

AN EMPIRICAL STUDY OF THE INFLUENCE OF FOREIGN DIRECT
INVESTMENT ON U.S.-CHINA TRADE DEFICIT

A Thesis
submitted to the Faculty of the
Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
degree of
Master of Public Policy
in Public Policy

By

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Washington, DC
April 10, 2017

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ABSTRACT

With a recent trend of possible trade war between the United States and China, international trade has become a hot topic and played a more important role in political world as well as for academic research. This study uses a fixed effect model with panel data from 2008 to 2016 and analyzes what affects the trade imbalance between the United States and China. The study especially focuses on the influence of Foreign Direct Investment (FDI) on the trade deficit between the two countries. A state-level analysis is added in the construction of empirical model to increase the number of total observation and determine the effects of key variables. The state-fixed effects will control for other state-invariant factors. The study concludes that FDI has a significant influence on the reduction of trade deficits. It could achieve this function through the increase of total imports and therefore reduce trade deficits. In addition, GDP also has a non-negligible influence on trade imbalance status that we should take into consideration for potential policy recommendations. The study gives policy recommendations for both sides: China should continue to seek long-term and efficient communication with the United States, while the U.S. ought to treat China equally in the market and also maintain a stable financial and economic environment.

The research and writing of this thesis is
dedicated to everyone who helped along the way.

Special thanks to Prof. Wise for his guidance and encouragement in the busiest days; and
Kersten for your great help for the model construction and data manipulation;

Many thanks,
Mengsu

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INTRODUCTION

After China's economic reform and opening up, especially after its accession to the WTO, China's economy has been growing at a high speed, its export volume has continued to expand, and its trade status has continued to rise. Bilateral trade between China and the United States has been growing rapidly, with the U.S.-China goods trade increasing from \$2 billion in 1979 to \$579 billion in 2016.¹ China is now ranked as the second largest merchandise trade partner of the U.S., and according to the United States Census Bureau, China is the U.S.'s third-largest export market as well as its No.1 source of imports.

With the rapid expansion of China's foreign trade, the trade disputes between the European and American countries and China have become increasingly fierce. China has also become one of the countries with the most anti-dumping investigations for many years.² The reasons for the frequent occurrence of U.S-China economic and trade disputes are complex and multilateral. One reason, however, is closely related to the fact that China has become a major source of trade deficits, as U.S. and China trade deficits widen year by year (See Figure 1).³

¹ CRS Report RL33534, *China's Economic Rise: History, Trends, Challenges, and Implications for the United States*, by Wayne M. Morrison.

² CHEN Jiyong, *an empirical study on "the US-China trade deficit produced by FDI"*, Higher Education Press and Springer-Verlag 2007.

³ Data Source: United States Census Bureau.
<https://usatrade.census.gov/data/Perspective60/Dim/dimension.aspx>

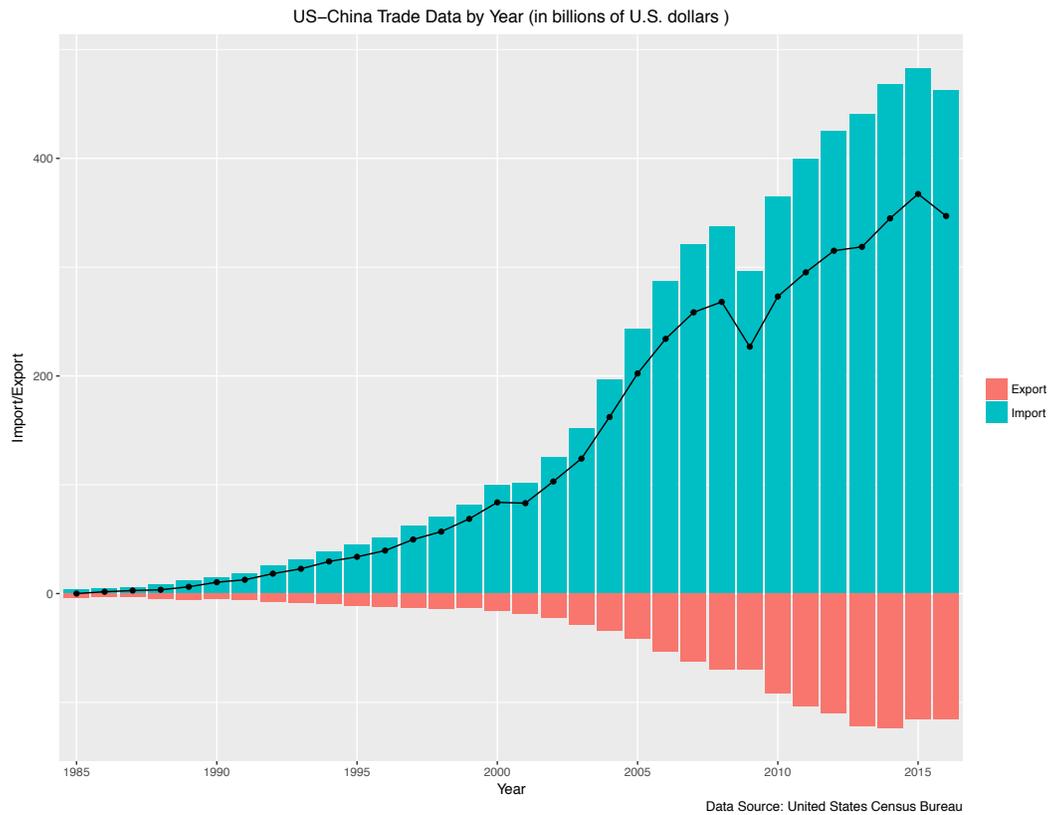


Figure 1: US-China Trade Data by Year (1985 – 2016)

Now, the U.S. government has promised to take a tougher stance, in order to reduce America's bilateral trade deficit, including implementation of United States trade laws and agreements, and a series investigation towards China based on Section 301 of Act, which gives the right for government to enforce trade agreements, resolve trade disputes, and open foreign markets to U.S. goods and services.

To help policy makers address the dispute between U.S. and China, in this paper I examine the factors that influence the U.S.-China trade deficit. Key concerns included is Foreign Direct Investment (FDI), along with some control variables such as Gross

Domestic Product (GDP), unemployment rate and taxes. Since the number of years of available data is limited, in order to increase the number of observations, I collect data from the U.S. side by state to run multiple regressions. My hypothesis is that higher foreign direct investment from China to the U.S. leads to a higher trade deficit, and the concerns for individual interests of the two countries also contribute to the overall level of trade deficit.

The paper proceeds as follow. In the next section, I give basic background information and review related literature in the field of those topics. In Section 3, I provide a theoretical model that serves as a general framework to assess the relationships between foreign direct investments and the trade deficit between the two countries. Section 4 explains the detailed empirical model I use to examine the hypotheses, showing its specific variables, methodology, and limitations. Section 5 describes my data and descriptive statistics for this study. Section 6 provides the results from my empirical analysis. And Section 7 draws conclusions and suggests policy implications and directions for future research.

BACKGROUND AND LITERATURE REVIEW

With the continuing progress of globalization all around the world, the topic of international trade is no longer a mystery to ordinary people. It is everywhere in our daily lives and forms an indispensable role in our lives. People may be very familiar with products that are “Made in China” such as the assembled iPhones and also oranges from California. However, they are not familiar with the details behind the bilateral trade for the two countries and the causes of huge deficits. Hence, I will first provide an overview of the current U.S.-China trade status, followed by the historical stages in the bilateral trade history, then examine the possible factors that influence the volume of trade balance, and finally discuss the relevant literature conducted by researchers involving the original cause of the U.S.-China trade deficit and empirical analyses of it.

Background on the U.S. – China Trade: History and Current Status

Since the United States and China established their diplomatic relations in 1979, the two countries have been working together in both governmental and the business worlds, and bilateral trade has grown, not only promoting the economic development of the two countries, but also promoting the diplomatic relations between the two countries. The most important part of the U.S.-China relationship is economic and trade relations. Since the end of the cold war, the common strategic foundation of China and the United States against the Soviet Union has disappeared. Now the most important bridge between China and the United States is their economic and trade relationship. The economic and trade relationship between China and the United States is not a simple and purely economic,

and it has important security strategy and diplomatic strategic significance. The exchanges between China and the United States have not only enabled the two sides to obtain their respective economic interests, but also to gain strategic interests.

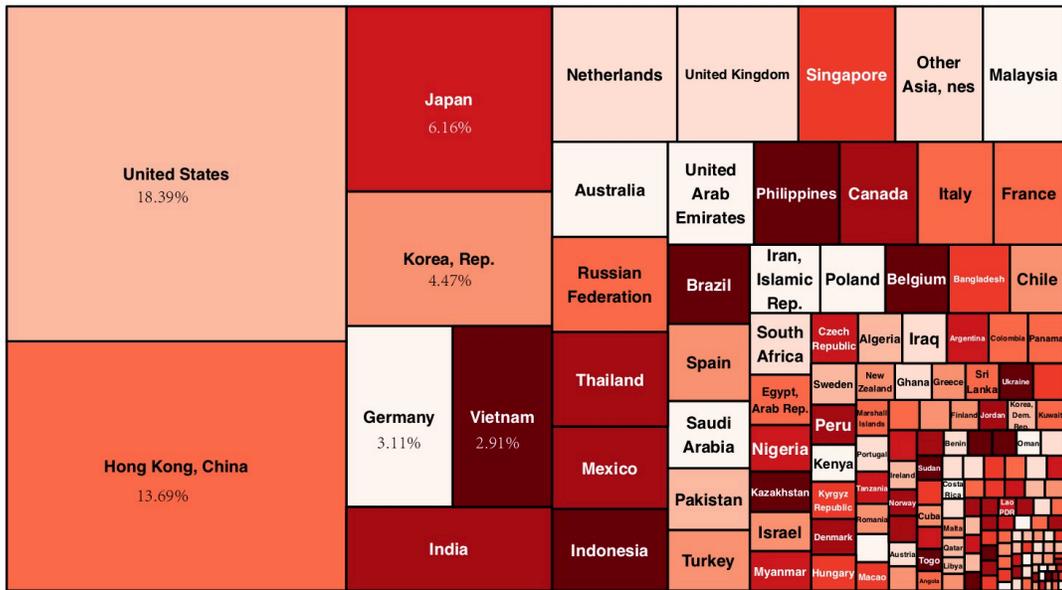
China is now the largest commodity trading partner of the United States, with total merchandise trade of \$578.6 billion in 2016 (see Figure 2), with total merchandise exports of \$115.8 billion. Total imports of goods amounted to \$462.8 billion. The U.S. trade deficit with China in 2016 was \$347 billion. In 2016, China's total trade in services (exports and imports) totaled about \$69.6 billion. Service exports amounted to \$53.5 billion; Total service imports were \$16.1 billion. The U.S. service trade surplus with China was \$37.4 billion in 2016. The U.S. services trade surplus with China was \$37.4 billion in 2016.⁴

In 2015, according to the U.S. Department of Commerce, the exports of goods and services from United States to China have supported about 911,000 jobs, about 60,000 of which are supported by exports of merchandise, and 309,000 are supported by exports of services.

U.S. President Donald Trump signed a memorandum of understanding with the U.S. Trade Representative Office in the early hours of March 23, 2018 ordering authorities to impose tariffs on Chinese imports of about \$60 billion and limiting Chinese companies' investment in the U.S. It was announced that temporary tariffs would be imposed on the import of solar cells and solar panel and large household washers on January 23, and that the import of steel and aluminum would be taxed at 25 percent and 10 percent, respectively, on March 8.

⁴ U.S.-China Trade Facts, The People's Republic of China, <https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china#>

In retaliation, on March 23, 2018 China's Ministry of Commerce released a list of the 232 measures against imports of steel and aluminum products from the United States, seeking public comments to impose tariffs on about \$3 billion of imports from the United States to balance the damage caused by the U.S. tariffs on imports. This dispute is ongoing.



Data Source: WITS-UNSD COMTRADE

Figure 2: China's Trade Partners (1985 – 2016)

If we take a closer look at the U.S.-China trade history, there are roughly three stages that form not only the diplomatic relationship but also witnessed the trade situation:

➤ **The First Stage, from 1970s to early 1990s**

As the two countries established diplomatic relations, the relationship between the two countries strengthened. In July 1979, in order to strengthening cooperation and to develop economic and trade relations between China and the United States, the two countries signed the U.S.-China trade relations agreement, under which both gave each other most-favored-nation treatment.

The U.S.-China cooperation has begun to develop rapidly. At the same time, the implementation of China's reforms and opening up has also provided a boost to the development of U.S.-China economic relations and trade. After the establishment of diplomatic relations between China and the United States, the total trade volume reached \$2.45 billion in 1979, and the United States became the third largest trading partner of China. During period of China's "cultural revolution", China had an average annual growth rate of 15.8 percent, but the volume of trade was not large until 1988, when it exceeded \$10 billion.

The tension of the U.S.-China political relations at this period directly affected the normal development of economic and trade relations between the two countries in the early 1980s.

➤ **The Second Stage, from 1990s to 2001:**

This is a period of rapid development of the U.S.-China economic relations and trade from the end of the cold war to China's accession to the WTO, which happened in 2001.

After Chinese leader Deng Xiaoping's "Southern Tour" speech in 1992, China's reform and opening up process was further expanded and deepened. After the Communist Party of China established the policy of maintaining a socialist market economy, the Chinese economy further accelerated, and the pace of China's economic integration with the world economy began to boost.

Relatively stable political relations have created favorable conditions for the development of economic and trade relations between the two countries. Under the stimulus of these favorable policies and conditions, U.S.-China trade continues to show a relatively fast growth momentum. In 1992, bilateral trade was \$14.8 billion, and it then reached \$80.5 billion in 2001, which was 5.5 times that of 1992.

Over the decade, bilateral trade volume has reached \$484.6 billion, with an annual growth rate of 18.7%, which was 2.7 percentage points higher than the previous decade. However, the outbreak of the Asian financial crisis in the late 1990s brought great impact to the world economy. The crisis also brought negative impacts on U.S.-China trade. In 1997, the export growth rate from China to the U.S. was 22.6%, and in 1999 it was down to 10.4%.

➤ **The Third Stage, post 2000s:**

China's debut in the new international trade platform was on December 2001, when China successfully joined the World Trade organization. It also means that China will be

integrating itself to multinational cooperation, and it will continue to reform and open up its market, which will provide a broader platform and greater opportunities for U.S.-China bilateral trade.

China's economy began its boom in 2003 and the U.S.-China relations have remained largely stable during this period. The Bush administration generally supported the development of economic and trade relations with China for the sake of mutual interests. In 2002, bilateral trade amounted to \$96.28 billion, which was an increase of 20.7% over the previous year. In 2005, the total exports from China to the U.S. reached remarkable \$200 billion, up 24.8% from the previous year. U.S.-China economic and trade relations enjoyed a stable and rapid development during this period, which could be seen as a milestone for both countries.

However, more recently, the Trump Administration pursued a series of investigations and policies with the aim of punishing China's merchandise exports to the U.S. As a response, China also announced several tariffs on U.S. beans, aircrafts, and auto cars. There seem to be signs of trade war, and the disruption between the world's two largest economies have made the international financial market even more volatile.

Retrospection of the Literature about the Factors that Influenced the U.S.-China Trade Imbalance

The real trade deficit with China is among one of the most discussed topics in the United States, no matter in a government or an academic environment.

At present, there exists a lot of deep research about the factors that influence bilateral foreign trade in the academic world, and also the particular research focusing on the

United States and China. I will not try to review all the literature under this broad topic, rather, I tend to look at the studies that are more recent and have similarities with my own study. I categorize the literature into three groups: the first one is study on the general relationship of bilateral trade and what contributes to or influences import/export values. The second group focuses on studies of the influence of foreign direct investment on trade activities. The third group consists of studies that have similar approaches in finding the causes of trade activities at the state level.

One of the reasons that have been discussed most is the exchange rate between the U.S. and China. During recent years, there has been a heated discussion about the currency exchange rate between the two countries. Jinlin Zhang (2001) concluded that during the last ten decades, the United States has kept condemning China for manipulating the Chinese Yuan. China has obtained a huge advantage with its exports all around the world, especially the U.S. Zhang argued that the United States' attitudes towards currency manipulation are totally different at different stages. On the one hand, the Treasury has continued to believe that China is intentionally lowering its currency rate, which will lower U.S. exports to China. However, on the other hand, during the 1997 Asian financial crisis, China's unchanged currency exchange has become a shining point as mentioned by the U.S. for maintaining a stable global financial environment. Zhang thereby concluded that the exchange rate could be a contributing factor to the overall level of trade, however, the alleged manipulation of exchange rate was not logical.

In regards with whether the exchange rate has played an essential role, high-level agencies in both countries have expressed their opinions. Kai Ma, chairman of NDRC (National Development and Reform Committee) expressed his opinion that the trade

deficit between the U.S. and China can't solely be blamed on the currency exchange rate. However, other factors in the industrial and business environment and fiscal policies could have played a much more important role. Quite interestingly, I have noted that Greenspan (2003), who was the chairman of Federal Reserve at that time also rejected the mainstream view from U.S. manufacturers' that the unemployment rate and the trade deficit gap were caused by the depreciation of Chinese Yuan. From Greenspan's perspective, appreciation of the Chinese Yuan will not help solve the current situation.

Followed by this belief, there are several researchers who conducted empirical model to examine the quantitative effect of exchange rate on trade deficit. Gubing Shen (2004 and 2005), respectively, got the conclusion that no matter whether it is in the long run or short run, there is not enough statistical evidence to prove that the U.S.-China trade deficit was correlated with the exchange rate of the Chinese Yuan with U.S. dollars. He used 8 years data from 1994 to 2002, with an Engle Granger two-step model. Therefore, the influence of the exchange rate on the trade balance is questionable. Relying only on the Yuan exchange rate changes can't solve the U.S. trade deficit with China.

Wang Shen (2007) used data from 1999 to 2004 of the Chinese Yuan currency exchange rate to U.S. dollars and the total GDP of China and the United States to conduct empirical model regressions, and he reached a similar conclusion with Shen that the currency exchange rate was not statistically correlated with the trade deficit. Therefore, the role of appreciation of Chinese Yuan in dealing with the trade deficit would not be significant.

In addition, there are also studies that examine other original causes of the trade imbalance between the U.S. and China. Major findings include macroeconomic environment and public policy, especially fiscal policies.

Lachica (1996) believed that the root cause of the trade gap between the U.S. and China is the lack of diversity in goods imported. She used cross-comparison analysis and concluded that China relied heavily on high-technology from the U.S. while exported relatively cheap but necessary goods to the U.S. As a result, the gap between the two countries increased and the trade deficit was further strengthened.

Unlike the unification of experts from the two countries on the exchange rate, scholars from China and the United States hold different attitudes at this time. Feenstra (1998) believed that there wasn't a single reason that caused the everlasting trade deficit between the U.S. and China. Rather, the actual reasons could be complicated and comprehensive, and we can't simply split them as individual causes. There is a lot to do with socio-economic factors. From one hand, the two countries are at different phases of development: China is a developing country and the U.S. is a well-developed country, the GDP growth rate is totally different. In addition, the birth rate, which will influence the population growth rate, will also affect the trade deficit. Because the two countries have different macro-economic environment, the trade imbalance between the two countries will develop at opposing directions, and thereby the deficit is becoming more and more obvious.

However, Lardy (2000) emphasized the importance China's opening up and friendlier foreign policy. On the one hand, the trade deficit arises from the increasing demand from developed countries, and on the other hand, it arises from the shortage in supply. As a

result, mainland China is getting more orders from nearby regions including South Korea and the Philippines.

From Chinese scholars' perspective, Liang (2004) believed that trade deficit was rooted in the depressed financial market in the United States, especially the low long-term interest rates. Zhang (2005) argued that processing trade could be one of the core reason behind the huge trade gap.

The second category of studies includes studies that specifically look at the influence of FDI on trade activities. There are actually two sub-groups in this category: one is theoretical studies about general Chinese foreign direct investment in the United States; and studies on FDI's influence on trade imbalances.

Through the analysis of China's direct investment status, motivation and trend of China's investment in the United States, Ge and Yan (2012) found out that China has accelerated its investment in the United States in the forms of mergers and acquisitions. The rationales for China's foreign direct investment are analyzed in two directions: the micro factors of Chinese enterprises and the macro factors of China's economy. In addition, they give a detailed summary of the investment environment in the United States. The second part analyzes China's direct investment motivation in the United States, and they pointed out the mode of China's direct investment, investment subjects, industry distribution, and analysis of risks and benefits, concluding that the United States is becoming an important foreign investment destination in China.

More specifically, Hong, Yan, and Ren (2009) put forward that based on the empirical analysis of the institutional perspective, and micro data of Chinese enterprises' outward FDI from 2006 to 2007, they constructed a multi-factor regression model on the decision-

making of Chinese enterprises' foreign direct investment. The empirical results show that government policy fostering, overseas relationship resources and self-financing ability have important influence on the motivation and capability of FDI.

Li Wang (2012) made an empirical analysis of the macroeconomic factors of China's direct investment in the U.S. and conducted a simple regression analysis of the data of direct investment flows from China to the United States from 2003 to 2010. The conclusion is that the factors that affect China's direct investment in the United States include the U.S. market, China's export level to the United States, the exchange rate of the U.S. dollar against the RMB, and the domestic wage level of the United States. China's exports to the United States are tied to China's non-financial direct investment, and the exchange rate and the domestic wage are negatively correlated; export is the main factor that drives China's FDI in the U.S. non-financial category.

In the category of FDI's influence on trade, there are theoretical and empirical studies all around the world. Lipse and Weiss (1981) studied the investment and export behavior of the United States in the 1970s, and panel data of 14 industries showed that direct investment in these countries promoted trade between the two countries, while the complementary effect was more obvious when the trading partners were developing countries. It was also found by Belderbos and Sleuwaegen (2004) that when there was a trade relationship between the investment countries, investment and trade represented a substitution relationship.

However, the studies that specifically focus on the U.S-China trade deficit are quite limited. Kang (2006) focused on the processing trade's effects on FDI. In her view, the imbalance between savings and investment in the domestic macroeconomic structure of

China and the United States is the fundamental reason. Processing trade is a major feature of bilateral trade between China and the United States, while American companies in China have increased internal trade through the export of finished products in China, and eventually expanded China's trade surplus with the United States.

In regards to empirical analysis, Xu and Qin (2006) used the co-integration analysis method and conducted Granger causality test with the data from 1984 and 2002. They concluded that the direct investment of the United States in China and the total value of U.S.-China trade are significantly positive, with the largest impact on exports, followed by the trade volume and then imports.

The third category of studies are those that look at state-level trade studies. Alvarado and Cabral (2017) analyzed factors that contribute to exports across Mexican states and regions from 2007 to 2015. Although the paper is about Mexican trade exports, it does provide a solid model framework for my study. Paying special attention to the role of FDI, the analysis considers internal and external determinants of manufacturing exports under static and dynamic panel data methods. It concludes that the ratio of manufacturing to total GDP is the most consistent determinant of exports performance regardless of the method or specification employed in the estimations. In addition, static panel data estimations under GMM techniques suggest different sensitivity to FDI across regions, with the Border region observing the strongest effect of FDI on manufacturing exports.

Liu (2015) argued that state-level analysis of foreign direct investment generated some statistically significant results. He used data from 2004 and 2010 in 50 U.S. states of total trade and total foreign direct investment and concluded that the FDI is negatively related to the total trade volume.

However, there aren't enough studies for China's FDI in the U.S., or studies that specifically focus on the U.S.-China trade deficit. In my paper, I will try to use more recent data to run regressions and examine the effect of foreign direct investment on trade deficits and also analyze the difference caused by other factors. I will analyze the difference behind the discrepancy of deficit and make policy recommendations.

Next, I turn to my theoretical framework section.

THEORETICAL FRAMEWORK

To examine the factors that contribute to the trade balance (imports minus exports), I develop the theoretical model described below. This model will create a framework for the discussion that follows by illustrating the factors that should, in theory, influence the general export and import activities. I tried to construct the empirical model that follows with this framework, and the empirical model tests the implications of the theoretical model.

$$\begin{aligned} \text{U.S. Trade deficit with China (by U.S. State)} = f(\text{FDI from China to U.S., State} \\ \text{Characteristics (demographics, economic, policy variables), Control Variables, } e) \end{aligned} \quad (1)$$

The way that foreign direct investment helps to alleviate the trade imbalance is that, in the case of the surplus countries, or in the case of the loss of the goods and services of the deficit countries, it takes a direct investment in the deficit country, to produce and sell it directly to the deficit country, and it can effectively reduce the impact of the export or the reverse of the trade, and it will help to reduce the trade imbalance and reduce trade friction, and on the other hand, it will facilitate the internationalization of the product and the process of taking over foreign markets.

In addition, in accordance with macroeconomic principles, U.S. imports from China are a function of its GDP and exchange rate while U.S. exports to China are a function of China's GDP and exchange rate. Therefore, adding state characteristics variables into the model will explain the dependent variable and also control for fixed effects. There might

also be some endogeneity, but fixed effects and right hand side control variables should alleviate the problem.

I next discuss the empirical model.

EMPIRICAL MODEL

Choosing the 9 years from 2008 to 2016 as the study period and 50 states to create panel data, I run a fixed effect model to analyze the U.S.-China trade deficit (the U.S. imports from China minus exports to China). An econometric model for the regression is below:

$$\begin{aligned} X_t = & \alpha_0 + \alpha_1 FDI + \alpha_2 GDP + \alpha_3 GDPpercapita \\ & + \alpha_4 UnemploymentRate + \alpha_5 Incomepercapita + \alpha_6 Subsidy \\ & + \alpha_7 TaxonIncome + \mu_t \end{aligned} \tag{2}$$

Where:

“ X_t ” are a group of dependent variables including Deficit, Exports, and Imports;

“FDI” is the total foreign direct investment from China to the United States;

“GDP” is the total gross domestic product of each of the U.S. states;

“GDPpercapita” is the total gross domestic product divided by the population of each of the U.S. states;

“UnemploymentRate” is the unemployed population in the labor force, as defined by the Bureau of Labor Statistics;

“Incomepercapita” is the total personal income by state divided by the population;

“Subsidy” is the total amount subsidized to promote international trade to each U.S. states given by the U.S. Department of Commerce;

“TaxonIncome” is the tax rendered to each U.S. states for total household income;
and

“ μ ” is the random error.

The variables “ X_t ” are three different dependent variables: Deficit is the total U.S. Imports minus Exports from China. I expect that Deficit and Imports would have the same effect while Exports would have an opposite effect in the regression.

The variable “FDI” is determined by overall level of China’s direct investment in the U.S. by state, and when the investment increases, there might be a substitution effect so that Exports would decrease. As a result, I expect that as FDI increases, Exports will decrease, Imports will increase, and the Deficit will also decrease. Therefore, the sign of this coefficient will be negative for Export trade deficit and positive for Import trade deficit.

In accordance with macroeconomic principles, U.S. imports from China is the function of its GDP while U.S. exports to China is the function of China’s GDP. Therefore, I would think that an increase in GDP will correspond to an increase in imports and therefore make the Deficit level decrease. I assume that GDP and GDP per capita will have similar effects, so that the sign of them will be negative for Export trade deficit and positive for Import trade deficit.

According to traditional international trade theory, as a country's domestic unemployment rate increases, the number of unemployed will increase, people's income will be greatly reduced, thereby weakening the purchasing power of residents, thereby reducing the demand for foreign goods. Therefore, I expect that the unemployment rate will decrease total imports and increase the trade deficit. Therefore, the sign of this coefficient will be negative for Import trade deficit.

The subsidy will give an incentive for the recipient to increase the level of imports. Therefore, I would expect that an increase in subsidy will also increase imports. Therefore, the sign of this coefficient will be positive for Import trade deficit.

Next, I will describe the data used in my study.

DATA AND DESCRIPTIVE STATISTICS

The data for this analysis come from the United States and other international financial institutions. The data are for nine years from 2008 to 2016 at the U.S. state level. Trade in goods is defined as change in ownership of material resources between one economy and another. The indicator comprises sales of goods as well as barter transactions or goods exchanged as part of gifts or grants between residents and non-residents. The data come from two major sources. (See Table 1 for descriptive statistics)

The dependent variable **Trade Deficit** comes from the U.S. Department of Commerce, Bureau of Economic Analysis. Here I had annual data by 50 states which will create panel data. The data here are seasonally adjusted by the Department of Commerce since 2004, which will alleviate the effect of periodical difference. The actual trade deficit is computed by total exports subtracting total imports.

Second, other explanatory variables come from the U.S. Census Bureau and the World Bank. Since it's an analysis of bilateral relationship, getting the same data from one independent organization is optimal. Therefore, I chose to extract data from the *World Bank*, including the price index, unemployment rate, and Gross Domestic Product. For price index, the data are set on the premise that year 2010 is 100. For GDP, I got two bundles of data. The first one is measured at current U.S. dollar value. The other one is measured constant at the U.S. dollar value in 2010.

Table 1, below, presents descriptive statistics for my study.

Table 1: Descriptive Data

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Export~dServices*</i>	9*50	88,640.44	56,669.79	17,193	170,155
<i>Import~dServices*</i>	9*50	304,195.10	144,477.10	84,633	499,122
<i>Balance~dServices*</i>	9*50	-215,554.60	90,154.74	-334,022	-67,440
<i>Exportsofgoods*</i>	9*50	68,234.06	40,944.49	13,174	124,728
<i>Importsofgoods*</i>	9*50	294,843.80	140,121.80	81,915	484,058
<i>Balanceongoods*</i>	9*50	-226,609.80	100,181.40	-367,495	-68,741
<i>ExportsofServices*</i>	9*50	20,406.44	16,563.25	4,020	54,157
<i>ImportsofServices*</i>	9*50	9,351.17	4,419.50	2,719	16,139
<i>BalanceonServices*</i>	9*50	11,055.28	12,737.28	438	38,018
<i>FDI from China to U.S. states</i>	9*50	237.68	1,126.64	0	16,599
<i>GDP_CHI~2010*</i>	9*50	5,151,733.00	2,453,109.00	2,061,987	9,505,157
<i>GDP_USC~2010*</i>	9*50	14,600,000.00	1,358,965.00	12,200,000	16,900,000
<i>GDP_CHINAC~T*</i>	9*50	5,089,805.00	3,737,207.00	1,093,998	11,200,000
<i>GDP_USCURR~T*</i>	9*50	14,100,000.00	2,742,261.00	9,660,624	18,600,000
<i>UNEMPLOYME~A</i>	9*50	3.97	0.38	3	4
<i>UNEMPLOYME~S</i>	9*50	6.11	1.78	4	10
<i>Populatiopn</i>	9*50	6,264,388.00	6,940,555.00	546,043	39,300,000
<i>GDPpercapita</i>	9*50	47,182.62	8,924.12	31,167	73,478
<i>Officialex~r</i>	9*50	7.33	0.89	6	8

* In millions of U.S. dollars

Figure 3 takes an in-depth look at the total trade in goods between the two countries try in an attempt to find a relationship between GDP, population and Trade Volume. The graph demonstrates the GDP (millions of current dollars), total trade in goods (including exports and imports) between U.S. and China and population by states in 2016. There is roughly a positive relationship between the three variables.

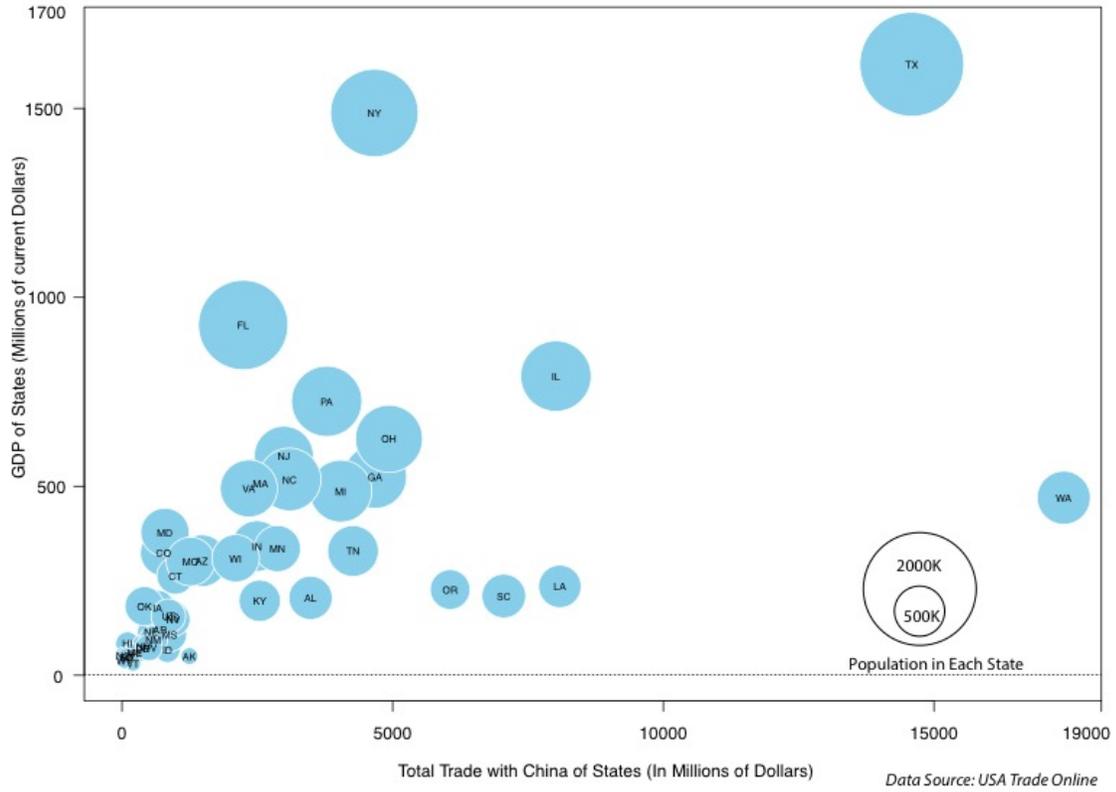


Figure 3: The Relationship among Population, GDP and International Trade

In the next section, I discuss my regression results.

REGRESSION RESULTS

Based on the data I have and the model specification discussed in previous chapter, I used a fixed effect model to analyze what affects the trade relationship between the United States and China. The empirical regression results show quite a few interesting points, some of which are consistent with my predictions while some are different. In general, I conducted three pairs of regression with different dependent variables and two of them have significant results, and one without significant results.

At the very beginning, I tried to use *TradeDeficit* (the Net U.S. trade Export to China) as the dependent variable in the regression model. However, I found out that splitting the total trade balance up into *TotalExport* and *TotalImport* would demonstrate the trade relationship clearer and in a more precise way. Therefore, I estimated three different groups of models in which the independent variables are *TradeDeficit*, *TotalExport*, and *TotalImport* respectively.

In order to maximize the number of observations, I chose data from 50 states (excluding Washington, D.C.) for the years 2008 to 2016 and set them as panel data. Under state-level analysis, it became a problem as to whether I should treat all 50 states equally. In theory, different states might have diverging scales of trade due to a lot of reasons, such as geographic area and population. California and Rhode Island should by no means be seen as equal trade partners, so I decided to give weights to each state and regress the empirical model based on those weights. I generated a new variable named *pop_weight*, which is the mean population for each of the 50 states from 2008 to 2016 and used it as the weight to treat different states.

Tables 2, 3 and 4 below show the regression results of each group of models. The coefficient estimates of key independent variables of interest are quite different and adding or dropping control variables creates totally different stories.

Table 2. Regression results (Deficit as Dependent Variable)

	(1)	(2)	(3)	(4)	(5)
FDIbyState	-1.34*** (0.26)	-0.48 (0.49)	-1.31*** (0.25)	-1.00*** (0.19)	0.15 (0.50)
GDP per capita	-0.73** (0.27)	0.76 (0.61)	-0.69** (0.27)	0.14 (0.62)	0.86 (0.74)
GDP		-0.08** (0.04)			
Unemployment			448.74 (519.60)	542.68 (574.59)	638.58 (521.98)
Income percapita				-1.88 (1.61)	-0.64 (0.88)
Subsidy					-7.66*** (1.99)
Tax on Import					-1.01*** (0.24)
Constant	17512.63 (14722.46)	-1647.14 (16992.25)	13301.24 (14588.43)	49698.82 (42280.38)	-5666.48 (20066.96)
No. of Obs.	450	450	450	450	400
F-statistic	40.22***	105.89***	52.35***	83.01***	191.88***
R-squared	0.45	0.62	0.45	0.50	0.66

Note: Robust standard errors are in parentheses. * p<0.01, ** p<0.05, *** p<0.01

Because of the fixed effects model, state-specific characteristics are controlled for the model. The Year dummy variables are omitted for clarity and most are not statistically significant.

In each of the three groups of regression, I estimated 5 empirical models. First, I only included two primary independent variables, *FDIbyState* and *GDPperCapita*. Then, I added some state-unique demographic variables such as *Unemployment* and *IncomeperCapita*. In addition, I added some state-specific trade-related variables – *Subsidy* and *TaxonImport* as control variables. For all the regressions, I calculated robust standard errors.

Table 3. Regression results (Export as Dependent Variable)

	(1)	(2)	(3)	(4)	(5)
FDIbyState	0.026 (0.025)	-0.049 (0.049)	0.019 (0.023)	-0.030 (0.038)	-0.115 (0.098)
GDP per capita	0.101** (0.047)	-0.029 (0.091)	0.095 (0.051)	-0.036 (0.095)	-0.125 (0.087)
GDP		0.007 (0.004)			
Unemployment			-89.562 (80.447)	-104.310 (79.303)	-116.980 (99.675)
Income percapita				0.294 (0.187)	0.207 (0.194)
Subsidy					0.826 ** (0.375)
Tax on Import					0.102 *** (0.035)
Constant	-1,632.427 (2,288.327)	44.369 (3,038.611)	-791.894 (2,795.499)	-6,506.372 (4,932.768)	-1,479.055 (5,942.896)
No. of Obs.	450	450	450	450	400
F-statistic	7.17***	28.34***	7.05***	13.77***	126.47***
R-squared	0.40	0.43	0.40	0.43	0.52

Note: Robust standard errors are in parentheses. * p<0.01, ** p<0.05, *** p<0.01

I am most interested in the variable *FDIbyState*. My research question is whether it will affect the bilateral trade between U.S. and China, to what extent it will influence the trade volume, and whether there a possible causal relationship between them. The results showed some significance of coefficient estimates under certain empirical models.

Comparing the three groups of models, the Deficit and Import groups demonstrated significant coefficients. Using *Deficit* as dependent variable, under model (4), the coefficient of *FDIbyState* is negative and significant at the 95 percent confidence level. It means that as FDI increases (from China to America), the total trade deficit of U.S. with China decreases. If *FDIbyState* increased by 1 million dollars, the total deficit will drop by approximately 1 million dollars.

The other regression results indicate something more interesting. When using *Import* as the dependent variable, under model (4), the coefficient of *FDIbyState* is now positive but still significant at the 95 percent confidence level. It means that as FDI increases (from China to America), the total trade deficit of U.S. with China increases as well. If *FDIbyState* increased by 1 million dollars, the total Deficit will increase by approximately 0.97 million dollars.

Although the direction of coefficient estimates in the two groups of models is different, it's merely an artifact of the sign of the data. Because the data in this study are the FDI from China to U.S. states, when direct investment in U.S. states increases, the total imports from China to the U.S. states also increase. However, the total *Deficit* is the *Export* minus *Import*, so a decrease in the Deficit is actually an increase in absolute value, holding all other factors equal.

Table 4. Regression results (Import as Dependent Variable)

	(1)	(2)	(3)	(4)	(5)
FDIbyState	1.368*** (0.275)	.4346113 (0.540)	1.325*** (0.263)	0.965*** (0.187)	-0.260 (0.570)
GDP per capita	0.829*** (0.295)	-0.786 (0.679)	0.788*** (0.290)	-0.172 (0.681)	-0.985 (0.802)
GDP		0.085** (0.041)			
Unemployment			-538.301 (546.696)	-646.989 (606.491)	-755.565 (577.300)
Income percapita				2.170 (1.717)	0.850 (0.844)
Subsidy					8.491*** (2.022)
Tax on Import					1.109*** (0.272)
Constant	-19,145.060 (15,773.127)	1,691.505 (19,060.448)	-14,093.135 (15,762.457)	-56,205.192 (44,410.812)	4,187.422 (19,626.903)
No. of Obs.	450	450	450	450	400
F-statistic	25.86***	69.75***	36.85***	62.95***	98.60***
R-squared	0.48	0.65	0.48	0.53	0.71

Note: Robust standard errors are in parentheses. * p<0.01, ** p<0.05, *** p<0.01

However, if we look at the Export group (see Table 3), nothing is statistically significant, except for *Subsidy* and *TaxonImports* in model (5). Here, I can't conclude that the *FDIbyState* doesn't affect the Exports to a specific country. One reason could be that the FDI data I use in this study is single directional, not bi-directional. It is reasonable to argue that if we have data on FDI from the U.S. to China, we can find out a similar pattern as the *Import* and *Deficit*. Unfortunately, due to a lack of transparency and

credibility of statistical data from the Chinese municipal province level, this is impossible for the current study.

Another significant variable is *GDPperCapita*. Using *Deficit* as the dependent variable, under model (3), the coefficient of *GDPperCapita* is negative and significant at the 95 percent confidence level. It means that as *GDPperCapita* increases, the total trade deficits of U.S. states with China decrease. If *GDPperCapita* increased by 1 dollar, the total Deficit will drop by approximately 0.69 million dollars.

It is such a big effect that indicates that GDP has a huge influence on total trade deficits. Therefore, a tiny change in GDP will cause significant differences in total Deficit.

When using *Import* as the dependent variable, under model (3), the coefficient of *GDPperCapita* is now positive but still significant at the 95 percent confidence level. It means that as *GDPperCapita* increases, the total trade deficit of the U.S. with China increases as well. If *GDPperCapita* increased by 1 dollar, the total Imports by U.S. state will approximately increase by 0.79 million dollars.

As discussed before, the results from Table 2 and Table 4 are consistent. As a country's GDP increases, the level of *Imports* from other places will likely increase.

When I first tried to construct the model, I chose the *GDP* as the primary independent variable but that makes *FDIbyState* variable insignificant (see Model 2). Therefore, I used *GDPperCapita*. This is an econometric problem for which I have no answer at the current stage. From my point of view, the GDP itself is too large and will have influence on the significance level of FDI variable. GDP per capita takes population data into consideration and therefore performs better in the whole model.

Other control variables could be categorized into two sub-fields. The first one is Job-oriented: *Unemploymentrate* and *IncomeperCapita*. However, these two variables are not statistically significant given the models above.

The second group of control variables are trade-related: *Subsidy* and *TaxonImports*. According to Table 2 & 4, they are both significant at the 95 percent confidence level.

Using *Deficit* as the dependent variable, under model (5), the coefficient of *Subsidy* is negative and significant at the 95 percent confidence level. It means that as *Subsidy* increases, the total trade deficit of U.S. states with China decreases. If *Subsidy* increased by 1 million dollars, the total Deficit will drop by approximately 7.66 million dollars.

When using *Import* as the dependent variable, under model (5), the coefficient of *Subsidy* is now positive but still significant at the 95 percent confidence level. It means that as *Subsidy* increases, the total trade deficit in U.S. states with China increases as well. If *GDPperCapita* increased by 1 dollar, the total Imports will increase by approximately 8.49 million dollars.

Using *Import* as the dependent variable, under model (5), the coefficient of *TaxonImports* is positive and significant at the 95 percent confidence level. It means that as *TaxonImports* increases, the total trade deficit of the U.S. with China also increases. If *TaxonImports* increased by 1 million dollars, the total Imports will increase by approximately 1.11 million dollars.

In summary, results from regression 1 and 3 are consistent and highly significant, indicating that Total Deficit and Imports are on the same page. It is telling us that FDI is positively associated with imports and thus negatively associated with trade deficits.

Other factors including GDP per capita, Subsidy and Tax on Imports all have a similar effect as FDI.

However, I conclude from the regression analysis that Regression 2, which uses Export as the dependent variable, doesn't generate statistically significant regression results. This might be attributed to the fact that FDI has a directional effect, which means that it will only affect the party where the investment flows to. In other words, Chinese FDI increases in the U.S. won't significantly affect U.S. exports to China. This has great policy implications and could benefit the decision-making process for both countries.

In the following section, I will give my conclusions as well as the policy recommendations and the implications of my study.

CONCLUSION AND POLICY RECOMMENDATION

Based on the current status of trade imbalance between the United States and China, and the analysis of the current situation of China's direct investment in the United States, I discuss the relationship between China's direct investment in the United States and the U.S.-China trade imbalance through the combination of theory and empirical evidence. I draw the following main conclusion: China's direct investment in the United States partly alleviates the trade imbalance between China and the United States.

From the empirical results we can see that FDI has a significant influence on the reduction of trade deficits. It could achieve this function through the increase of total imports and therefore reduce trade deficits. More importantly, GDP also has a non-negligible influence on trade imbalance status that we should take into consideration for potential policy recommendations.

Based on the experience of Japan in the late 1980s, speeding up foreign direct investment can indeed generate inhibition to investor's trade surplus, and the empirical results in this study about the U.S.-China trade relationship conforms to the basic conclusion of all kinds of classical models. This may be because of a decrease in the export of investment of countries due to the transfer of production and export capacity. On the other hand, it could be due to an increase in the imports of products produced in the host country.

The current world economy, and in particular, the economy of China and the United States, has been in a long-term structural adjustment, and the U.S.-China relationship is in the context of a new adjustment period. From the perspective of the development

environment of bilateral relations, the domestic investment environment in the United States and the demands of both countries, Chinese enterprises are facing greater opportunities for direct investment in the United States.

As the cooperation between the two countries has become more widespread, each of these layers has grown closer together, and the interests of each other have become more and more intertwined, and the mutual interests have far outgrown their differences. Cooperation is a win-win situation, and it is an objective fact that anyone with strategic vision and a clear mind will agree with, but it is not the inevitable trend of people's will to move forward.

Since 2017, Chinese President Xi Jinping has held three meetings with the U.S. President Trump, and has made many calls and communications, which has played a strategic stabilizing role in the world's most complex and important bilateral relationship. Shortly after President Trump took office, the Chinese and American presidents held a meeting, established four high-level dialogue mechanisms covering the various areas of U.S.-China relations, agreed on a cooperation plan in the main direction, and achieved a smooth transition and a good start to the U.S.-China economic dialogue.

Although developing China's direct investment in the U.S. is beneficial to both China and the U.S., due to the changes in the relative position of economic power and the relative status of enterprises, the U.S. has shown a more cautious attitude in attracting Chinese direct investment, and there is a great deal of uncertainty in the policy.

From China's perspective, there are approximately four aspects to address:

1. Take a rational view of the problem and gradually develop direct investment in the U.S.

China should understand the national interest of the United States objectively, so as to rationally position the U.S.-China investment relationship.

On December 18, 2017, President Trump released his first national security strategy report, highlighting the "four core national interests": protecting the American people and homeland security, promoting prosperity in the United States, striving for peace with power, and increasing American influence. The main feature of the report is that it puts the importance of developing the U.S. economy in national security in a more prominent position, emphasizing that "economic security is national security" and emphasizing the need to "protect" the U.S. economy. Therefore, China should bear in mind that it is important to step up the process in a peaceful manner, especially in sensitive industries and sectors.

2. Strengthen high-level communication and establish a long-term bilateral economic and trade consultation mechanism.

To enhance strategic mutual trust and deepen bilateral cooperation, China must strengthen high-level communication and establish long-term bilateral trade and economic cooperation.

The only effective way to solve investment problems and overcome investment barriers between China and the United States is through adequate communication and consultation, especially the smooth communication between the top executives. It is recommended that China continues to promote economic diplomacy in the United States

and invite the United States to participate in the "Belt and Road" infrastructure cooperation consultation mechanism.

From the U.S.'s perspective, finding the root cause of the trade deficits and communication would be more important:

1. Continue to maintain a healthy and sustainable free trade environment

China has always maintained trade liberalization and is a major driver and contributor to the open world economy. If Washington goes ahead and puts the U.S.-China economic and trade relations in jeopardy, the consequences will ultimately be borne by American consumers. It has to be said that this is a disregard for the vital interests of American businesses and consumers.

Trade protection policy is not an effective way to solve the trade deficit. Only by correctly understanding the root cause of the deficit can the United States be able to remedy the problem. The U.S. has to gradually reduce its fiscal deficit, reduce excessive consumption, curb financial bubbles and relax export controls so as to create an environment conducive to the benign development of the global economy.

2. Seek long-term and efficient communication with China

The balance of trade is not a good indicator of the health of the economy, because trade imbalances are affected by factors such as the macro economy. The Trump administration should seek to resolve the trade imbalance with China through negotiations with China, rather than on its own. Strong measures, such as tariffs, would be less effective for China. The United States needs a professional dialogue with China, not a sudden, blunt force.

In conclusion, we should be rational in dealing with trade deficit or trade surplus. Only by analyzing the root causes behind these actual terms can we really understand what to expect and what needs to be done in order to establish a strong and friendly cooperation.

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