How Much Effect Does Sino-US Trade War Had on the Greater Bay Area's (GBA) Import -Export? Was it Inevitable?

Qiannan Zhang [1], Jiangqiang Huang[1], Xiaowen Huang[1], Xianqing Tu[1], Miraj Ahmed Bhuiyan [1*]

[1] *Guangdong University of Finance & Economics，21 Luntou Road, Guangzhou, PRC*
nancy2008@gdufe.edu.cn; 15724084436@163.com;1149179660@qq.com; 1819419777@qq.com; ahmed.miraz@qq.com
** Corresponding Author. Email: ahmed.miraz@qq.com*

ABSTRACT
At this open market economy, both China and US have suffered economically due to their trade war. Even though some development plans and actions were taken to mitigate the loss, Guangdong-Hong Kong-Macao Greater Bay Area (GBA) has suffered a lot; and its consequences are still prevailing. This paper aims to analyze the impact of trade war on import-export of the GBA area through theoretical and empirical analysis, so as to provide some basis for the region to respond to the situation. In this paper, we have used event basis model for the econometric analysis. It shows that Sino-US trade friction will have a certain negative impact on the import and export trade of Guangdong, Hong Kong and Macao. Some suggestions to promote the development of import and export trade in GBA region were listed in the paper as well.

Keywords: *Sino-US trade war, Guangdong-Hong Kong-Macao Greater Bay Area, port and export trade, vent research method*.

1. INTRODUCTION

It is determined that the Guangdong, Hong Kong and Macao Great Bay area (GBA) will be composed of nine cities in Guangdong Province (Guangzhou, Shenzhen, Zhaoqing, Jiangmen, Huizhou, Foshan, Zhongshan, Dongguan and Zhuhai) and two special administrative regions (Hong Kong and Macao). The Guangdong, Hong Kong and Macao Great Bay area will be positioned as a national world-class urban agglomeration and participate in global competition. The economic development of GBA is at the leading level in China, with strong economic strength. The industrial system of the bay area is powerful, with strong complementarity between economy and industry, obvious cluster advantages, and high development level of innovative elements, advanced manufacturing industry and modern service industry. With less than 1% of the land area and less than 5% of the country's total population, it has created 12% of the country's total economic output. The region is fully capable of leading China's high-quality and rapid economic development, and it serves as a model for realizing the country's new development concept and high-quality economic development. The characteristics of industrialization and regionalization of Guangdong, Hong Kong and Macao (GBA) are very obvious with its great development advantages and opportunities. The high-end service industry of GBA has great development potential, and the integration of its advanced manufacturing industry and modern producing service industry is expected to be occur in near future. There are serious industrial segmentation and isomorphism between Hong Kong, Macao and nine cities in Guangdong respectively. In the future, the region needs to further strengthen the infrastructure construction, integrate the resources of the bay area, and constantly improve the industrial division and cooperation system and the development coordination mechanism of the bay area.

2. LITERATURE REVIEW & METHODOLOGY

Since the Sino-US trade war started, there have been a lot of studies on the impact of Sino US trade war on the economy, but most of the existing studies focus on the trade war itself and the economic impact of trade war on the national level, while the research on the impact of Sino US trade war on the regional level is still relatively small due to the lack of data and scientific methods.

After measuring and analyzing Sino-US trade imbalances and their employment impacts during Sino-US trade conflict, Long Guoqiang, Wang Lingli (2018) [1] proposed that current US and Mainland china trade statistics are affected by Hong Kong transit, pricing methods, and global value chains. Xinru, Chen Xikang, etc. (2018) [2] On the basis of correcting the differences in trade statistics, based on the perspective of national income, objectively revealed the distribution of Sino-US bilateral trade benefits, and proposed to use total trade value and trade increase. The study shows a positive outcome or trade gain for both nation without any conflict. Xie, Zhang Gong (2018) [3] considered excess global supply, lack of effective demand, Sino-US trade friction generated background; the global industrial transfer and distribution chain, is an important cause of Sino-US Trade Deficit. With Xue Rui, Shen Zhou (2017) [4] concluded that Chinese labor market has experienced a short-term downward trend due to Sino-US trade war; but in the long term, this negative impact may gradually dissipate. As a major trading partner of GBA, also has some negative effect on region's labor market as well. Liu Yuanchun (2018) [5] adopting the GTAP computable general equilibrium model, conducting empirical simulation analysis on different hypothetical scenarios, have drawn four conclusions. One of these conclusions is, due to Sino-US trade war, china's domestic technological development and innovation will be slow down and GBA is not out the scenario. From the perspective of intermediate goods trade, through quantitative analysis Haichao, Zhang Lina (2018) [6] studied the impact of Sino-US trade frictions on the two countries, found the domestic welfare and import tendency of the both nations will be deteriorated. Corden (2018) [7] believes that US's trade protection policy will lower the income of the United States and other parts of the world. Thus, US citizen may import less from outside world, as well as Guangdong. This is cause not only Hongkong's service industry will suffer but also the region will experience a negative trend.

Monique Carvalho(2019)[8] sed GTAP's computable general equilibrium model to study two situations. One is to consider only US protectionist measures, and the other is to consider Chinese retaliation. The result: On the one hand, the trade war will lead to a reduction in the U.S. trade deficit and an increase in domestic production in those sectors affected by rising import tariffs. Chinese producers and consumers will bear most of the burden of the trade war; on the other hand, Due to the sharp decline in distribution efficiency, especially in the United States, and the deterioration of China's trade environment, both countries and the world will suffer losses in terms of welfare. Yu Zhen et al. (2018) [9] believes that it is necessary to continuously improve China 's position in the global value chain so that the " lubricant effect " of its own value in the reconstruction of the value chain can be brought into full play, so as to better reduce Sino-US trade frictions. Yu Miaojie (2018) [10] proposed that China should strengthen its own economic construction to effectively deal with the trade war. The author added, China should further improve domestic economic policies, improve market mechanisms, increase economic strength, and accelerate the "Belt and Road" construction, etc., in order to seize the initiative in the Sino-US trade war.

Liu Yi et al. (2020) [11] believe that the scale and conditions of Guangdong, Hong Kong and Macao Bay area have reached the level of world-class Bay area, but the quality of economic growth still needs to be improved. Shan Jingjing, Zhang Zhuoqun (2020) [12] proposed that the Guangdong-Hong Kong-Macao Greater Bay Area can be developed and mitigate the trade war impact through strengthening infrastructure construction, improved transportation mechanism, and creatingcreate a world-class international shipping logistics center. Li Yan and Wang Yue (2019) [13] believe that the long-term and serious trade friction between China and the United States will not only directly affect the development of Guangdong's foreign trade, but also indirectly impact the re-export trade of Hong Kong and the development of Macao's gambling industry. The authors suggested that Guangdong, Hong Kong and Macao should give attention to their outstanding advantages in business environment, financial agglomeration, so as to give importance to their respective comparative advantages, and promote the construction of modern industrial system. Wang Wen, Bian Yongzu & Chen Zhiheng (2019)[14] proposed that as the Sino-US economic and trade frictions continue to escalate, they have begun to have an impact on China's financial market and investor expectations. As the frontier of China's financial opening, the Guangdong-Hong Kong-Macao Greater Bay Area needs to further promote the construction and integration of the financial market, increase the degree of financial industry openness, implement various financial policies, and create a "financial special zone" in the GBA region.

This paper first gives a brief introduction to the research background, and then briefly introduces the research status and basic situation of Sino-US trade friction and Guangdong Hong Kong Macao Great Bay area. Then it makes a brief analysis of the impact of Sino -US trade friction on the import and export trade of Guangdong Hong Kong Macao Great Bay Area, and then uses the event analysis method to analyze the situation of

Guangdong Hong Kong before and after the Sino-US trade war in March 2018.

Zheng guihuan and Wang Shouyang (2004) used a new application of event analysis method to study the impact of export rebate policy on China's export trade. Wei Yunjie, Cui Xiaoyang et al. (2016) [15] using event analysis method, analyzed the impact of the "8.11 exchange rate reform and incident on China's foreign trade decline in the exchange rate of RMB against the US dollar. Zheng Gui ring, Shouyang Wang (2004) [16] using event analysis studied the China's export tax rebate policy and the impact of these aspects of the trade structure based on Chinese exports in general trade presented with reduced growth and decline in the proportion of the implementation of export tax rebate policy. As the event analysis method is less used in the field of trade, import & export; it has a certain scope of new research area. But this is also one of the shortcomings of the study. As this method is more used for the impact of event shocks on the return of financial assets; thus, the applicability of event study method to the impact of trade friction on trade needs to be further verified. In addition, the event study method has many shortcomings, so it is difficult to quantify the impact of trade frictions, and can only analyze the trend. Finally, in the analysis of principal component (PC)'s excess return rate, we cannot rule out other factors unchanged. The decline of PC's excess return rate may not be completely attributed to the impact of Sino-US trade friction.

3. SINO- US TRADE WAR AND THE TRADING SITUATION OF GUANGDONG, HONG KONG AND MACAO

2018 and May 2019, and then came to nearly an end in January 2020. In order to promote China's economic development, the Chinese central government officially established the Guangdong Hong Kong Macao Greater Bay Area (GBA) in 2019. The GBA is China's largest foreign trade area. According to the ministry of foreign affairs, in 2019, the total import and export volume reached 2163.227 billion US dollars, of which the total trade volume of Guangdong was 1183.705 billion US dollars, accounting for 25.65% of China's total foreign trade.

In 2014-2019, Guangdong's foreign trade import and export showed a trend of falling first, it went up later on and then falling again. Guangdong's total foreign trade import and export volume in 2014 was 6.61 trillion yuan, which fell to 6.30 trillion yuan in 2016, then increased to 7.16 trillion yuan in 2018, down 0.3% in 2019 and 7.14 trillion yuan in total.

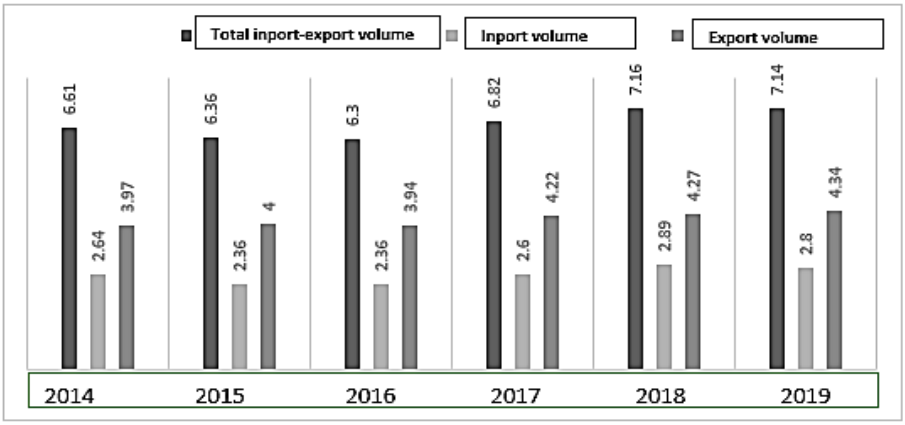


Figure 1 Guangdong Import and export trade volume (trillion yuan) from 2014 to 2019; Note: the data are from the Guangdong statistical yearbook

Hong Kong, the United States and ASEAN are the main trading partners of Guangdong Province. From 2015 to 2019, Guangdong's trade volume with Hong Kong shows a downward trend, from 1.31 trillion yuan in 2015 to 1.17 trillion yuan in 2019. The import and export volume to ASEAN is increasing, from 704.2 billion yuan in 2015 to 1.02 trillion yuan in 2019. From 2015 to 2018, Guangdong'simport and export to the United States showed an overall growth trend, from 797.16 billion yuan to 873.12 billion yuan. However, in 2019, the total foreign trade between Guangdong and the United States was 809.5 billion yuan, a decrease of 7.3% compared with the previous year. In 2019, the European Union successfully replaced the United States as the third largest foreign trade target of Guangdong Province.

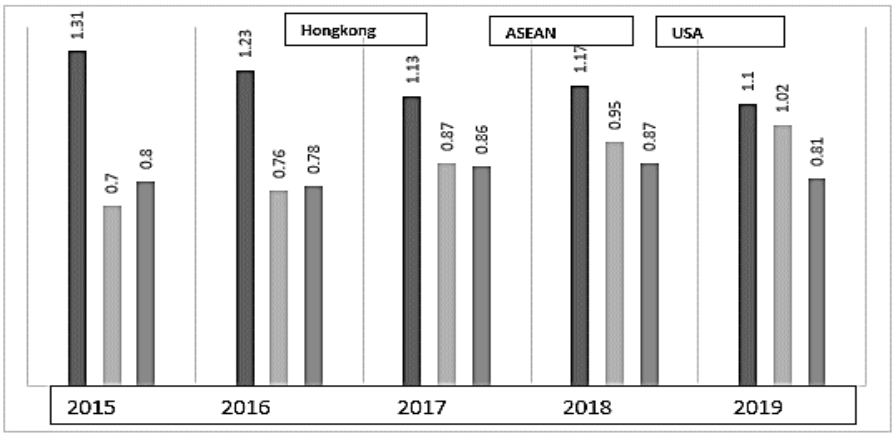


Figure 2 import and export volume of Guangdong Province to major trading partners (trillion yuan) from 2015 to 2019; Note: the data are from the Guangdong statistical yearbook

As a free trade port, Hong Kong has a long history of goods import and export trade, which has always played a very important role in the development of international trade. From 2010 to 2019, Hong Kong's import and export trade shows an overall growth trend, with the total foreign trade volume increasing from US $842.061 billion to US $1114.301 billion. Hong Kong's mode of foreign trade can be roughly divided into unique entrepot trade and traditional import trade and export trade. As a duty-free port, Hong Kong's entrepot trade is very developed. From 2010 to 2018, Hong Kong had a trade deficit. In 2018, Hong Kong's import trade of goods increased by 6.4% to US $627.52 billion. Hong Kong's total merchandise export trade (Hong Kong products export + reexport) increased by 3.5% in 2018 to US $569.24 billion, of which re export accounted for 97.7% of the total merchandise export trade; Among them, the export trade of Hong Kong's products decreased by 29.9% to US $12.9 billion, but the re-export trade increased by 4.6% to US $556.34 billion. The trade deficit in Hongkong was mainly caused by trade with Japan, mainland China, Taiwan and Korea. Trade with Chinese mainland and the United States was the main source of the trade surplus in Hongkong.

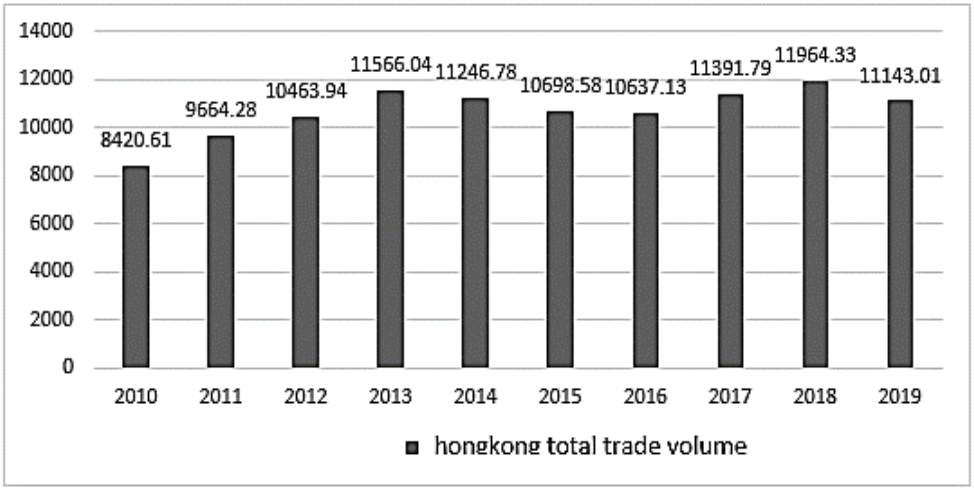


Figure 3 total import and export trade of Hong Kong (US $100 million) from 2010 to 2019; Note: data from the statistics office of Hong Kong

In 2010-2019, Macao's total foreign trade import and export volume was generally rising, rising from US $6389 million to US $12.743 billion. In terms of export, Macao mainly exports mechanical equipment, parts and gaming services, with a total export volume of US $1.584 billion in 2019. In terms of import, Macao mainly imports clothing and watches, and imports reach 11.159 billion dollars in 2019. Macao's main trading partners include Chinese mainland, EU, Hongkong and the United States. In the 2012-2018 year, the import trade trend between Chinese mainland and Macao increased first and then decreased. In 2015, the import volume reached the highest point of 4 billion 780 million US dollars, then dropped to 3 billion 160 million US dollars in 2018. In 2018, Macao's total trade volume with EU, Hongkong and the USA was 2 billion 352 million US dollars, 1 billion 511 million US dollars and 471 million US dollars respectively.

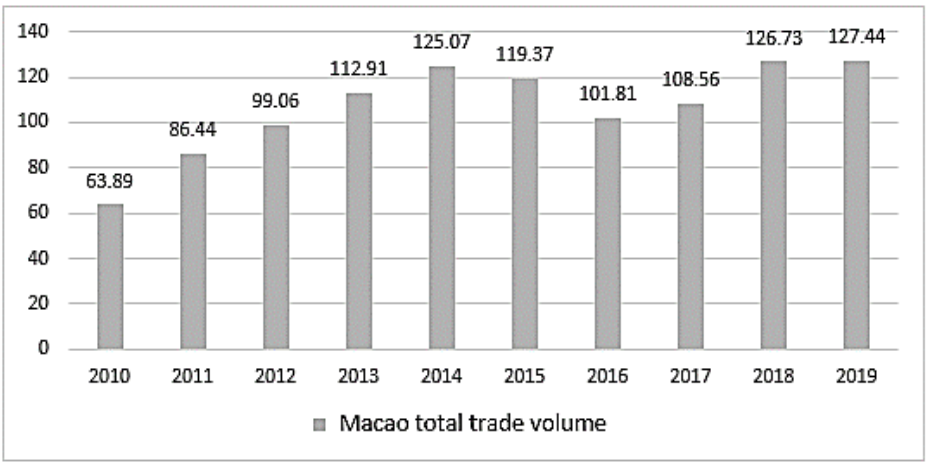


Figure 4 total import and export trade of Macao from 2010 to 2019 (US $100 million); Note: the data are from the Macao statistical yearbook

4. THE EFFECT OF SINO-US TRADE WAR ON GBA REGION

4.1. The influence of Sino US trade friction on Guangdong Trade

The United States is one of Guangdong's major trading partners. According to the data collected by Guangdong statistical yearbook, the total import and export volume to the United States in 2010-2019 accounts for about 16.77% of the total import and export trade in Guangdong Province. Due to the dependence of Guangdong export trade on the trade with the United States, Sino-US trade friction will directly affect the import and export trade of Guangdong. The pressure on Guangdong enterprises' export will be increased by the USA's imposed high tariffs. The anti-system tariff measures adopted by China to the United States will also increase the import burden of Guangdong enterprises. In 2018, Guangdong trade with the United States amounted to 87.31 billion yuan, and in 2019, Guangdong trade volume to the United States was 80.5 billion yuan, down 7.2% year on year.

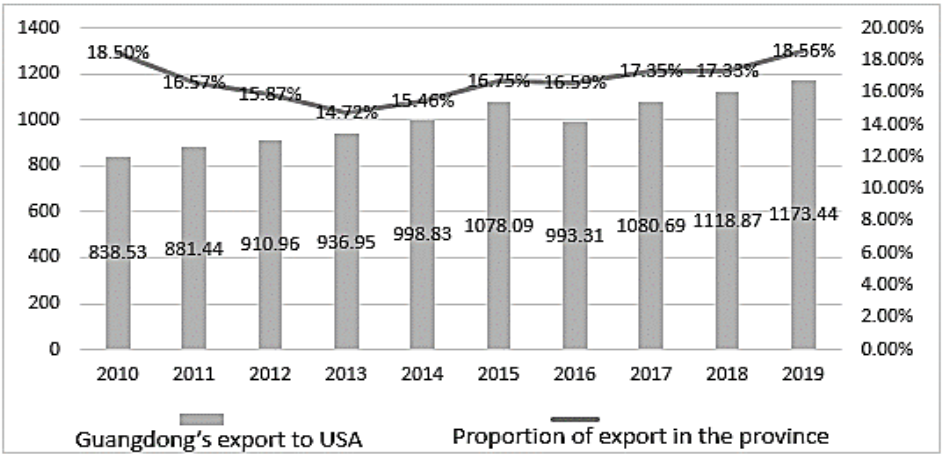


Figure 5 export trade of Guangdong Province to the United States from 2010 to 2019 (US $100 million); Note: the data are from the statistical yearbook of Guangdong Province

4.2. The effect of Sino US trade friction on Hong Kong Trade

The trade disputes between China and the United States have little influence on Hong Kong's direct trade, but the transit trade (indirect trade) of Hong Kong will be greatly affected. In the past five years, Hong Kong's direct trade has been about 6.5% of the total import and export trade of Hong Kong, which is not very significant. In 2018, Hongkong's trade with Chinese mainland was about 55.2% of the total value of exports in Hongkong, and the trade volume was 314 billion 330 million US dollars. In terms of imports, it was about 43.7% of the total value of imports in Hongkong and 274 billion 400 million dollars in trade volume. Because of Chinese mainland is Hongkong's largest trade partner and China and the US are the main trade partners of each other, the trade disputes between China and the United States will make Hongkong's indirect trade downward. In 2017, the total value of Chinese mainland goods transferred to Hongkong by the United States was 35 billion 500 million US dollars, accounting for about 12.5% of all

China's re-exports. The total value of all trans-shipment goods from the United States to Chinese mainland via Hongkong is 9 billion 360 million US dollars, accounting for 63.2% of its total merchandise value. From this, we can know that Hong Kong has a very important transfer role in the foreign trade chain between China and the United States, and the economic and trade relations between the two countries have a great influence on the development of Hong Kong's foreign trade. Therefore, the trade disputes between China and the United States will have an indirect adverse effect on Hong Kong's import and export trade.

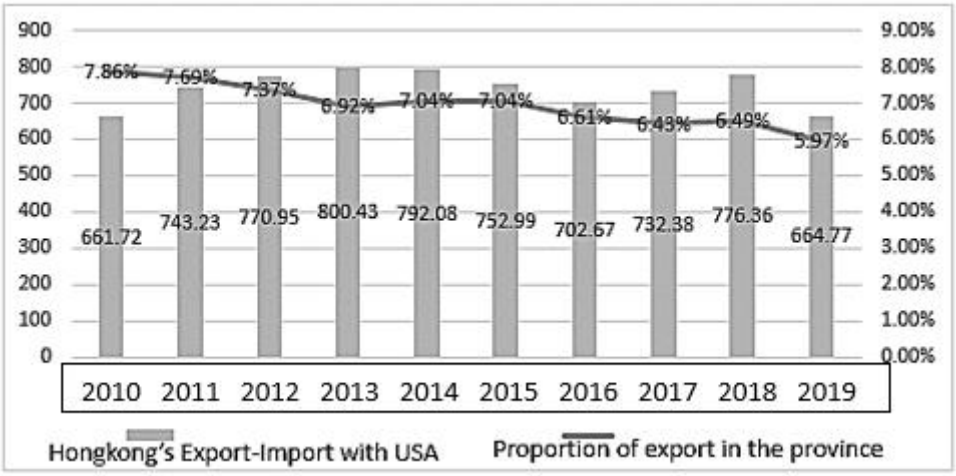


Figure 6 Hong Kong trade with the United States (US $100 million) from 2010 to 2019; Note: the data are from the Hong Kong Statistical Yearbook

5. AN EMPIRICAL STUDY ON THE IMPACT OF SINO- US TRADE FRICTION ON THE IMPORT AND EXPORT TRADE OF GREATER BAY AREA (GBA)

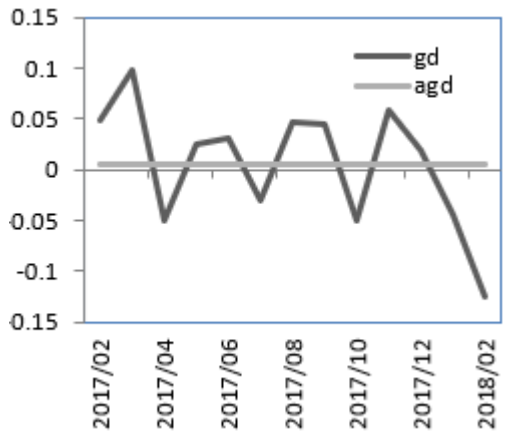
The empirical analysis of this paper is mainly through the comparative analysis of the import and export trade data of Guangdong, Hong Kong and Macao GBA before and after the Sino-US trade friction. We have used the "event analysis method" to make an empirical analysis of the impact of Sino-US trade friction on the import and export trade of the region.

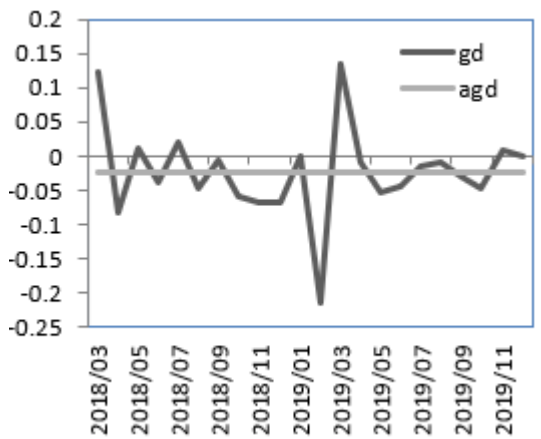
5.1. Variables and samples

As the Sino-US trade conflict occurred in March 2018, the sample period selected in this paper is from January 2017 to December 2019, which just includes the peak time of Sino-US trade conflict. This paper takes the Sino-US trade conflict in March 2018 as an impact event, and applies the method of event study to analyze the impact of Sino US trade conflict on the import and export trade of Guangdong, Hong Kong and Macao.

5.2. Data comparison

In this paper, Gd, HK and MC are used to represent the total import and export trade volume of Guangdong, Hong Kong and Macao respectively. Then, the logarithms of Gd, HK and MC are taken respectively, and then the difference is made to obtain their growth rates, which are recorded as Gd, HK and MC respectively. The trend chart of Gd, HK and MC are drawn in Figure 7.





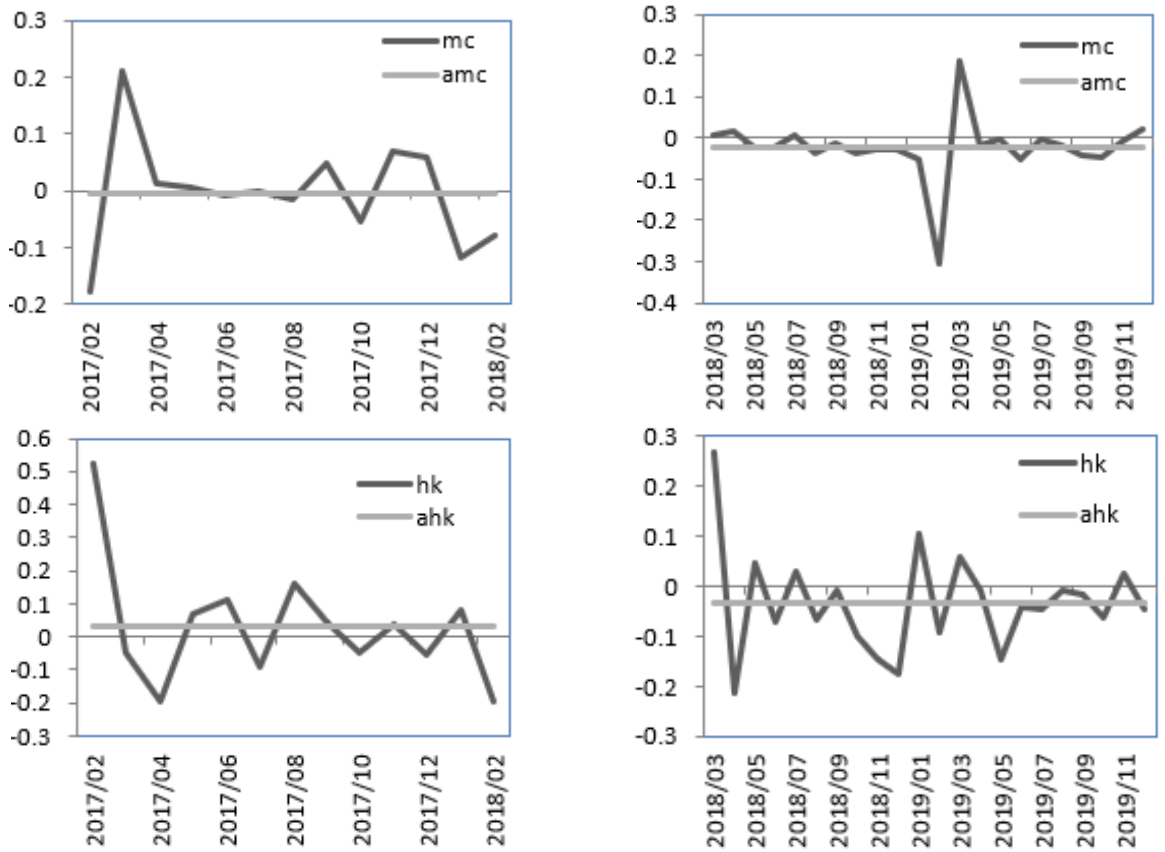


Figure 7 trend of import and export trade in Guangdong, Hong Kong and Macao around March 2018

In Figure 8, Gd, HK and MC are divided into two sections by march2018 as the boundary, and their mean curves are added in the graph, which are AGD, AHK and AMC respectively. Compared with the results before and after March 2018, the average curves of Gd, HK, MC and AGD, AHK and AMC all decreased, indicating that the Sino US trade conflict really led to the decline of export trade in Guangdong, Hong Kong and Macao.

5.3. Research method

In order to analyze the impact of trade war, this paper continues to analyze principal component analysis and later on run the event research method.

5.3.1. principal component analysis

In order to analyze the influence of trade conflict between China and the United States on GD, HK and MC more precisely, this paper first analyzes the main components of Gd, HK and MC, in order to obtain a comprehensive variable that can comprehensively reflect the trend of Gd, HK and MC. The results of principal component analysis are shown in Table 1 below:

Table 1 results of principal component analysis

Eigenvalues: (Sum = 3, Average = 1)					
Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.866049	0.739565	0.6220	1.866049	0.6220
2	1.126485	1.119018	0.3755	2.992534	0.9975
3	0.007466	---	0.0025	3.000000	1.0000
Eigenvectors (loadings)					
Variable	PC 1	PC 2	PC 3		
GD	0.730666	0.016027	-0.682547		
HK	0.444904	0.747134	0.493812		

MC	0.517869	-0.664480	0.538775		
Ordinary correlations					
	GD	HK	MC		
GD	1.000000				
HK	0.617580	1.000000			
MC	0.691350	-0.127322	1.000000		

From table1, the first principal component of Gd, HK and MC can explain 62.2% of the information of the three variables. Therefore, this paper thinks that the first principal component can well measure the basic information of the three variables, that is, it is appropriate to use the first principal component to comprehensively measure Gd, HK and MC. In this paper, the first principal component is denoted as PC, and the result is shown in Figure 8.

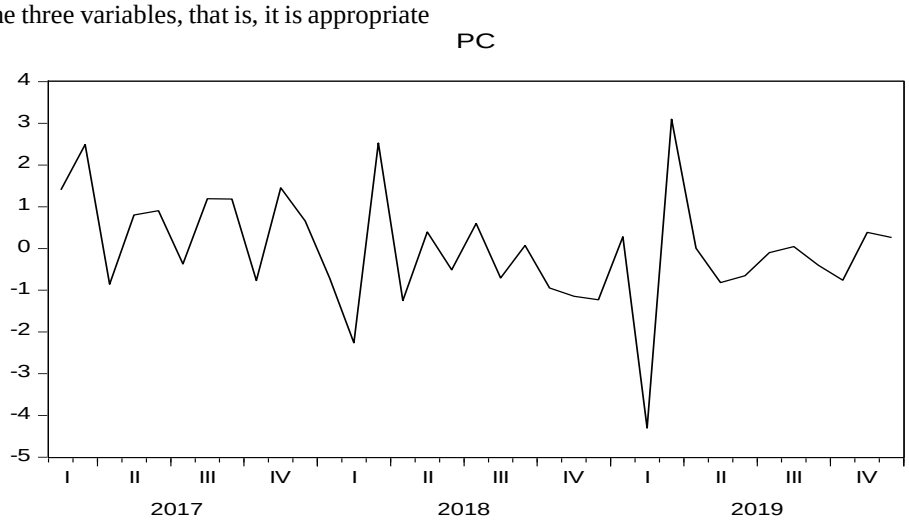


Figure 8 trend of PC, the first principal component

5.3.2. event research method

After determining the variables, the paper analyzes the impact of the friction dispute on PC in China US trade in march 2018. This paper needs to evaluate the impact of Sino US trade disputes by measuring abnormal returns, which is the difference between the actual income and the normal income of securities during the event window, namely:

$$K_{it} = R_{it} + \varepsilon_{it} \quad (1)$$

In Formula 1, K_{it} is the actual income, the normal income of R_{it} (calculated by the expected income model selected), and ε_{it} is the abnormal (or non-expected) income part. Under such decomposition, the abnormal return ε_{it} is the difference between the actual income and the normal income: $\varepsilon_{it} = K_{it}R_{it}$. In this paper, ε_{it} is defined as AR, and its cumulative abnormal (or excess) return rate in the window period is recorded as car, and the following expression is given:

$$AR_t = \frac{1}{N}\sum_1^N \varepsilon_{it} \quad (2)$$

$$CAR(t_1, t_2) = \sum_{t1}^{t2} AR_t \quad (3)$$

In the above formula t_1 and t_2 correspond to the upper and lower limits of the event window respectively.

Because there is only one variable PC, this paper uses the "historical trend model" (HMM) model to estimate the parameters. That is, the average return rate of PC in each event estimation window is taken as the normal rate of return R_{it} of the event window, and then the abnormal return ε_{it} of the event window can be obtained by reducing R_{it} by the actual rate of return K_{it} in the event window, and the variance of its fluctuation can be calculated：

$$Var[\varepsilon_{it}] = \sigma^2_{\varepsilon_{it}} \quad (4)$$

By constructing the following t-test statistics, we can detect whether the cumulative abnormal return is significant or not:

$$t_{cs} = \frac{\overline{CAR}(\tau_1,\tau_2)}{[\bar{\sigma}^2(\tau_1,\tau_2)]^{\frac{1}{2}}} \sim N(0,1) \quad (5)$$

Where the upper and lower limits of the event window respectively.

This paper takes January 2017 to February 2018 as the estimation window, and uses the "historical trend model" (HMM) model to predict, taking the period of 1 month and 3 months before and after March 2018 as the window period, to check whether car is significant. The results are as follows:

Table 2 inspection results

Time	CAR [-1,1]	CAR [-3,3]
March-2018	-0.424%*	-0.650%**

*** p-value < 0.01, ** p-value <0.05, * p-value <0.1

Table 2 shows that car is significant, indicating that the impact time has a significant effect on the fluctuation of PC. Furthermore, we can get the trend chart of cumulative excess return of PC as shown in Figure 9.

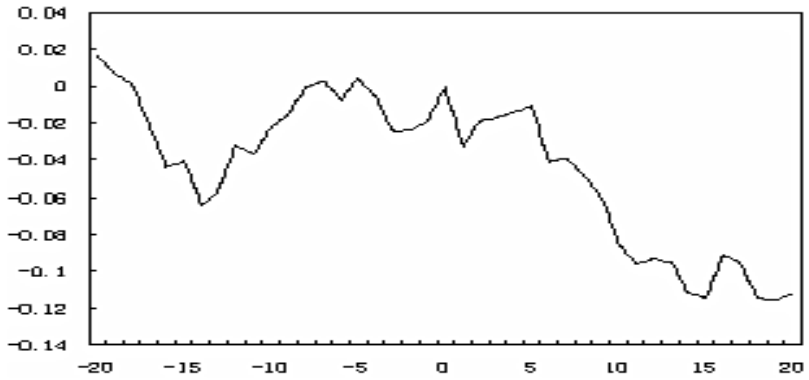


Figure 9 trend of cumulative excess return of PC

Figure 9 shows that after the Sino US trade conflict occurred in March 2018 (corresponding to the 0 moment in Figure 9), the excess return rate of PC decreased, indicating that the import and export trade level of Guangdong, Hong Kong and Macao region showed a downward trend.

According to the empirical study of this paper, we know that after the Sino US trade conflict, the trade level of Guangdong, Hong Kong and Macao (GBA) has declined significantly. Although this decline is also related to other economic variables such as economic growth and exchange rate changes at home and abroad in the same period, from the perspective of time matching, Sino US trade conflict has an important impact.

6. SUGGESTIONS

This paper puts forward some suggestions for reference as well. In order to enhance the international competitiveness and influence of the bay area, authority should constantly improve the development coordination mechanism of the bay area, further promote regional coordinated development, integrate coastline resources, and coordinate the regional industrial division and cooperation system. They should deepen the development of modern service industry and advanced manufacturing industry in Guangdong, Hong Kong and Macao, work together to create a pilot zone for industrial transformation and upgrading and further enhance the level of market integration. Developing diversified markets and reduce trade dependence on the United States could be another alternative. The region should increase the opening up to the third world countries and achieve the full-scale growth of the market. In addition, GBA should actively carry out scientific research and innovation, improve science and technology, vigorously support and encourage the development of patent and other independent intellectual property rights, so as to improve the international competitiveness of high-tech products. Furthermore, GBA should strengthen the construction of brand awareness, improve brand awareness, and build their own high-end brands, so as to enhance their own advantages, enhance the competitiveness of enterprises, and enhance international competitiveness. Merging the high-quality development of Guangdong's advanced manufacturing and high-tech industries, Hong Kong's modern service industries such as financial services and trade services, and Macao's service industries such as gambling and tourism is the key. Build Guangdong, Hong Kong and Macao into a world-class mega bay area, improve its brand awareness and enhance its international competitiveness is crucial. At last, but not the least we can say that, Sino-US trade war had its pitfall on GBA’s trade and economy as it was inevitable but possible to mitigate the consequences by taking proper actions.

7. CONCLUSION

After the previous analysis, we can draw the conclusion that Sino US trade friction has an impact on the import and export trade of Guangdong, Hong Kong and Macao. At first, Sino-US trade friction will affect the export cost of labor-intensive products in Guangdong, increase the burden of Guangdong enterprises, affect the profit margin of enterprises, reduce the export competitiveness of labor-intensive products in Guangdong, and the export trade of labor-intensive products will also be negatively impacted. Second, it will affect the development and foreign trade of Guangdong's high-tech products. The "301" investigation of the United States mainly focuses on high-tech products, which will greatly increase the export cost of Guangdong's high-tech products export enterprises, and multiply the pressure of

technological innovation and development of enterprises and export trade of products. Third, the trade of mechanical and electrical products in Guangdong, which accounts for more than 60% of Guangdong's trade with the United States, will have the biggest impact of Sino-US trade frictions. Mechanical and electrical products are one of the major industries in which the United States imposes tariffs on China, thus increasing the cost of Guangdong's trade of mechanical and electrical products. Four, the re-export trade in Hongkong will be affected. Because China and the United States are the main trading partners of each other, and the US and Chinese mainland are Hongkong's main import and export countries, the re-export trade of Hongkong will also be affected by Sino-US trade friction.

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