Macroeconomic Factors and Structural Reforms in the Context of US-China Trade Tensions

Yuhan Jin

Author Background: Yuhan Jin is now in Grade 12 at the Experimental High School Attached to Beijing Normal University in Beijing, China.

Abstract

As the global trade develops together with a rise of trade protectionism, reflected by the recent US-China trade conflicts, a clearer understanding of trade patterns is badly needed. This paper discusses the underlying factors driving trade balance in the context of the US-China trade tensions and the role of bilateral tariffs. It presents an empirical regression model based on the classical gravity model with some extensions to show that macroeconomic factors, including fundamental factors and macroeconomic policies, are the major drivers of not only the aggregate trade balance of one country but also the bilateral trade balance between two countries. So far the US-China bilateral tariffs have not achieved the intended object of reducing the bilateral trade balance or aggregate trade balance for either the US or China. In addition, the increased tariffs will have significant negative impacts on national output and economic growth, as well as on consumers, producers and national welfare for the countries involved and for other economies through value chain links. This paper suggests that both China and the US should focus on macroeconomic factors and take actions, especially carry out structural reforms, to address external imbalance to achieve a more sustainable economic development. Policymakers in all countries should work together to continue to promote free and fair trade, including strengthening the rule-based multilateral international trade system. It is also critical to recognize that trade liberalization can impose costly adjustments for some groups of workers and communities. Therefore, measures need to be taken to ensure that gains from trade are more widely shared and individuals or groups left behind are adequately protected.

Key Words:

US-China Trade Tensions, Bilateral Trade Balance, Macroeconomic Factors, Tariffs

I. Introduction

In the last two decades, the global trade volume has nearly quadrupled and trade between the two largest economies in the world, the US and China, has also undergone a steady increase (Figure 4 and 5). Meanwhile, there has been a considerable bilateral trade imbalance between the two countries, as the US has a large and rising size of bilateral trade deficit with China (Figure 5). The US government considers the large trade deficit as an urgent problem, which is believed to have affected economic growth and employment in the US. In order to address its trade imbalance, the Trump administration raised tariffs on various products imported from China in 2018, sequentially on three "lists" of goods from China, firstly 25% tariffs on $34 billion of annual import in July 2018, secondly 25% tariffs on $16 billion of annual import in August 2018, and finally 10% tariffs on $200 billion of annual import in September 2018. As a result, China imposed retaliatory tariffs afterwards. When the US-China trade tension intensified in May 2019, the Trump administration increased the tariff on the $200 billion list from 10% to 25%. Consequently, China's exports to the US of those goods subject to higher tariffs started to decrease in 2018, and then its overall exports to the US declined in the first half of 2019. As China's imports from the US also declined, there has been a decrease in their bilateral trade volume (Table 3 and 4). However, we have not observed significant changes in either the US-China bilateral trade balance or their aggregate trade balances. As a result, a crucial question comes: Is increasing bilateral tariffs an effective approach to address the concern on the US-China bilateral trade imbalance? And if imposing tariffs is not an appropriate approach, what should the US and China do to reduce bilateral and aggregate trade imbalances?

The purpose of this paper is to examine what the underlying factors driving the US-China bilateral trade balance are. It can be shown that macroeconomic factors, including fundamental factors and macroeconomic policies, are the major drivers of not only the aggregate trade balance of one country, but also the bilateral trade balance between two countries by using an empirical regression analysis based on the gravity model. The analysis reveals that macroeconomic policies, rather than tariffs, are the right approach to reducing trade imbalance. The paper also shows that the US-China bilateral tariffs so far have not achieved the intended object of reducing their bilateral trade balance or aggregate trade balance. Furthermore, the bilateral tariffs will negatively affect national output and economic growth, as well as consumers, producers and national welfare, and cause uncertainties in global value chains.

The remainder of this paper is organized as follows. Section II reviews literature about the major drivers of a country's aggregate and bilateral trade balances including the recent extended use of the gravity model in this field. Section III presents the evolution of China-US bilateral trade and trade balance, and formulates an empirical regression analysis based on the gravity model with some extensions, which shows that most of the changes in China-US bilateral trade balance over the past two decades

can be explained by macroeconomic factors. Section IV discusses the impacts of the increased tariffs, and finally Section V presents conclusions and policy implications.

II. Literature review

Since the US raised tariffs sequentially on three "lists" of goods from China in 2018, and China imposed retaliatory tariffs afterwards, whether bilateral tariff is the right approach to address the concern on the US-China bilateral trade imbalance is at the heat of the debate. Therefore, there is a need to examine what the underlying factors driving the US-China bilateral trade balance are.

2.1 Macroeconomic factors are the major drivers of a country's aggregate current account balance

According to the conventional macroeconomic theory, the primary measure of national economic activity of an open economy - GDP (Gross Domestic Product) is the sum of the domestic and foreign expenditures on the goods and services produced by domestic factors of production. Therefore, the national income identity of an open economy is as follows:

$$Y = C + I + G + EX - IM, \qquad (1)$$

in which Y stands for GDP, C for consumption, I for investment, G for government purchases, EX for exports, and IM for imports.

The difference between exports and imports of goods and services is defined as the current account balance (CA), which can be expressed as:

$$CA = EX - IM. \qquad (2)$$

A country has a current account surplus when its exports exceed its imports, and it has a current account deficit when its imports exceed its exports. In this paper, current account balance and trade balance will be used interchangeably.

We define national savings (S) as the proportion of output that is not devoted to consumption or government purchases, i.e. S = Y-C-G. Therefore, Equation (1) can be rewritten as:

$$CA = (Y - C - G) - I = S - I. \qquad (3)$$

This equation is very important as it shows that it is net savings, i.e. the gap between savings and investments, that determines a country's aggregate current account balance. What drives savings and investment are basically macroeconomic factors which can be broadly classified into two categories. One category includes

fundamental factors such as demographics, culture and social safety net, etc., while the other category includes macroeconomic policies, such as fiscal policies, monetary policies, and in some cases, exchange rate policies, and supply-side policies, etc. It also indicates that change in current account balance is best achieved through adjustments to macroeconomic factors, not trade policies.

2.2 Recent research based on the Gravity Model finds that most of the changes in bilateral trade balance over the past two decades can also be explained by macroeconomic factors

2.2.1 Changes in bilateral trade balance

Since being introduced by Isard (1954) and popularized by Tinbergen (1962), the Gravity model has been widely used by economists to estimate the magnitude of bilateral trade or exports, which has a basic style as follows:

$$X_{ij} = G \cdot \left(Y_i \cdot Y_j\right) / D_{ij}, \qquad (4)$$

where X_{ij} stands for the value of trade between country pairs, Y_i and Y_j stand for the two countries' output, and D_{ij} stands for the distance between the two countries. The gravity model shows that the value of trade between any two countries is proportional, other things equal, to the two trading partners' size, and diminishes with their distance. Depending on the specific version of the gravity equation, the output can be proxied in various ways. In some cases, they can be proxied by the two countries' GDP, while in other cases, they can be proxied by the exporting country's aggregate supply (gross output) and importing country's aggregate demand (gross spending). The distance represents the trade costs, which, in addition to natural costs such as geographic distance, also includes historical ties, level of tariffs, and whether they have engaged in trade agreement, etc.

However, although the gravity model does a good job of explaining the bilateral trade or export/import magnitude, it lacks explanatory power when applied to the level of bilateral trade balance. It has been the long-established observation in the literature that trade balance is more difficult to predict than export, reflecting the difficulty in accounting for structural factors (Donald and Weinstein 2002, IMF 2019a). Hence, there has been little empirical literature which attempts to explain the level of trade balance (for example, Davis and Weinstein 2002).

In this context, IMF (2019a) tries to explain changes, rather than levels, of bilateral trade balance using the gravity model while distinguishing the role of three sets of determinants: macroeconomic factors, trade costs (including tariffs), and sectorial specialization, which reflects the international division of labor. Firstly, it estimates

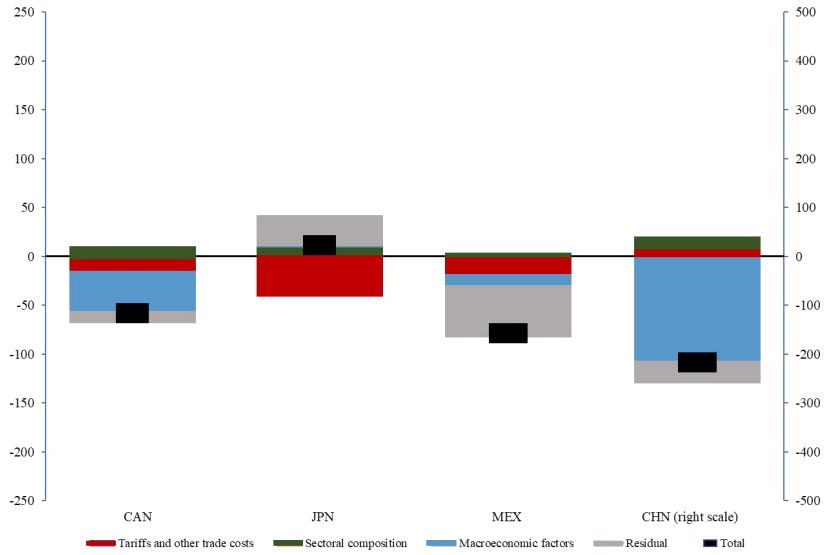
bilateral exports at both the country and sector levels based on Anderson and van Wincoop (2003) using the following model specification:

$$X_{ijt} = exp[\alpha + \beta_1 ln(Y_{it}) + \beta_2 ln(E_{jt}) + \beta_3 ln(Y_{wt}) + (\beta_4 ln(Distance_{ij}) + \beta_5 Language_{ij} + \beta_6 Colony_{ij} + \beta_7 Border_{ij} + \beta_8 FTA_{ijt})\cdot(1 - SM_{ij}) + \beta_9 ln(Distance_{ij})\cdot SM_{ij} + \beta_{10} SM_{ij} + \beta_{11} ln(1 + \tau_{ijt}) + \beta_{12} ln(MRT_{it}^{out}) + \beta_{13} ln(MRT_{jt}^{in})]\cdot\eta_{ijt} \quad (5)$$

Secondly, the estimated coefficients from the above bilateral exports equation are used to construct bilateral imports. And finally, the predicted values of bilateral trade balances and changes in bilateral trade balances are constructed at both the aggregate and sectoral levels.

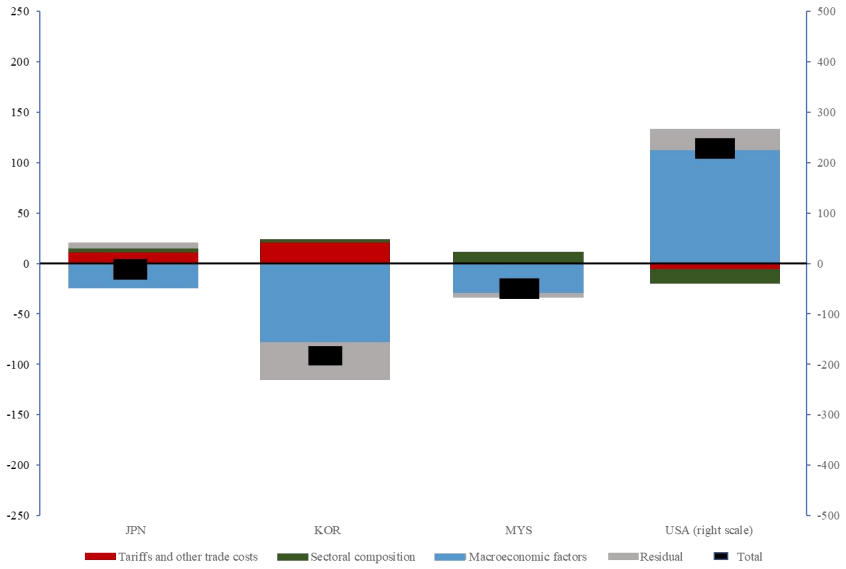
Based on the data of 63 countries over 20 years (1995-2015) and across 34 sectors, IMF (2019a) finds that both domestic and foreign macroeconomic factors, which determine the imbalance between aggregate supply and demand of the two trading countries, are the largest contributors to the evolution of bilateral balance over the past two decades. Meanwhile, changes in bilateral tariffs play a smaller role than macroeconomic conditions in explaining the changes of bilateral balance (Figure 1 and 2). For instance, macroeconomic factors can explain 95% of the changes in China-US trade balance and 20% of the changes in the US-Germany bilateral trade balance over 1995-2015.

Figure 1. Net Contributions to the US Bilateral Trade Balance, 1995-2015



Source: IMF, 2019a.

Figure 2. Net Contributions to China's Bilateral Trade Balance, 1995-2015



Source: IMF, 2019a.

2.2.2 Relationship between bilateral and aggregate trade balances

In addition, IMF (2019a) examined the relationship between bilateral and aggregate trade balances by manipulating the usual gravity equation as follows:

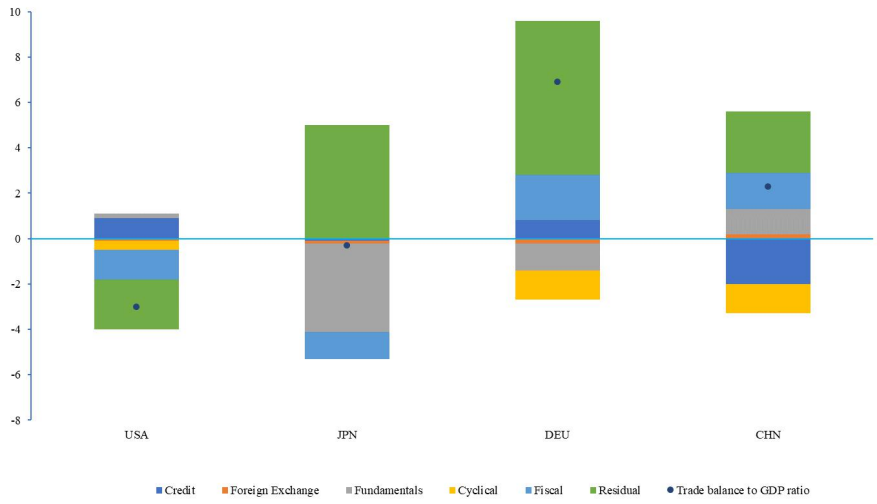
$$\frac{TB_{ij}}{Y_i Y_j^W} = m_{ij} \cdot \left(\frac{TB_i}{Y_i} - \frac{TB_j}{Y_j} \right). \qquad (6)$$

It shows that the bilateral trade balance depends on the relative size of the two countries' aggregate trade balance-to-GDP ratios, the two countries' size relative to the world economy and bilateral trade intensities, which means that changes in the aggregate trade balances of the US and China accounted for most of the evolution in their bilateral trade balance. Therefore, macroeconomic factors that are relevant for aggregate trade balance also, to a large extent, determine bilateral trade balance. However, the opposite does not hold, i.e. large changes in bilateral balance do not necessarily lead to large adjustments in the aggregate trade balance. This suggests that a policy that targets bilateral trade deficit would likely not help to reduce the overall trade deficit. Without changes in macroeconomic factors, large adjustments in bilateral trade balance tend to result in compensating adjustments in other bilateral balances. Davis and Weinstein (2002) also moved beyond the gravity framework and concluded bilateral trade imbalance largely arises as a result of aggregate trade imbalance.

2.2.3 Factors behind the movement of trade balance

In order to inform policy discussion, IMF (2019a) analyzes the factors behind the movement of aggregate trade balance over time using its External Balance Assessment (EBA) framework, which relates a country's current account balance to four broad determinants: macroeconomic policies, fundamentals, credit and cyclical factors. For example, it finds that in the US, the correction of credit boom after the global financial crisis has contributed to reduction in its external imbalance, whereas the recent tax-cutting is expected to further widen its trade deficit. For China, the credit expansion after the crisis has led to an increase in domestic demand and hence a reduction in its trade surplus, while some supply-side policies such as export subsidy has helped promote output and hence continued increase in exports (Figure 6).

Figure 3. Contributions of Macroeconomic Drivers to Aggregate Trade Balance
Average 2010-17



Source: IMF, 2019a.

2.3 Role of tariffs

Currently, it seems the most prevalent approach for politicians to reduce bilateral trade deficit is to introduce or increase bilateral tariffs. Even though compared with macroeconomic factors, changes in bilateral tariffs play a smaller role in the evolution of bilateral balance, over the longer term, large and persistent changes in tariffs, as an important part of bilateral trade costs, can have a significant impact on the international division of labor, and hence the way changing macroeconomic factors influence bilateral trade and trade balance. As a result, tariffs can have important effects on productivity, output, and employment over the longer term (Amiti *et al.* 2019, Fajgelbaum *et al.* 2019, IMF 2019a). This will be discussed in more detail in Section IV of this paper.

2.4 Political economy of trade

With the benefits of trade already recognized by most people, why are there still lots of voices against trade and supporting tariffs? The main reason is that people have dual roles: they are both consumers and producers. Though most economists try to maximize benefits to consumers and speak highly of trade's role of providing cheaper and better goods and services, workers, especially those who lose their jobs and their representatives in the government, place more weight on their role of being producers, in other words, the jobs of those "losing and unhappy" workers (Blinder 2018). As there are valid concerns on the associated distribution effect, dislocations, and costly adjustment for certain groups of workers and communities, it is not surprising that politicians cast more and more doubts on free trade (Irwin 2016). By imposing tariffs, these politicians in the US expect that the manufacture jobs "stolen" by other countries will come back to America. According to Monicken (2018), the new tariffs led to a 67% increase in aluminum production and thousands of jobs. However, although the tariffs seem to have benefited the aluminum industry, the agriculture sector and other manufacturing industries suffered a huge loss. Given the apparent benefits of trade, rather than increasing tariffs and blocking the international trade, policy makers are advised to put in place more relevant and effective policies, such as improving the social security net and education, to ensure that gains from trade are more widely shared and individuals or groups left behind are adequately protected (Irwin 2016). In this way, not only does the country as a whole benefit from free trade, but the "losers in the globalization" can also be adequately protected (Irwin 2016, Blinder 2018, IMF 2019a).

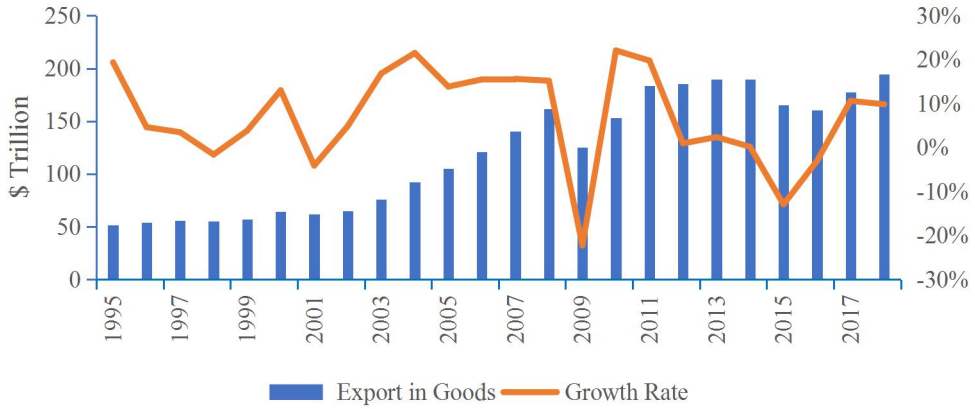
III. Empirical analysis

Enlightened by the empirical analysis in IMF (2019a), this section constructs a model based on the gravity model with some modifications to analyze the relationship between the China-US bilateral trade surplus and macroeconomic factors in both countries in the past 20 year. Before presenting this model, here are some stylized facts that provide background information on the evolution of China-US bilateral trade and trade balance.

3.1 Stylized facts

With the development of globalization, international trade has achieved a steady growth, nearly quadrupling in the last two decades. There were two major adjustments, one during the 2018-2019 international financial crisis and the other in 2015 when the global financial market experienced significant volatility (Figure 4). It is also evident that in 2018, the global trade slowed down considerably from its peak in late 2017, with its annual growth rate decreasing from 5.4% in 2017 to 3.8% in 2018 (IMF 2019a). This is widely believed to be relevant with the introduction of higher tariffs by the US and other major economies.

Figure 4. World Exports Since 1995

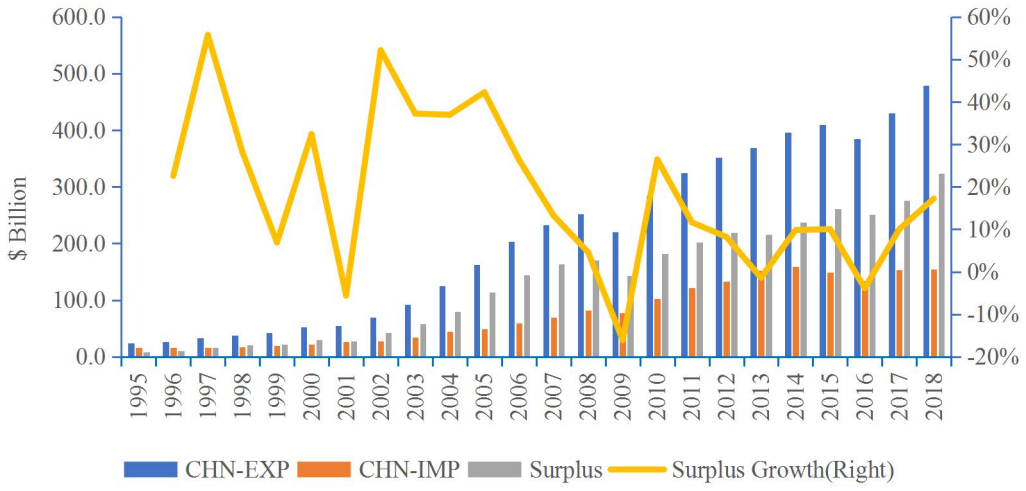


Source: WTO, International Trade Statistics Database.

3.1.1 The evolution of China-US bilateral trade

Meanwhile, the bilateral trade between the two largest economies, the US and China, also experienced rapid growth (Figure 5). The total volume of their bilateral trade in goods increased almost 14 times, growing from $40.8 billion in 1995 to $633.5 billion in 2018. China's exports to the US and imports from US both rose significantly, with higher growth in exports reflecting their respective comparative advantages and positions in the global value chains. This resulted in a rising trade surplus between China and the US, which increased from $8.6 billion in 1995 and $323.3 billion in 2018. Since 2011, the growth of the China-US trade surplus has slowed down considerably, even experiencing negative annual growth in 2013 and 2016.

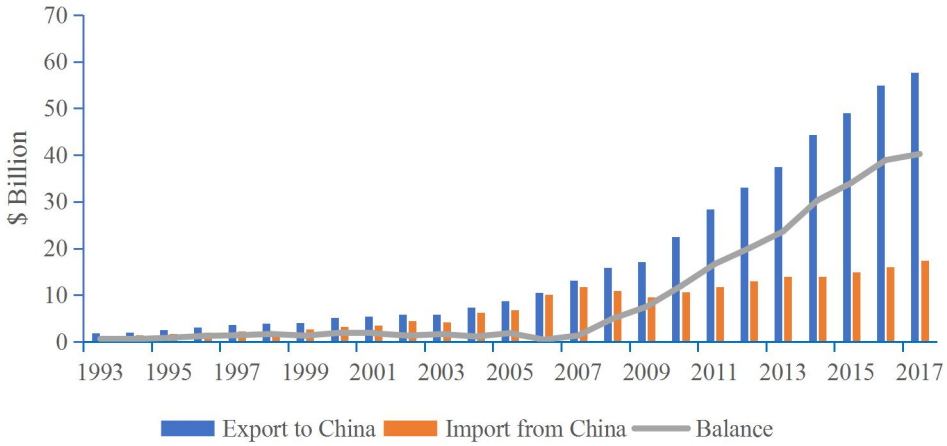
Figure 5. China-US Bilateral Trade in Goods and Trade Balance



Source: China's General Administration of Customs.

In terms of trade in service, the US runs a large and increasing surplus with China. The US exports in service to China grew 21.9 times during 1995-2017, mainly reflecting the Chinese rising expenditures on overseas traveling, studying, and medical treatment. This made the US surplus of trade in service increase 47.5 times, largely offsetting its deficit of trade in goods and helping narrow its current account deficit with China (Figure 6).

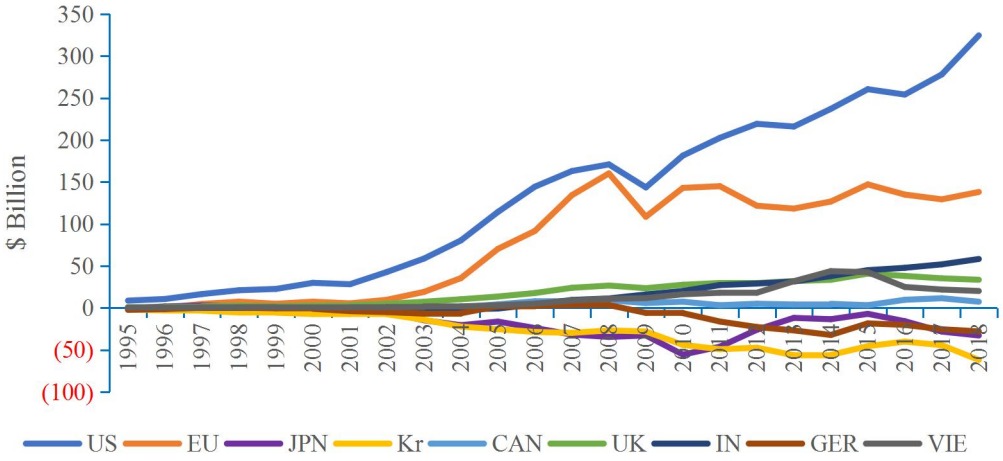
Figure 6. Trade in Service between the US and China



Source: BEA.

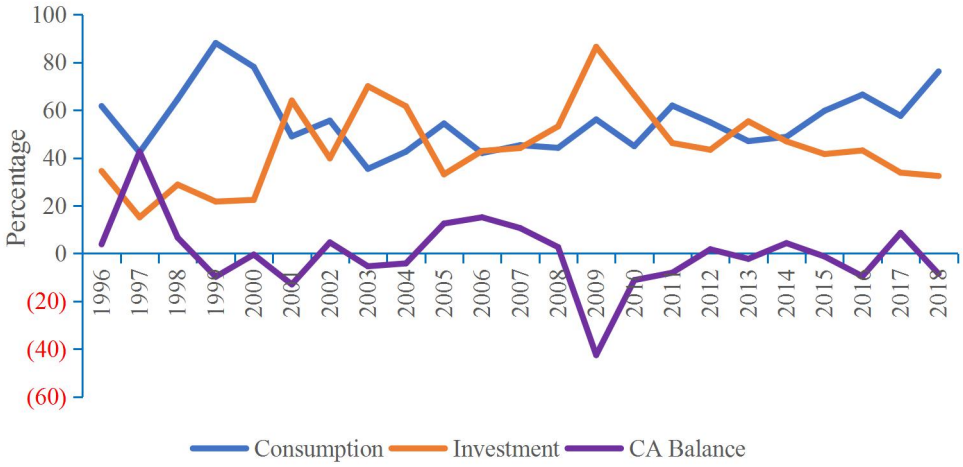
At the same time, despite the large surplus with the US, China has run increasing trade deficits with some other countries such as Japan, South Korea, and Germany since 1998 (Figure 7), which reduces China's overall trade surplus. China's aggregate current account surplus over GDP decreased to 0.4% in 2018 after it peaked at nearly 10% in 2007 (Figure 9), well within the 3% limit set by the IMF. As shown in Figure 8, the contribution of China's net exports to GDP growth has gradually decreased from its peak level of 42.6% in 1997 to less than 5% in the past years, and even became negative in several years. Meanwhile, the contributions of investment and consumption have increased considerably, with consumption accounting for 76.2% in 2018, reflecting the notable progress made to achieve a more balanced economic development in China. IMF (2019d) states that China's external position was assessed to be in line with fundamentals and desirable policies.

Figure 7. China's Trade Balance by Country



Source: China's General Administration of Customs.

Figure 8. Contribution to China's GDP Growth

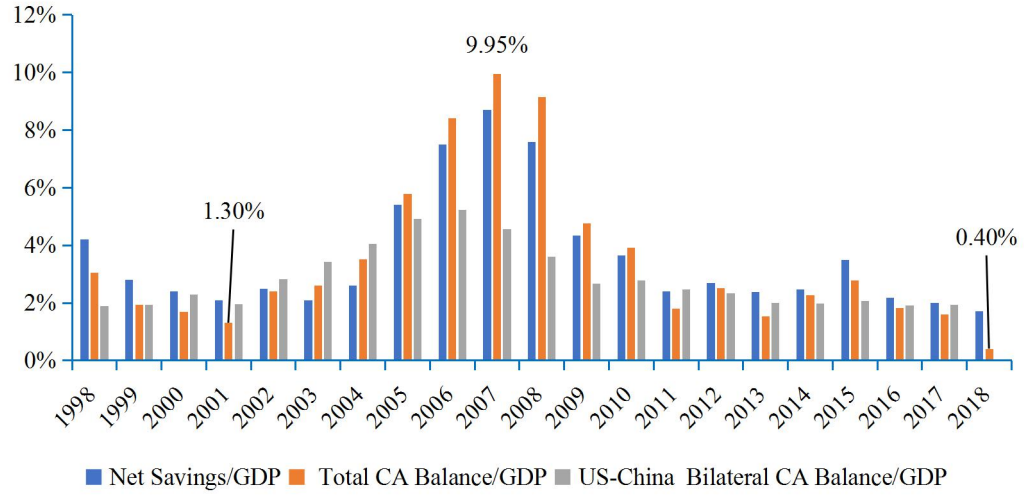


Source: China's National Bureau of Statistics.

3.1.2 Trade balance and macroeconomic factors

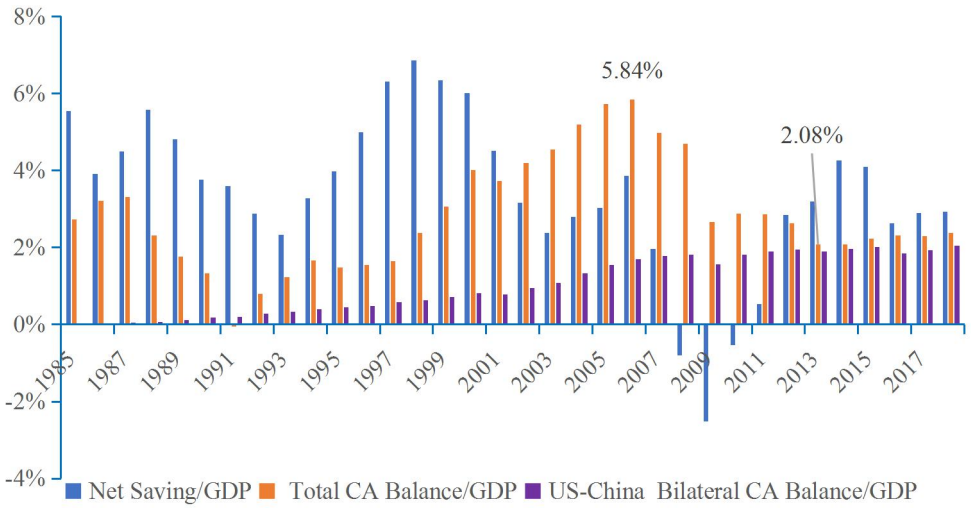
According to the conventional macroeconomic theory, macroeconomic factors are the major drivers of a country's aggregate current account balance. Recent research based on the Gravity Model finds that most of the changes in bilateral trade balance over the past two decades can also be explained by macroeconomic factors. These statements in Section II of this paper can be clearly illustrated in Figure 9 and 10. As shown in figure 9, the overall current account balance in China and its bilateral trade balance with the US have moved well in line with its net savings. In the US, the trade balances have followed a similar pattern of change (Figure 10).

Figure 9. Trade Balance and Net Savings in China



Sources: China's National Bureau of Statistics, General Administration of Customs, BEA.

Figure 10. Trade Balance and Net Savings in the US



Sources: BEA, US Department of Commerce.

3.2 Empirical analysis

3.2.1 Model specification and data

In order to test whether macroeconomic factors are the major contributors to the changes in the China-US bilateral trade balance, the following model of equation is formulated based on the gravity model with some modifications enlightened by IMF (2019a).

$$\Delta TB_i = c + \beta_1 \cdot Y_{c,i} + \beta_2 \cdot E_{u,i} + \beta_3 \cdot REER_i + \beta_4 \cdot Lev_i + \varepsilon_i,$$

where ΔTB_i stands for quarterly changes in China-US bilateral trade balance at time i, $Y_{c,i}$ stands for China's GDP, and $E_{u,i}$ stands for the US domestic demand at time i. Choosing ΔTB_i as the dependent variable is noted by IMF (2019a) to explain changes, rather than levels, of bilateral trade balance given that the gravity model lacks explanatory power when applied to the level of bilateral trade balance. Meanwhile, domestic aggregate supply of the exporting country and aggregate demand of the importing country are key determinants of their bilateral trade flows as chosen in IMF (2019a). In addition, $REER_i$ represents the real effective exchange rate of RMB, and Lev_i represents Credit-to-GDP in China where credit is the debt finance provided to the private non-financial companies in China. Choosing exchange rate and Credit-to-GDP as other independent macro variables is because they are both important factors which determine production activities and trade balance in China as shown in Figure 3, and have data available over a relatively long period. They are somehow a proxy to other macroeconomic factors, rather than representing a complete set of macroeconomic factors that affect the China-US bilateral trade balance.

All observations are quarterly data from 1998 to 2019. ΔTB_i is calculated from China-US bilateral trade balances. $E_{u,i}$ is calculated from $E_{u,i}$=$Y_{u,i}$-$CA_{u,i}$, where Y_u stands for the US GDP and CA_u stands for the US current account balance. Credit is calculated using relevant data published by China's central bank.

Table 1. Data Sources

Variables	**Data Sources**	**Relevant Institutions**
TBs	http://www.customs.gov.cn/	China's General Administration of Customs
Yc	http://www.stats.gov.cn/	China's National Bureau of Statistics
Eu (Yu, CA)	https://www.bea.gov/	US Bureau of Economic Analysis (BEA)
REER	https://www.bis.org/	Bank for International Settlements (BIS)
Lev	http://www.pbc.gov.cn/	China's Central Bank

3.2.2 Estimation result

$$\Delta TB_i = 0.03Y_{c,i} + 0.01E_{u,i} - 3.57REER_i - 449.05Lev_i + 464.12$$

The results are as expected. The coefficient of China's GDP (Y_c) is positive (0.03) and highly significant (P-value = 0.000), which shows that China-US bilateral trade surplus expands when China's aggregate output increases. The coefficient of the US domestic demand (E_u) is positive (0.01) and is also highly significant, which suggests China-US

bilateral trade surplus also expands with the increase in the US imports as a result of rising domestic demand in the US. The coefficient of RMB real effective exchange rate index ($REER$) is negative (-3.57), which is very significant. It indicates that the China-US trade surplus narrows with the appreciation of RMB, which leads to a fall in China's exports and rise in China's imports. The coefficient of Credit-to-GDP (Lev) is negative and also highly significant, which suggests that credit expansion leads to an increase in domestic demand, especially investment in China, and hence a reduction in its trade surplus.

Table 2. Estimation Result

Variable	Coefficient	Std. Error	t-Statistic	P-value
C	464.1239	197.3369	2.351937	0.0211
Yc	0.030250	0.003737	8.094966	0.0000
Eu	0.010594	0.002737	3.870154	0.0002
LEV	-449.0518	59.33396	-7.568208	0.0000
REER	-3.568432	1.570782	-2.271755	0.0258
R-squared	0.953393	Mean dependent var		382.7981
Adjusted R-squared	0.951062	S.D. dependent var		244.1430
S.E. of regression	54.00904	Akaike info criterion		10.87320
Sum squared resid	233358.2	Schwarz criterion		11.01689
Log likelihood	-457.1111	Hannan-Quinn criter.		10.93100
Wald F-statistic	395.7272	Durbin-Watson stat		1.212562
Prob (F-statistic)	0.000000	Prob (Wald F-statistic)		0.000000

3.2.3 Model test

Through examining the stationarity of the variables and their first-order difference, we find out that the variables except ΔTB are unsteady time series. However, their first-order differences are all stable. In addition, the cointegration test shows that there are five groups of cointegration eqn(s) at the 0.05 level.

The White test of model shows the existence of heteroscedasticity in the observations with an Obs*R-squared of 46.7. The estimation of the time series model provides the Durbin-Watson (DW) test statistics at about 1.21, which indicates the presence of serial correlation in the residuals.

To remedy heteroscedasticity and serial correlation, Newey-West method (HAC) was conducted, the result of which shows that the estimation is highly significant. As we can see from the HAC standard errors and covariance matrix results, both T and F tests are significant at the level of 0.05, which suggests 95% of the changes in the China-US bilateral trade balance can be explained by the independent variables, i.e.

macroeconomic factors. The model test results are presented in Table 1-4 of the appendix.

IV. Impacts of the US-China bilateral tariffs on trade, growth and welfare

While literature and empirical analysis show that macroeconomic factors are the major drivers of bilateral trade balance, are the tariffs as effective as politicians claim? In fact, the trade data shows that the US-China bilateral tariffs so far have not achieved the intended object of narrowing their bilateral imbalance. The tariffs reduced trade flows between the US and China, while their bilateral trade surplus/deficit remained broadly unchanged with some observed trade diversion. The tariffs have also not resulted in narrowing of the aggregate current account surplus/deficit of either China or the US. On the contrary, both countries have experienced widening of their overall current account surplus/deficit. Furthermore, the increased tariffs will have negative impacts on production, employment, productivity and welfare for the countries involved and for other economies through value chain links.

4.1 Impacts on trade volume and trade balance between the US and China

In 2018, the global trade slowed down considerably from its peak in late 2017, with its annual growth rate decreasing from 5.4% in 2017 to 3.8% in 2018 (IMF 2019a). According to China's General Administration of Customs, the annual growth rate of the US-China bilateral trade volume also declined from 12.3% to 8.5% in 2018. China's exports to the US decreased sharply in the three groups of goods subject to higher tariffs, i.e. the first $34 billion of annual imports, the $16 billion more, and the additional $200 billion.

Despite the tariffs, the US-China bilateral trade deficit continued to rise from $275.8 billion to $323.3 billion in 2018, up by 17.2%, as China's overall exports to the US increased from $429.8 billion to $478.4 billion, which partly reflects the front-loading. With China imposing retaliatory tariffs, its imports from the US remained broadly unchanged according to China's General Administration of Customs, and decreased from $129.8 billion to $120.2 billion, down by 7.4%, according to the US Department of Commerce.

This trend continued in 2019. As of end-June 2019, while China's overall international trade volume increased by 3.9% if denominated in RMB, and showed a slight decrease of 2% if denominated in USD, the US-China trade volume declined from $302 billion to $258.4 billion, down by 14.5% compared with that at the end of June 2018, according to the most recent data published by China's General Administration of Customs on July 12, 2019. Meanwhile, China's trade with the EU and the Association of Southeast Asian Nations (ASEAN) rose by 4.9% and 4.2%, accounting for 15.7% and 13.5% respectively of China's total international trade.

Thus, the US changed from China's second largest trading partner in 2018 to the third largest one in the first half of 2019, accounting for 12% of China's total international trade.

Specifically, in the first half of 2019, China's exports to the US decreased from $218 billion to $199.4 billion, down by 8.5% while its imports from the US decreased from $84 billion to $59 billion, down by 30%. As a result, the US-China trade deficit continued to widen from $134 billion to $140.4 billion, increasing by 4.8%. Although the trade data from the US Department of Commerce shows that the US-China bilateral trade deficit declined by 9.9% by the end of May 2019, we can at least draw the conclusion that their bilateral trade deficit remained broadly unchanged, given the different direction shown by different sources of data. Meanwhile, the tariffs have not achieved the goal of narrowing the aggregate current account surplus/deficit of either China or the US. On the contrary, by the end of March 2019, China's aggregate current account surplus increased by 243% while the US aggregate current account deficit rose by 14.4%, up by 5.6 percentage points compared with that as of end-2018. Table 3 and 4 show the US-China bilateral trade and trade balance using data from China's General Administration of Customs and the US Department of Commerce respectively. Even though we can observe some data discrepancies, the trend of changes has been mostly consistent.

Table 3. China-US Bilateral Trade and Trade Balance (Chinese Data)

	Trade Volume		**China-US Exports**		**China-US Imports**		**US-China Deficit**		**China's Aggregate Current Account Surplus**	
	Amount	Changes	Amount	Changes	Amount	Changes	Amount	Changes	Amount	Changes
2016	519.5	-7.0%	3851	-6.0%	134.4	-9.6%	250.7	-3.9%	202.2	-33.5%
2017	583.7	12.3%	429.8	11.6%	153.9	14.5%	275.8	10.0%	195.1	-3.5%
2018	633.5	8.5%	478.4	11.3%	155.1	0.8%	323.3	17.2%	49.1	-74.8%
June-19	258.4	-14.5%	199.4	-8.5%	59.0	-30.0%	140.4	4.8%	49.0*	243%*

* As of end-March 2019.

Amounts are in $ billion.

Sources: China's General Administration of Customs, China's State Administration of Foreign Exchange.

Table 4. China-US Bilateral Trade and Trade Balance (US Data)

	Trade Volume		**China-US Exports**		**China-US Imports**		**US-China Deficit**		**US Aggregate Current Account Deficit**	
	Amount	Changes	Amount	Changes	Amount	Changes	Amount	Changes	Amount	Changes
2016	578.0	-3.5%	462.4	-4.3%	115.6	-0.2%	346.8	-5.6%	432.9	6.2%
2017	635.0	9.9%	505.2	9.3%	129.8	12.3%	375.4	8.3%	449.1	3.8%
2018	659.8	3.9%	539.7	6.8%	120.2	-7.4%	419.5	11.8%	488.5	8.8%
May-19	223.0	-13.8%	180.0	-12.3%	43.0	-19.3%	137.1	-9.9%	130.4*	14.4%*

* As of end-March 2019.

Amounts are in $ billion.

Sources: BEA, the US Department of Commerce.

4.2 Impacts on economic growth and global value chains

In addition, recent research finds that the increase in tariffs will affect global and national output and economic development, not only for the economies directly imposing and facing them, but also for other countries up and down the value chains. It may also create uncertainties in repositioning of global value chains.

G20 (2019) points out that trade and investment growth slowed in 2018, which has been contributing to a weaker global growth outlook for 2019-20 than previously projected. While growth is expected to increase in 2020, downside risks arising from the current trade environment could undermine this growth. IMF (2019b) estimates that at the global level, the additional impact of the recently announced increase in tariffs from 10% to 25% on $200 billion of the US imports from China in May 2019 and envisaged possible 25% tariffs on the roughly $267 billion of the US imports from China will subtract about 0.3 percent of the global GDP in 2020. Considering also the impact of tariffs imposed in 2018, the global GDP is likely to be lower by 0.5 percent in 2020. Meanwhile, IMF (2019a) revised down its global growth projection by 0.4 percentage points to 3.3% in 2019, and by 0.1 percentage points in 2020. It also lowered its growth projection for the US by 0.2 percentage points in 2019 and for China by 0.1 percentage points in 2020.

Moreover, the rapid growth of trade which contributed to the global economic development in the last two decades is under serious threat. Since the mid-1990s, the significant decline in trade costs—that is, tariffs and transportation and communications costs—has gone together with an increase in the extent and complexity of global value chain participation. This has allowed countries to become more productive and create more jobs, which has been instrumental for the global economic growth. However, the growth is disrupted by the recent increase of trade barriers. In the longer term, large and sustained changes in tariffs can shape the

international organization of production as firms adjust domestic and international investment and production structures, reorganizing themselves into global value chains. Global value chains are important features of the global economy, and can help shape trade, investment and development. The disruption to global supply chains will ultimately lower global output and productivity. The empirical analysis conducted by IMF, using a large panel data set of 35 countries and 13 manufacturing sectors, suggests that tariffs have significant effects along the value chain as well as on employment and productivity. Both labor productivity and total factor productivity are largely reduced by higher upstream or downstream tariffs because they make foreign inputs more expensive and reduce countries' abilities to benefit from returns to scale by participating in international markets (IMF 2019a).

Meanwhile, there has been observed evidence of trade diversion resulted from the increased US-China bilateral tariffs, reflected by partial substitution of China's exports to the US by third countries, mainly Canada, Mexico, Japan, Korea, Taiwan, Vietnam and other East Asian economies. However, while the trade activities between the US and China have declined, there has not been significant change in either of their aggregate trade balances. This phenomenon shows that under certain macroeconomic conditions, changes in bilateral trade balance or trade diversion do not necessarily translate into changes in the overall trade balance (IMF 2019a). While some third countries may benefit from trade diversion, the trade tension between China and the US would also lead to increasing uncertainty, decreasing market confidence, and tightening of global financial conditions, with negative effects on most countries. Therefore, most countries, even those that benefit from trade diversion, are likely to be worse off (IMF 2018).

4.3 Impacts on prices, consumers, producers and welfare

The US-China bilateral tariffs also exerted considerable impacts on prices, consumers, producers, and thereby welfare. First, consumers in the US and China are unequivocally the losers from trade tensions. Some research finds that the tariff revenue collected has been borne either by the US consumers or absorbed by importing firms through lower profit margins, while others find that the Chinese exporters have reduced or plan to reduce prices. As the trade volume of targeted goods decreased, the competition between companies in both countries became less intense, resulting in a rise in the price of the relevant products from both domestic and foreign companies. Therefore, it would make tradable consumer goods less affordable, harming low-income households disproportionately. Amiti, *et al.* (2019) finds that over the course of 2018, the U.S. experienced substantial increase in the prices of intermediates and final goods, dramatic changes to its supply-chain network, reductions in availability of imported varieties, and complete pass through of the tariffs into domestic prices of imported goods. Using standard economic methods, they find that the full incidence of the tariff falls on domestic consumers. Fajgelbaum *et al.* (2019) also finds complete pass-through of the US tariffs to variety-level import

prices. UBS (2019), however, finds that among the 558 companies in China covered in its survey, by the end of April 2019, 10% had already cut down prices while 72% plan to decrease prices. The companies with less than 10% downward price adjustment accounted for 23% while those with 11-20% downward price adjustment accounted for 38%. In any case, either the US or Chinese consumers, or both, will bear the cost of increased tariffs.

The effect of the US-China bilateral tariffs on producers is more mixed, with some winners and many losers. The companies in the US and China that mainly focus on the domestic markets with imports affected by tariffs may benefit from the increase in tariffs, while exporters of the goods affected by the tariffs as well as producers that use those goods as intermediate inputs will mostly suffer from losses. Moreover, the competing third country exporters may benefit by increasing their exports to the US or China. For example, the US soybean farmers suffered, while those in Brazil benefited from trade diversion and market segmentation (IMF 2019a).

With regard to the effect on welfare, Amiti *et al.* (2019) finds that overall, the US real income will decline by $1.4 billion per month by the end of 2018. They also observe similar patterns for foreign countries that have retaliated against the US, which indicates that the trade war also affected the real income of other countries. Fajgelbaum *et al.* (2019), using a general equilibrium framework, finds that the annual consumer and producer losses from higher costs of imports were $68.8 billion, or 0.37% of the US GDP. After accounting for higher tariff revenue and gains to domestic producers from higher prices, the aggregate welfare loss was $7.8 billion, or 0.04% of the GDP. Even though the US tariffs favored sectors located in politically competitive counties, retaliatory tariffs offset the benefits to these counties. They find that tradable-sector workers in heavily Republican counties were the most negatively affected by the trade war.

V. Conclusions and Policy Implications

The analysis and findings in this paper show that macroeconomic factors are the major drivers of a country's aggregate current account balance and most of the changes in bilateral trade balance over the past two decades can also be explained by macroeconomic factors. Meanwhile, the trade data shows that imposing bilateral tariffs is not an effective way to address trade imbalance. The bilateral tariffs reduces trade flows between the US and China, while their bilateral trade surplus/deficit remained broadly unchanged and aggregate current account surplus/deficit of both countries continued to expand. In addition, the increased tariffs will have significant negative impacts on production, employment, productivity and welfare for the countries involved and for other economies through value chain links. While trade diversion might narrowly benefit some, the US, China and the global economy overall lose from the recently imposed trade restrictions. Heightened uncertainty and tighter financial conditions also add to the economic costs that arise from distorting

well-established global value chains. This suggests that unless there are changes in macroeconomic policies, targeting particular bilateral trade balance will likely only lead to trade diversion and offsetting changes in trade balance with other partners, leaving the country's aggregate balance little changed. Therefore, policy makers are well advised to carefully think about whether the tariffs can fulfill their original purpose. This paper hence would like to make the following policy suggestions:

First, both China and the US should focus on macroeconomic factors to address external imbalance so as to achieve a more sustainable economic development. The macroeconomic policies should be based on the economic structure, fundamentals and situations of the specific country. In general, excess deficit countries should adopt growth-friendly fiscal consolidation, while excess surplus economies need to deploy available fiscal space to promote growth and achieve rebalancing. With regard to structural policies, excess surplus countries should carry out reforms to encourage investment and discourage excessive savings including expanding the coverage of social safety nets, while excess deficit economies need to increase labor market flexibility and improve competitiveness of the tradable sector (IMF 2019d). In this regard, both China and the US should take measures, especially carry out structural reforms, to reduce the gap between savings and investment and correct distortions. In China, reforms should focus on facilitating the transition to a more sustainable growth, including by reducing subsidies for exporting sectors, tackling barriers to labor mobility, reforming state-owned enterprises, enhancing intellectual property protection and increasing spending on the social safety net, education, health, and employment insurance to discourage excessive household savings and boost consumption. This will be instrumental to address domestic imbalance and prevent a resurgence of external imbalance. For the US, the above measures suggested by IMF for excess deficit countries are all relevant. For instance, certain efforts, including growth-friendly fiscal consolidation, need to be made to narrow the gap between savings and investments, and policies should be put in place to incentivize labor supply among low-income households. It should focus on the capital-intense industries and improve the education of lower-class people, helping them find jobs that require higher skills.

Second, past experiences have clearly shown that multilateral reductions of tariffs and other non-tariff barriers will benefit trade and, over the longer term, improve economic outcomes. Hence, policymakers should avoid policies that distort trade, continue to promote free and fair trade and enhance efforts to reduce existing barriers to trade. Meanwhile, the rule-based multilateral international trade system should be modernized to capture the increasing importance of trade in services and e-commerce, strengthen rules in areas such as subsidies and technology transfer, and assure continued enforceability of WTO commitments through a revamped WTO dispute settlement system.

Finally, it is critical to recognize that trade liberalization can impose costly adjustment

for some groups of workers and communities, which has been evident in the US. Putting in place policies such as retraining and job search assistance programs, adequate social safety net, and redistributive tax-benefit systems can help ensure that gains from trade are more widely shared and individuals or groups left behind are adequately protected. Amid persistent inequality, increased focus on assuring that growth benefits all segments of society is essential. This would include adequate social spending to ensure high-quality and accessible education, health, and social safety net that protect vulnerable households and foster human development.

In this paper, the attempt to construct an econometric model enlightened by the gravity model with some modifications to analyze the relationship between China-US bilateral trade surplus and macroeconomic is to a large extent innovative. The findings and policy recommendations are very important because if consensus could be reached in this regard and both China and the US can implement appropriate structural reforms to address their bilateral trade imbalance, it would be very helpful in mitigating the current trade tensions between the two countries, which, I believe, is instrumental for maintaining a sustainable economic growth at both national and global levels. Meanwhile, it is also important to recognize the limitations of this paper, especially in that some macroeconomic factors such as demographics, culture and social safety net are difficult to proxy or measure. Also, given the relatively short period of time, the impacts of the US-China bilateral tariffs on trade, growth and welfare are still evolving. These will all be the areas of my future research.

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Appendix Model Test Results

Table 1. Stationary Test

Variables	T	1% level	5% level	P-value
ΔTB	-3.579973	-4.076860	-3.466966	0.0380
dΔTB	-3.855250	-4.076860	-3.466966	0.0186
Y_c	-1.667442	-4.078420	-3.467703	0.7564
dY_c	-3.587127	-4.078420	-3.467703	0.0374
E_u	-1.860936	-4.072415	-3.464865	0.6657
dE_u	-4.738534	-4.076860	-3.466966	0.0013
REER	-2.212325	-4.073859	-3.465548	0.4763
dREER	-7.043163	-4.073859	-3.465548	0.0000
Lev	-1.992301	-4.078420	-3.467703	0.5963
dLev	-3.839779	-4.078420	-3.467703	0.0194

Table 2. Optimal Lag Interval

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2157.25	NA	2.06e+17	54.05626	54.20514	54.11595
1	-1597.152	1036.183	3.20e+11	40.67879	41.57205	41.03692
2	-1492.062	181.2794	4.35e+10	38.67655	40.31420	39.33313
3	-1457.328	55.57432	3.47e+10	38.43320	40.81523	39.38823
4	-1361.547	141.2775	6.13e+09	36.66367	39.79008	37.91714
5	-1272.41	120.3352*	1.31e+09*	35.06024*	38.93103*	36.61215*

Table 3. Cointegration Test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	P-value**
None *	0.302134	82.36835	69.81889	0.0036
At most 1 *	0.242143	52.87064	47.85613	0.0157
At most 2 *	0.212324	30.13528	29.79707	0.0457
At most 3	0.085998	10.56442	15.49471	0.2398
At most 4	0.038164	3.190770	3.841466	0.0741
Unrestricted Cointegration Rank Test (Trace)				

Table 4. White Test

F-statistic	6.107179	Prob. F (14,70)		0.0000
Obs*R-squared	46.73646	Prob. Chi-Square (14)		0.0000
Scaled explained SS	76.01771	Prob. Chi-Square (14)		0.0000
Variable	Coefficient	Std. Error	t-Statistic	P-value
C	-72810.60	202261.9	-0.359982	0.7199
YC^2	-0.000259	0.000126	-2.057086	0.0434
YC*EU	0.000208	0.000253	0.822943	0.4133
YC*REER	0.049849	0.057809	0.862300	0.3915
YC*LEV	5.872542	5.231999	1.122428	0.2655
YC	-12.95549	9.339206	-1.387215	0.1698
EU^2	-5.08E-05	0.000106	-0.481610	0.6316
EU*REER	0.005026	0.057237	0.087805	0.9303
EU*LEV	2.956908	4.557951	0.648736	0.5186
EU	-1.688531	9.945665	-0.169776	0.8657
REER^2	-0.472168	15.13258	-0.031202	0.9752
REER*LEV	-999.5625	1522.767	-0.656412	0.5137
REER	447.2552	2783.320	0.160691	0.8728
LEV^2	-167014.7	72589.22	-2.300820	0.0244
LEV	276377.4	205821.6	1.342801	0.1837
R-squared	0.549841	Mean dependent var		2745.390
Adjusted R-squared	0.459809	S.D. dependent var		5292.335
S.E. of regression	3889.744	Akaike info criterion		19.52886
Sum squared resid	1.06E+09	Schwarz criterion		19.95992
Log likelihood	-814.9765	Hannan-Quinn criter.		19.70224
F-statistic	6.107179	Durbin-Watson stat		1.735502
Prob (F-statistic)	0.000000			
Dependent Variable: RESID^2；Method: Least Squares				