.01. Although the shock begins to rebound after that, the rise is tiny and eventually converges to zero in the 20th period.

Such a fluctuation path can be generally summarized as a reduction in the average U.S. tariff on imported Chinese goods promotes an increase in exports from Guangdong Province. Specifically, the average U.S. tariff rate on imported Chinese goods contributes greatly to the expansion of Guangdong Province's export commerce to the United States in the first period. After the third year, the tariff increase significantly reduces the exports from Guangdong to the U.S. As time progresses, the impact of tariff changes on exports decreases. Several possible reasons can lead to this result. On the one hand, the increase in the average U.S. tariff rate implies an increase in the cost of products exported from Guangdong Province to the U.S. as well as higher relative prices for goods exported. [5] Multinational enterprises in Guangdong Province expanded their exports to the United States during the initial period of tariff increases to avoid further tariff increases and inventory accumulation. However, the long-term return to a higher price causes the export industry's revenues to diminish, resulting in a rapid reduction in export volume. On the other hand, in the face of the U.S. practice of raising tariffs, in order to protect its export trade, Chinese government will use policy subsidies to defray some of the costs and will engage in active negotiations with the the U.S. Therefore, even if tariffs are raised, in a short period of time by the influence of our government policy subsidies, the export from Guangdong province to the U.S. once the growth rate is positive. The interstate consultation may have an impact on the establishment of a cycle of gaining influence and diminishing influence. In the later period, the average tariff rate for exports declined. This may be partly due to the development of the economy and also resulted from the gradual increase of factors affecting export trade. These factors have led to a weakening of the impact of tariffs on exports. However, it is easy to see that tariffs have a negative long-term effect on exports.

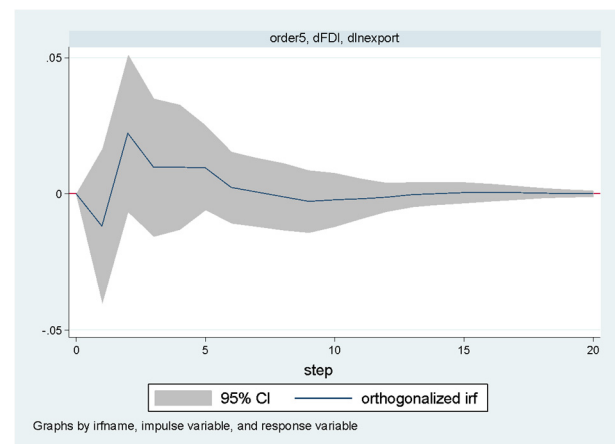


Figure 3 Impulse response analysis of $dFDI$ to $dlnextport$

In figure 3, the impacts of U.S. direct investment in Guangdong Province on China's export trade are all negative shocks and converge in the 10th period to 0.

dllexport after a shock of one standard deviation of dFDI, the positive effect decreases at the former phase, but starts to increase in the first period and reaches a peak of 0.25 in the second period. After that, the positive effect declines rapidly. As time progresses, the negative effect gradually becomes smoothly. This reflects that FDI in the U.S. has an effect in promoting the export trade of China in the first period and negatively influence the trade in the later period.

There is a possible reason of the increment of the negative effect of U.S. FDI on the export trade of Guangdong in the early stage. With the introduction of the foreign capital, multinational export-oriented enterprises intensified competition in the domestic market, which results in a number of local export-oriented enterprises in Guangdong being unable to cope and counteract, and eventually being acquired or going bankrupt. In the early stage, the inflow of foreign capital brought the "export spillover effect" to Guangdong enterprises for about one year, which drives the development of Guangdong export enterprises through the channels of technology spillover effect, industrial linkage effect and capital formation effect. However, the rapid development of high-tech in Guangdong Province, growing labour costs, and the U.S. obligatory "technology transfer" become the causes to limit multinational corporations' ability to set up facilities in China. As a result, fewer multinational corporations from the U.S. are investing in China, but Guangdong's exports to the U.S. are increasing. This not only protects the domestic exports from Guangdong to the U.S., but also reflects that the U.S. has come to Guangdong to establish facilities that are more focused on Chinese domestic market rather than simply processing and exporting to the U.S. using local labour.

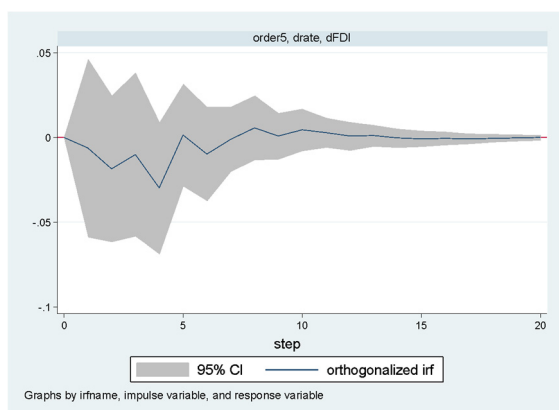


Figure 4 Impulse response analysis of drate to dFDI

4. CONCLUSIONS

To begin with, the increase in the average tariff rate on U.S. imports into China reduces the total quantity of Guangdong Province exports to the U.S., which has a negative and long-term impact. Because tariff obstacles constrain multinational firms in Guangdong Province,

they must reduce the total volume of exports to the U.S.. Meanwhile, a lack of competition inhibits the process of establishing a security system, developing a competitive strategy, upgrading industrial chain technology, and speeding up the pace of modernisation of associated industries in bilateral commerce.

Second, the reduction of U.S. foreign investment in Guangdong Province has resulted in a rise in the province's exports. Although there will be some "export spillover" effect in the early stages, high-tech sectors in Guangdong Province are reasonably well established, both technology spill over and industrial linkage of Guangdong exports to the U.S. are not significant. For U.S. manufacturers, the huge Chinese market is more attractive than pure processing export trade. For Guangdong Province, the direction of the U.S. direct investment in Guangdong Province differs from the trajectory of the exports of Guangdong to the United States. Therefore, there is a negative correlation between the two.

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