ISSN: 2288-2766 © 2017 EABEA. http://eajbe.jams.or.kr
doi: http://dx.doi.org/10.20498/eajbe.2019.7.1.27

A Study on the Determinants of Bilateral Trade : Evidence from China and US

Yugang He

Doctoral Candidate, Department of International Trade, Chonbuk National University, Jeollabuk-do, Korea
E-mail: 1293647581@jbnu.ac.kr

Received: February 25, 2019. Revised: March 6, 2019. Accepted: March 24, 2019.

Abstract

Purpose **–** Recently, the trade war between China and US has been escalating, which has also attracted worldwide attention. Based on this background, this paper sets China and US as an example to explore the determinants of bilateral trade between China and US.

Research design, date, and methodology **–** A quarterly data from the 2000-Q1 to the 2017-Q4 will be used to perform an empirical analysis under some econometric approaches such as the fully modified least squares and the vector error correction estimates.

Result **–** The results illustrate that the two economic entities of China and US have the greatest positive effect on bilateral trade between China and US. The real exchange rate has a positive effect on bilateral trade between China and US. The nominal exchange rate has a negative effect on bilateral trade between China and US in the short run. US's average price has a positive effect on bilateral trade between China and US in the short run. China's average price has a negative effect on bilateral trade between China and US in the short run. Meanwhile, the bilateral trade between China and US also suffers from the economic crisis happened in 2008. Even through the bilateral trade between China and US in the short run is deviate from the long-run equilibrium, there exist an error correction mechanism back to the long-run equilibrium.

Conclusion **–** This paper provides some empirical evidences for both governments. Based on the results of this paper, both governments should take corresponding measures to promote the development of bilateral trade between China and US.

Keywords: Bilateral Trade, Determinants, Econometric Approaches.

JEL Classification Code: F10, F31, G10.

1. Introduction

The bilateral trade is treated as an important channel to affect both countries' economies. Recently, one of the hottest topics about the bilateral trade is the trade war between China and US. This trade war has also attracted the attention and worry of all countries in the world and the discussion of experts and scholars. Based on this background, this paper sets China and US as an example to explore the determinants of bilateral trade between China and US. Then, a quarterly data from the 2000-Q1 to the 2017-Q4 will be used to perform an empirical analysis under some econometric approaches such as the fully modified least squares and the vector error correction estimates. The results of this paper show that the two economic entities of China and US have the greatest positive effect on bilateral trade between China and US. The real exchange rate has a positive effect on bilateral trade between China and US. The nominal exchange rate has a negative effect on bilateral trade between China and US in the short run. U.S.'s average price has a positive effect on bilateral trade between China and U.S. in the short run. China's average price has a negative effect on bilateral trade between China and U.S. in the short run. Meanwhile, the bilateral trade between China and U.S. also suffers from the economic crisis happened in 2008. Even through the bilateral trade between China and US in the short run is deviate from the long-run equilibrium, there exist an error correction mechanism back to the long-run equilibrium. According to these empirical results, some corresponding suggestions will be put forward so as to make the bilateral trade between China and US have a better development in the near future.

The arrangement of this paper will be shown as follows: Sector one provides the introduction which gives an overall concept of this paper. Sector two presents the literature review which reviews and organizes the achievements of previous scholars. Sector three offers the theoretical framework of this paper. Sector four processes the empirical analysis. Sector five offers the conclusion and purposes some corresponding suggestions.

2. Literature Review

Bilateral trade is a way for an economy to integrate into the world economy and has a profound impact on the sustainable development of a country's economy. However, the bilateral trade will be impacted by a lot of factors such as geographical location, natural resources, economic development levels and politics. It is these uncontrollable impacts on bilateral trade that inspire the interest of many experts and scholars to explore the mechanism that how these variables affect the bilateral trade. Due to different samples and approaches, their findings are also different.

Yeyati (2003) uses a gravity model to explore the impact of a common currency on bilateral trade. He finds that for a common currency pair consisting of unilateral dollarized countries, the link between the common currency and the bilateral trade flows is closer than that of the Monetary Union member states. Clark, Dollar and Micco (2004) examine the impact of port efficiency and maritime transport costs on bilateral trade. They find that the national inefficiencies associated with transportation costs have fallen from 25% to 75%, which means bilateral trade has increased by about 25%. In recent years, the scale of natural person movement has been expanding, becoming a new trend in the development of service trade in various countries. Song and Guo (2008) expand the basic gravity model to study the empirical impact of natural person flows on China's bilateral trade, and they find that there is a positive effect, but the impact is lower than the level of developed countries. Wu (2008) attempts to find the impact of institutional factor on bilateral trade of east Asia in terms of the trade gravity model. he finds that the banking and finance, government intervention, black market activity, capital flows and foreign investment, and monetary policy have an important impact on the export trade of east Asian economies. And the banking and finance, government intervention, property rights, and government burden have an important impact on the import trade of east Asian economies. Bahmani-Oskooee and Ratha (2008) propose another way to assess the impact of currency devaluation on bilateral trade flows. they find that in most cases, US trade flows are indeed sensitive to real exchange rates. Ye (2009) uses the cross-sectional data of the top 40 major trading partners to establish a bilateral trade gravity model so as to study the influencing factors of China's bilateral trade, especially the trade system factors. He finds that the country that has established the FTA with China belongs to the potential remodeling, the bilateral trade volume will be greatly affected by the financial crisis. In addition, the trade volume between China and other APEC member countries has also dropped significantly.

Meng (2010) tries to study the bilateral trade with 17 major trading partners. He concludes that the free trade zone has a positive effect on China's foreign trade. Huang (2011) examines the relationship between foreign direct investment and provincial international trade based on the trade gravity model with a panel data of China's 30 provinces and 26 countries or regions in 2007. His results show that the foreign direct investment and international trade are complementary. Egger and Larch (2011) evaluate through the structural analysis of the bilateral trade flow

model, the trade, gross domestic product and welfare effects of these agreements. they find that these agreements have had a major positive impact on the trade in goods between the EU-15 incumbents and ECE. Meanwhile, they induce the trade redirection from other countries. Feng, Liu and Liu (2012) use the monthly data from 1995 to 2009 to explore the impact of exchange rate on bilateral trade between China and U.S. Their findings show that the economic entities of China and US are the two factors which have most significant effect on bilateral trade between China and US. An appreciation of Renminbi will depress China's export to US. but its effect is much lower than that of economic entities of China and US. Dong and Whalley (2012) assess the use of two relevant values for the five major World Trade Zones, the general equilibrium trade model, and the potential consequences of Sino-US trade retaliation scenarios for trade flows and welfare. They find that the bilateral trade retaliation between China and the US will reduce China's trade surplus, and thus yield welfare gains to China. Li (2013) uses the trade gravity model to study the bilateral trade between China and Chile. He finds that the economic growth can promote the bilateral trade between China and Chile. Wang and Deng (2014) use the trade data of 31 countries and Regions to study on the impact of logistics infrastructure on bilateral trade. They find that the telecommunications and network infrastructure have a significant impact on bilateral trade. The port, aviation and road infrastructure contribute significantly to bilateral trade, but the impact of rail infrastructure is only partially effective. Zheng (2014) uses the constant market share model to decompose the bilateral trade growth factors for China-India bilateral overall trade and segmentation product trade. He finds that the scale effect has always been the dominant factor in promoting the bilateral trade growth. The scale effect of China's export growth to India is manifested in industrial manufactured goods, and the competitive impact of primary products is becoming more significant. Shang and Cui (2014) try to exploit the impact of cultural distance on bilateral trade between China and CEE countries based on revised trade gravity model. They find that the cultural distance has a significant impediment to bilateral trade in goods between China and Central and Eastern European countries. With the development of economic globalization. the cultural distance has a significant decline in the degree of impact on China's import trade with 15 countries in Central and Eastern Europe. Baek (2014) investigates the impact of exchange rate fluctuations on trade between South Korea and the US by considering the effects of exchange rate fluctuations and third-country effects. They find that South Korea's major export industries have a high degree of reaction to bilateral exchange rates, volatility and third-country effects in the long-term and short-term.

Wang, Wang and Wang (2015) examine the impact of investment environment on bilateral trade between China and CEE countries based on revised trade gravity model. Their finding show that the investment environment has a positive impact on imports and exports, but the impact is slightly different. Zhou (2015) attempts to study the impact of currency swap on bilateral trade between China and South Korea based on the trade gravity model. He finds that the impact of currency swaps on trade between China and South Korea is not significant. Chen (2016) modifies and optimizes the classic trade gravity model. And the variables such as currency swap amount and exchange rate are added. Based on the revised model, he tests the impact of China-Korea currency swap on trade between two countries. His result is not significant, but the result can not completely negate the impact of currency swaps. Guo and Wu (2016) analyze the domestic production factors used in the bilateral trade between China and Japan from 1995 to 2009. they find that the proportion of high-tech labor in the domestic production factors used by Japan's exports to China is higher than that of China's exports to Japan. This situation is particularly significant in bilateral manufacturing trade and final product trade between China and Japan. Pham, Lovely and Mitra (2017) try to study the relationship between home-market effect and bilateral trade patterns. They find that the HME evidence goes away when they estimated the difference in the differential gravity model on the censored sample of the positive trade stream.

These papers that have been analyzed above attempt to examine how some variables such foreign direct investment, exchange rate and something else affect the bilateral trade. Setting their researches as a foundation, this paper sets China and U.S. as an example to explore the determinants of bilateral trade between China and US both in the short run and long run. Meanwhile, this is also one of the most significant innovations in this paper.

3. Methodology

Trade balances are also known as "net export" or "tangible trade balances. it is the most important item in the entire balance of payments. It reflects the income and expenditure of the import and export trade of commodities, in which the export revenue of goods is recorded in the credit side, and the import expenditure of goods is recorded in the borrower. The trade balance reflects the trade situation between countries and it is an important indicator for judging the operation of the macroeconomy. Simply speaking, the trade balance is the difference between export and import.

The trade balance between China and US gives:

$$bt_t = ex_t - im_t \quad (1)$$

Where bt indicates the trade balance between China and US; ex indicates the total amount of China's export; indicates the total amount of China's import.
The total amount of China's export gives:

$$ex_t = vim_t \bullet p_t^c \quad (2)$$

Where vex indicates the volume of China's export; p^c indicates the China's export price.
The total amount of China's import gives:

$$im_t = vim_t \bullet p_t^{us} \quad (3)$$

Where vim indicates the volume of China's import; p^{us} indicates the US's export price.
The nominal exchange rate between China and US gives:

$$E_t^n = \frac{p_t^c}{p_t^{us}} \quad (4)$$

Where E^n indicates the nominal exchange rate between China and US.
Combing equation (1), equation (2), equation (3) and equation (4) gives:

$$bt_t = vex_t \bullet p_t^c - vim_t \bullet E_t^n \bullet p_t^{us} \quad (5)$$

Taking the partial derivative of to E^n gives:

$$\frac{\partial bt_t}{\partial E_t^n} \bullet \frac{E_t^n}{vex_t p_t^c} = \frac{\partial vex_t}{\partial E_t^n} \bullet \frac{E_t^n}{vex_t} - \frac{\partial vim_t}{\partial E_t^n} \bullet \frac{E_t^n}{vim_t} \bullet \frac{vim_t E_t^n p_t^{us}}{vex_t p_t^c} - \frac{vim_t E_t^n p_t^{us}}{vex_t p_t^c} \quad (6)$$

Rewriting equation (6) gives:

$$\frac{\partial bt_t}{\partial E_t^n} \bullet \frac{E_t^n}{vex_t p_t^c} = \alpha + |\beta| \frac{vex_t E_t^n p_t^{us}}{vex_t p_t^c} - \frac{vex_t E_t^n p_t^{us}}{vex_t p_t^c} \quad (7)$$

Where α is equal to $\frac{\partial vex}{E^n} \bullet \frac{E^n}{vex}$; β is equal to $\frac{\partial vim}{E^n} \bullet \frac{E^n}{vim}$.

The trade equilibrium gives:

$$bt_t = ex_t - im_t = 0 \quad (8)$$

Based on equation (8), rewriting equation (7) gives:

$$\frac{\partial bt_t}{\partial E_t^n} \bullet \frac{E_t^n}{vex_t p_t^c} = \alpha + |\beta| - 1 \qquad (9)$$

If the absolute sum of the price elasticity of export and the price elasticity of import is greater than one, the trade surplus will occur. Namely, China's currency will be depreciated. Since the elasticity of China's import and export in the short run are sticky, equation (9) will not hold in the short run. Due to that the substitution effect will increase the elasticity of China's import and export in the long run are flexible, equation (9) will hold in the long run. Said differently, the impact of the depreciation of the China's currency on China's trade balance is changing over time. China's trade surplus will be reduced in the short run. Over time, China's trade surplus will begin to increase.

The trade equilibrium is the precondition for the folding of equation (9). since China has been running a trade surplus with the United States of America, the increase of China's trade surplus caused by the China's currency depreciation does not need the elasticity of China's import and export to satisfy the equation (9). Meanwhile, the in-satisfaction of equation (9) also does not indicate that the depreciation of China's currency must lead to a decrease in China's trade surplus. This point is also a purpose of this paper, which will be verified in the section four.

The model used in this paper gives:

$$\begin{bmatrix} ex_t \\ im_t \\ bt_t \end{bmatrix} = c_{i,t} + \alpha_{1i} \log gdp_{i,t}^c + \alpha_{2i} \log gdp_{i,t}^{us} + \alpha_{3i} \log E_{i,t}^n + \alpha_{4i} D_{2008} + \varepsilon_{i,t} \qquad (10)$$

Where c indicates the constant; E^r indicates the real exchange rate between China and US in terms of China's currency; gdp^c indicates China's GDP; gdp^{us} indicates US's GDP; D_{2008} indicates the dummy variable (the reason why this variable puts into this model is to explore the shock of global economic crisis in 2008 on trade between China and US. Before the year of 2008, the value of it is zero. Otherwise, the value of is one); α indicates the coefficient; i indicates ex, im and bt. ε indicates the white noise. The real exchange rate gives:

$$E_t^r = E_t^n \bullet \frac{p_t^{us}}{p_t^c} \qquad (11)$$

Putting equation (11) to equation (10) gives:

$$\begin{bmatrix} ex_t \\ im_t \\ bt_t \end{bmatrix} = c_{i,t} + \alpha_{1i} \log E_t^n + \alpha_{2i} \log gdp_{i,t}^c + \alpha_{3i} \log gdp_{i,t}^{us} + \alpha_{4i} D_{2008} + \alpha_{5i} \log p_{i,t}^{us} + \alpha_{6i} \log p_{i,t}^c + \varepsilon_{i,t} \qquad (12)$$

Where all notations are the same as mentioned above.

4. Empirical Analysis

4.1. Basic Statistics

The quarterly data from the 2000-Q1 to the 2017-4Q will be used to perform an empirical analysis. There are ten variables (China's export to United States of America, China's import from United States of America, trade balance between China and United States of America, China's GDP, nominal exchange rate, United States of America' average price, China's average price, China's GDP, real exchange rate and economic crisis happened in 2008 as a dummy variable) used to explore their impacts on bilateral trade between China and United States of America, respectively. All these data are collected from the National Bureau of Statistics of China, the FRED Economic Data and U.S. Bureau of Economic Analysis. These variable used in this paper will be taken the logarithm so as to decrease the heteroscedasticity and remove the outliers. The reason is that this kind of process can increase the model's fit and it also can make our estimation more accurate. The basic statistics of these variables show in <Table 1>.

Table 1: Basic Statistics

Statistics / Variable	Mean	Median	Maximum	Minimum	Std. Dev
$\log gdp^c$	3.640	3.690	4.054	3.115	0.261
$\log E^n$	0.255	0.234	0.316	0.186	0.051
$\log ex$	1.702	1.787	2.048	1.104	0.303
$\log im$	1.262	1.303	1.615	0.706	0.288
$\log p^c$	2.000	1.525	6.691	-1.194	2.011
$\log p^{us}$	0.535	0.539	2.195	-2.829	0.718
$\log gdp^{us}$	4.188	4.192	4.261	4.111	0.041
$\log bt$	1.503	1.621	1.849	0.816	0.318
$\log E^r$	0.255	0.234	0.316	0.816	0.051
D_{2008}	0.556	1.000	1.000	0.000	0.500

<Table 1> intuitively indicates the basic statistics (mean, median, maximum, minimum and standard deviation) of these variables used in this paper.

4.2 Unit Root Test

When using the economic variables to perform a regression, the spurious regression often occurs due to the nonstationary of these economic variables. Therefore, before conducting a regression, the stationarity must be tested. In this paper, based on the research of He (2018), the Augmented Dickey Fuller (ADF) Test will be used to test the stationarity of these variables. The results of Augmented Dickey Fuller Test show in <Table 2>.

As <Table 2> illustrates, we find that these variables used in this paper are not stationary at 5% significant level due to that the absolute value of t-Statistic is less than that of 5% test critical value. However, if these variables are conducted the first difference, these variables used in this paper become stationary at 5% significant level due to that the absolute value of t-Statistic is greater than that of 5% test critical value.

Table 2: Results of Unit Root Test

Variable	(C, T, L)	t-Statistic	5% Test critical value	Prob.*
$\log gdp^c$	(c, T, 8)	-2.525	-3.482	0.311
$\log E^n$	(c, T, 1)	-1.550	-3.475	0.802
$\log ex$	(c, T, 5)	-2.385	-3.479	0.384

$\log im$	(C, T, 1)	-1.576	-3.475	0.793
$\log p^c$	(C, T, 9)	-2.210	-3.484	0.476
$\log p^{us}$	(0, 0, 3)	-1.751	-1.946	0.079
$\log gdp^{us}$	(C, T, 1)	-1.642	-3.475	0.766
$\log bt$	(C, T, 5)	-3.006	-3.479	0.138
$\log E^r$	(C, T, 1)	-1.550	-3.475	0.802
$\Delta \log gdp^c$	(c, T, 7)	-4.195	-3.483	0.000
$\Delta \log E^n$	(c, 0, 0)	-2.975	-2.904	0.042
$\Delta \log ex$	(c, T, 4)	-5.325	-3.479	0.000
$\Delta \log im$	(c, T, 3)	-4.954	-3.478	0.001
$\Delta \log p^c$	(C, T, 11)	-5.200	-3.488	0.000
$\Delta \log p^{us}$	(C, T, 2)	-9.605	-3.477	0.000
$\Delta \log gdp^{us}$	(C, T, 0)	-6.018	-3.475	0.000
$\Delta \log bt$	(C, T, 0)	-6.018	-3.475	0.000
$\Delta \log E^r$	(C, T, 4)	-3.910	-3.479	0.017

Note: Δ indicates the difference operator; C indicates the constant; T indicates the trend; L indicates the lag.

4.3. Long-run Effect

In econometrics, there are a menu of approaches to explore the long-run relationship among economic variables. Commonly, the Engle-Granger two-step method, the Johansen test, the Phillips–Ouliaris cointegration test will be used to conduct a long-run relationship among economic variables. As a matter of fact, these approaches still exist some insurmountable sufferings that will affect the accuracy of the estimated results. due to this reason and based on the research of He (2018), the fully modified least squares will be employed to perform the long-run relationship among $\log gdp^c$, $\log E^n$, $\log ex$, $\log im$, $\log p^c$, $\log p^{us}$, $\log bt$ and $\log E^r$. The results of estimation of fully modified least squares gives in <table 3>.

<Table 3> indicates the long-run relationship among $\log gdp^c$, $\log E^n$, $\log ex$, $\log im$, $\log p^c$, $\log p^{us}$, $\log bt$ and $\log E^r$. Overall, the greatest shock to the bilateral trade between China and US is from US's economic entity. Stated more generally, in terms of model 1, model 2 and model 3, When China's GDP increases by 1%, China's exports to US will increase by 0.871% and China's imports from US will increase by 0.288%, the trade balance between China and US will increase by 0.514% as well; US's GDP increase by 1%, China's exports to US will increase by 4.608%. China's imports from US will increase by 5.276%, the trade balance between China and US will increase by 6.147%; The real exchange rate increases by 1%, China's exports to US will increase by 0.487%. China's imports from US will increase by 0.135%, the trade balance between China and US will increase by 0.248%; <Table 3> also shows that the economic crisis happened in 2008 has a negative effect on trade balance between China and US.

Table 3: Estimates of Fully Modified Least Squares

Dependent Variable / Independent Variable	Model 1 $\log ex_t$	Mode2 $\log im_t$	Model 3 $\log bt_t$	Model 4 $\log ex_t$	Model 5 $\log im_t$	Model 6 $\log bt_t$
$\log gdp_t^c$	0.817*** (0.108) [7.656]	0.288*** (0.080) [3.364]	0.514*** (0.131) [3.924]	0.757*** (0.138) [5.474]	0.127*** (0.031) [4.097]	0.117*** (0.018) [6.501]
$\log E_t^n$				0.732*** (0.117) [6.256]	0.272*** (0.035) [7.771]	0.109** (0.041) [2.659]
$\log p_t^{us}$				0.022* (0.011) [1.883]	0.065*** (0.013) [5.003]	0.031* (0.016) [1.964]
$\log p_t^c$				-0.007* (0.005) [-1.360]	-0.011*** (0.003) [-3.225]	-0.045 (0.041) [-1.098]
$\log gdp_t^{us}$	4.608*** (0.630) [7.314]	5.276*** (0.465) [11.340]	6.147*** (0.911) [6.748]	9.323*** (0.778) [11.989]	4.551*** (0.530) [8.581]	3.209*** (0.906) [3.542]
$\log E_t^r$	0.487*** (0.121) [4.025]	0.135* (0.085) [1.588]	0.248** (0.078) [3.179]			
D_{2008}	-0.070*** (0.011) [-6.364]	-0.021** (0.008) [-2.625]	-0.110* (0.065) [-1.689]	-0.067*** (0.017) [-3.941]	-0.012*** (0.003) [4.001]	-0.110* (0.064) [1.724]
c	-4.108* (2.314) [1.775]	-2.109 (0.221) [-9.533]	-5.326*** (0.412) [-12.917]	-3.970*** (0.372) [-10.674]	-1.759*** (0.254) [-6.936]	-5.298*** (0.507) [-10.443]
R^2	0.971	0.982	0.956	0.973	0.985	0.959

Note: () indicates the standard error; [] indicates the t-statistics; * indicates 10% significant level; **indicates 5% significant level; *** indicates 5% significant level.

With regarding to model 4, model 5 and model 6, the performance of China's GDP, US's GDP and shock of economic crisis happened in 2008 is the same as that of model 1, model 2 and model 3 except the shock's magnitude. In this paper, we break down the real exchange rate into three parts including China's average price, US's average price and nominal exchange rate. Said in details, the nominal exchange increase by 1%, China's exports to US will increase by 0.732%. China's imports from US will increase by 0.272%, the trade balance between China and US will increase by 0.109%; US's average price increases by 1%, China's exports to US will increase by 0.022% (it only gets through the 10% significant level). China's imports from US will increase by 0.065%, the trade balance between China and US will increase by 0.031%, which also only gets significant test at 10% level; China's average price increases by 1%, China's exports to US will decrease by 0.007% (but also only significant at 10% level). China's imports from US will decrease by 0.011%, the trade balance between China and US will decrease by 0.045%, which does not get through the significant test.

In summary, the biggest factor affecting the bilateral trade between China and US is the economic entity of China and US in the long run. Even through the exchange rate and economics crisis happened in 2008 also can affect the bilateral trade between China and US, their impacts are much less than that of two countries' economic entity.

4.4. Short-run Effect

As policy makers, they not only pay attention to the long-run impact of various factors on bilateral trade between China and US, they are also concerned about another issue, namely, the short-run impact of various factors on

bilateral trade between China and US as well as the rate of return to long-run equilibrium after suffering from short-run shocks of various factors on bilateral trade between China and US.

In this paper, the vector error correction model will be employed to explore the short-run impact of various factors on bilateral trade between China and the United States of America. Before we conduct a vector error correction estimates, we should select the optimal lag so as to keep the accuracy of our estimates. the estimated results show in <Table 4>.

Table 4: Selection of Optimal Lag

Model 6			Model 7			Model 8		
lag	AIC	SC	lag	AIC	SC	lag	AIC	SC
0	-8.477	-8.250	0	-9.183	-8.957	0	-7.910	-7.683
1	-25.357	23.544	1	-25.623	-23.810*	1	-24.227	-22.414
2	-27.153*	-23.753*	2	-27.204*	-23.804	2	-26.033*	-22.633*
3	-26.963	21.976	3	-26.717	-21.731	3	-25.868	-20.882
Model 9			Model 10			Model 11		
lag	AIC	SC	lag	AIC	SC	lag	AIC	SC
0	-14.242	-14.080	0	-14.850	-14.688	0	-13.686	-13.524
1	-29.261	-28.290	1	-29.055	-28.084*	1	-28.522	-27.550
2	-30.445*	-28.665*	2	-29.821*	-28.040	2	-29.652*	-27.871*
3	-30.116	-27.526	3	-29.418	-26.828	3	-29.422	-26.832

Note: AIC indicates the Akaike information criterion; SC indicates Schwarz information criterion. * indicates lag order selected by the criterion.

According to results of <Table 4>, it can be found that lag two is optimal based on AIC and SIC. Then, the vector error correction model with two lags gives:

$$\begin{bmatrix} \Delta ex_t \\ \Delta im_t \\ \Delta bt_t \end{bmatrix} = c_{i,t} + \sum_{j}^{2} a_{1i} \log gdp_{i,t}^{c} + \sum_{j}^{2} \alpha_{i,t} \log gdp_{i,t}^{us} + \sum_{j}^{2} \alpha_{i,t} \log E_{i,t}^{r} + \alpha_{4i} D_{2008} + \lambda ecm_{t-1} + \varepsilon_{i,t} \quad (13)$$

Where equation (13) is the short-run relationship with real exchange rate.

$$\begin{bmatrix} \Delta ex_t \\ \Delta im_t \\ \Delta bt_t \end{bmatrix} = c_{i,t} + \sum_{j}^{2} a_{1i} \log E_{t-j}^{n} + \sum_{j}^{2} \alpha_{2i,t} \log gdp_{t-j}^{\delta} + \sum_{j}^{2} \alpha_{3i,t} \log gdp_{t-j}^{\delta} + \alpha_{5i} D_{2008} + \sum_{j}^{2} \alpha_{6i,t} \log p_{t-j}^{us} + \sum_{j}^{2} \alpha_{7i,t} \log p_{t-j}^{c} + \lambda ecm_{t-1} + \varepsilon_{i,t} \quad (14)$$

Where equation (14) is the short-run relationship with nominal exchange rate. The results of vector error correction estimates show in <Table 5>.

Table 5: Vector Error Correction Estimates

Dependent Variable / Independent Variable	Model 7 $\Delta \log ex_t$	Mode 8 $\Delta \log im_t$	Model 9 $\Delta \log bt_t$	Model 10 $\Delta \log ex_t$	Model 11 $\Delta \log im_t$	Model 12 $\Delta \log bt_t$
ecm_{t-1}	-0.083*** (0.017) [-4.882]	-0.048*** (0.015) [-3.201]	-0.025*** (0.007) [-3.571]	-0.041*** (0.011) [-3.727]	-0.034** (0.013) [-2.615]	-0.067*** (0.022) [-3.045]

$\Delta \log ex_{t\text{-}1}$	-0.398*** (0.130) [-3.060]			-0.219*** (0.065) [-3.369]	-0.167*** (0.042) [-3.976]	-0.137*** (0.033) [-4.152]
$\Delta \log ex_{t\text{-}2}$	-0.071*** (0.023) [-3.087]			0.089** (0.037) [2.405]	0.248 (0.201) [1.234]	0.058*** (0.015) [3.867]
$\Delta \log im_{t\text{-}1}$		-0.366** (0.161) [-2.273]				
$\Delta \log im_{t\text{-}2}$		-0.040 (0.031) [-1.290]				
$\Delta \log bt_{t\text{-}1}$			-0.258* (0.133) [-1.940]			
$\Delta \log bt_{t\text{-}2}$			-0.073*** (0.022) [-3.318]			
$\Delta \log gdp^{c}_{t-1}$	0.397*** (0.112) [3.545]	0.893*** (0.156) [5.724]	0.585*** (0.141) [4.149]	0.878*** (0.139) [6.317]	0.326** (0.160) [2.038]	0.813*** (0.124) [6.556]
$\Delta \log gdp^{c}_{t-2}$	0.146*** (0.029) [5.034]	0.509*** (0.132) [3.856]	0.695*** (0.115) [6.043]	0.452** (0.201) [2.249]	0.526*** (0.171) [3.076]	0.778*** (0.202) [3.842]
$\Delta \log E^{n}_{t-1}$				-0.110*** (0.033) [-3.333]	-0.092** (0.045) [-2.045]	-0.035*** (0.011) [-3.182]
$\Delta \log E^{n}_{t-2}$				0.047* (0.024) [1.958]	-0.023** (0.011) [-2.091]	0.025** (0.009) [2.083]
$\Delta \log p^{us}_{t-1}$				0.031** (0.015) [2.067]	0.048** (0.018) [2.667]	0.093*** (0.021) [4.429]
$\Delta \log p^{us}_{t-2}$				0.019 (0.013) [1.462]	0.032*** (0.008) [4.001]	0.018 (0.016) [1.126]
$\Delta \log p^{c}_{t-1}$				-0.078*** (0.017) [-4.588]	-0.027*** (0.008) [-3.376]	-0.061*** (0.013) [-4.692]
$\Delta \log p^{c}_{t-2}$				-0.077** (0.036) [-2.139]	-0.031 (0.029) [-1.069]	-0.207** (0.089) [-2.326]
$\Delta \log gdp^{us}_{t-1}$	2.463*** (0.542) [4.543]	2.040*** (0.614) [3.320]	2.457*** (0.746) [3.292]	2.011*** (0.561) [3.586]	1.652** (0.622) [2.657]	2.033*** (0.790) [2.574]
$\Delta \log gdp^{us}_{t-2}$	1.332** (0.542) [2.407]	1.806*** (0.614) [2.992]	0.618*** (0.203) [3.044]	1.021*** (0.325) [3.142]	1.721*** (0.592) [2.907]	1.358*** (0.421) [3.226]
$\Delta \log E^{r}_{t-1}$	0.125*** (0.032) [3.906]	0.157** (0.075) [2.093]	0.285** (0.135) [2.112]			

$\Delta \log E^r_{t-2}$	0.461 (0.311) [1.482]	0.398 (0.213) [1.869]	0.239*** (0.052) [4.596]			
D_{2008}	-0.689*** (0.131) [-5.260]	-0.362*** (0.112) [-3.232]	-0.559*** (0.135) [-4.141]	-0.416** (0.193) [-2.155]	-0.358** (0.175) [-2.046]	-0.498*** (0.117) [-4.256]
c	0.134*** (0.018) [7.445]	0.986*** (0.301) [3.276]	0.147 (0.009) [1.485]	0.638*** (0.151) [4.225]	0.632*** (0.163) [3.877]	0.765*** (0.207) [3.696]
R^2	0.664	0.987	0.986	0.734	0.738	0.986

Note: () indicates the standard error; [] indicates the t-statistics; * indicates 10% significant level; ** indicates 5% significant level; *** indicates 5% significant level.

<Table 5> indicates the short-run relationship among $\log gdp^c$, $\log E^n$, $\log ex$, $\log im$, $\log p^c$, $\log p^{us}$, $\log bt$ and $\log E^r$. In the short run, China's GDP and US's GDP still have the greatest effect on bilateral trade between China and US. Meanwhile, the impact of US's GDP on bilateral trade between China and US is greater than that of China's GDP. The economic crisis happened in 2008 also has a negative effect on bilateral trade between China and US. From model 7, model 8 and model 9, we find that the real exchange rate has a positive effect on bilateral trade between China and US. Said differently, 1% increase in the real exchange rate will lead to 0.125% increase in the China's exports to US in the lag one. one percent increase in the real exchange rate will lead to 0.157 percent increase in the China's imports from US in the lag one. one percent increase in the real exchange rate will lead to 0.285 percent increase in the trade balance in the lag one and 0.239 percent increase in the trade balance in the lag two. From model 10, model 11 and model 12, we can find that China's average price has a negative effect on bilateral trade between China and US. US's average price has a positive effect on bilateral trade between China and US. The nominal exchange rate has a negative effect on bilateral trade between China and US. As for error correction terms, their coefficients indicate the speed of explained variables return to long-run equilibrium. Even through all of them get through the significant test, the adjusting speed is relatively slower. Just as model 7 indicates, the coefficients of error correction terms are –0.083, -0.048 and –0.025. It means that the difference between real value of China's exports to US and long-run equilibrium value will be corrected in the nest period by 8.3%. The difference between real value of China's imports from US and long-run equilibrium value will be corrected in the nest period by 4.8%. The difference between real value of trade balance between China and US and long-run equilibrium value will be corrected in the nest period by 2.5%.

5. Conclusion

The economic globalization poses a good foundation for the development of bilateral trade. Meanwhile, the bilateral trade also can promote the economic globalization. In reality, there are a menu of factors such as politics and resources, which will affect two countries to conduct the bilateral trade. This paper treats China and US as an example to explore the determinants of bilateral trade between China and US in the short run and in the long run. The quarterly data from the 2000-Q1 to the 2017-Q4 will employed to conduct an empirical analysis under some econometric approaches such as fully modified least squares and vector error correction estimates. The results of this paper show that the two economic entities of China and US have the greatest effect on bilateral trade between China and US. The real exchange rate has a positive effect on bilateral trade between China and US. The nominal exchange rate has a negative effect on bilateral trade between China and US in the short run. US' s average price has a positive effect on bilateral trade between China and US in the short run. China's average price has a negative effect on bilateral trade between China and US in the short run. Meanwhile, the bilateral trade between China and US also suffers from the economic crisis happened in 2008. Even through the bilateral trade between China and US in the short run is deviate from the long-run equilibrium, there exist an error correction mechanism back to the long-run equilibrium.

According to the empirical analysis, some corresponding suggestions will be put forward. First, China and the US should increase their efforts to develop their economy so as to promote the bilateral trade between China and US. Second, China and US should strengthen their macroeconomic regulations and controls to cope with the impact of price and exchange rate factors on bilateral trade between China and US. Third, China and the United States of

America should establish some corresponding mechanisms to prevent unpredictable shocks on bilateral trade between China and US.

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