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Effects of U.S. Bilateral Trade with China on U.S. Economic Growth

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Abstract

It is widely seen exports could promote growth, while imports may hinder growth. Thus, the huge amount of U.S. trade deficit with China causes some tension between these two countries. This study investigates the possible effects of U.S. exports to China and U.S. imports from China on U.S. growth in the long run. By applying Autoregressive Distributed Lags Model and employing annual data from 1985 to 2016, we are able to show that the effects of U.S. bilateral trade with China on U.S. growth are distinct from the effects of U.S. total exports and imports. Further, although U.S. exports to China do not affect U.S. growth in the long run, U.S. imports from China may actually promote U.S. growth in the long run.

Keywords: ARDL model, U.S. bilateral trade with China, U.S. exports, U.S. growth, U.S. imports

1. Introduction

The growth in United States (U.S.) started slowing down since 2000 and it continues to be sluggish after the financial crisis. In the meantime, the amount of U.S. trade deficit unceasingly increases to about 750 billion dollar in 2016. Consequently, it causes quite some public's aversion to the imports from foreign countries. To the most public, U.S. losses more and more companies and jobs as U.S. imports more and more goods, which hinder growth. In contract, exports are beneficial for sustainable growth. This is quite misleading. Theoretically, both exports and imports could promote economic growth. In general, exports allow the firms to adopt the more advanced technologies and expand the size of the production. Both will lower the production costs per unit of output, increase productivity, yield positive externalities, encourage the competitiveness, and thus accelerate economic growth. As pointed out by the economic report from the U.S. department of Commerce (2014), there are three specific benefits of U.S. exports to foreign countries: U.S. Exports support additional jobs; jobs in Export-Intensive industries pay more; and firms that export can increase productivity. On the other hand, imports could increase productivity and boost growth for different reasons. First, imports may lower the costs of raw material and inputs, which will decrease the production costs, and stimulate growth. Second, imports can encourage domestic import-substituting firms to innovate in order to stay competitive in global economy. Third, by importing the goods that domestic country cannot produce efficiently, domestic firms can specialize in the goods with comparative advantage.

Previous literature about trade and growth roughly can be divided into three classes. For the first class, studies try to investigate the relationship between openness and economic growth. Andersen and Babula (2008) gave a good review of the literature in this class. As stated by Andersen and Babula (2008), the center argument in the studies in this class is how to measure openness. The openness is usually defined as the percentage of total trade to a country's Gross Domestic Product (GDP), while the more sophisticated indicator of openness could be a measure of trade policies; a measure of the protection level; and combination of different openness indicators. After reviewed the previous literature, Andersen and Babula (2008) concluded: "there is likely to be a positive relationship between international trade and economic growth". The second class of the literature focuses on the relationship between exports and economic growth. Many studies in this class employed cross-sectional data or time series data of developing countries. Numerous studies in this class were included in a review on the relationship between trade and growth by Hallaert (2006). To a developing or less developed country, export-led growth is an excellent strategy to promote economic growth. Thus, the majority of the studies in this class found the exports had a positive effect on growth, which was one of the conclusions by Hallaert (2006). However, there are some studies find that exports have insignificant or ambiguous effect on growth. Anyway, exports and imports could affect economic development differently in theory. Thus, the literature in the third class examines the possible influence of exports and imports on growth simultaneously. There is a lot of literature fall into the first two classes, but the empirical studies belong to the third class are very limited. Using data from 1980 to 2010, Mohsen (2015) examines the effect of exports and imports on the economic growth of Syria and concluded imports had the biggest effect on the GDP. Saaed and Hussain (2015) investigated the impact of exports and imports on the growth of Tunisia and they found "Imports are thus seen as the source of economic growth in Tunisia".

It is important to examine the effects of both exports and imports on U.S. growth given the slow economic expansion and large amount of trade deficit. However, the bilateral trade data and pattern of each country with U.S. are different. Moreover, each country also has its own trade policies with U.S. and has country-specific characteristics. Thus, different country's trade with U.S. may affect U.S. growth differently. The effects of bilateral trade may not be the same as the effects of aggregate trade on growth.

U.S. has largest trade deficit with China currently, which causes quite some tension between these two countries. U.S. trade deficit with China were 6 million dollar in 1985, which only counted about 0.005 percent of U.S. total trade deficit at that time. However, U.S. trade deficit with China increased to about 347 billion dollar and was about 46 percent of U.S. total trade deficit in 2016. As Morrison (2017) noticed, "some analysts contend that the large U.S. merchandise trade deficit with China indicates that the trade relationship is somehow unbalanced, unfair, and damaging to the U.S. economy".

Therefore, the purpose of this study is to investigate the effects of U.S. bilateral trade with China on the U.S. economic growth. To this end, Section 2 introduces the model and explains the estimation method. Section 3 presents the results, while Section 4 concludes.

2. Method

We apply Autoregressive Distributed Lags (ARDL) Model to carry out the empirical analysis for two reasons. First, ARDL works well when the observations are limited. Second, ARDL by Pesaran et al. (2001) does not require usual pre-unit root testing. Instead, Pesaran at al. (2001) calculated upper bound of critical values for F-test assuming all variables are integrated of order one and lower bound of critical values for F-test assuming all variables are integrated of order zero. Only when F-test is higher than the upper bound critical values, cointegration exists among the variables in the equation.

In order to investigate the possible effects of total U.S. exports and imports on its growth, the model is presented as follows:

$$LnY_t = a + bLnUSX_t + cLnUSM_t + \varepsilon_t \quad (1a)$$

where Y is U.S. national income, measured by its GDP. USX is U.S. total exports, while USM is U.S. total imports. All variables are in nominal terms. The data of U.S. GDP is collected from U.S. Bureau of Economic Analysis (BEA), while U.S. trade data is from the Foreign Trade Statistics by U.S. Census Bureau. If the coefficient of USX is positive and significant, it indicates total exports have positive impact on the growth, while if the coefficient of USM is positive and significant, it suggests total imports may have positive effects on the growth in the long run.

In order to investigate the effects of U.S. bilateral trade with China on U.S. growth, we consider the following modified model outlined by equation (1b):

$$LnY_t = a + bLnUSCX_t + cLnUSCM_t + \varepsilon_t \quad (1b)$$

USCX is U.S. exports to China, while USCM is U.S. imports from China. Both USCX and USCM are in nominal terms and are from the Foreign Trade Statistics by U.S. Census Bureau. Similarly, it indicates U.S. export to China has positive impact on U.S. growth if the coefficient of USCX is positive and significant, while it suggests U.S. import from China may have positive effects on U.S. growth if the coefficient of USCM is positive and significant.

Both equation (1a) and (1b) describe the long-run relationship among the variables. Following Pesaran et al. (2001), to carry out the testing procedure, we need to incorporate the short-run dynamic of (1a) and (1b), respectively, to carry out the empirical analysis. The short-run dynamic of (1a) takes the form of (2a) and the short-run dynamic of (1b) takes the form of (2b).

$$\Delta LnY_t = \alpha + \sum_{k=1}^{n} \beta_{0,k} \Delta LnY_{t-k} + \sum_{k=0}^{n} \beta_{1,k} \Delta LnUSX_{t-k} + \sum_{k=0}^{n} \beta_{2,k} \Delta LnUSM_{t-k} + \delta_0 LnY_{t-1} + \delta_1 LnUSX_{t-1} + \delta_2 LnUSM_{t-1} + \mu_t \quad (2a)$$

$$\Delta LnY_t = \alpha + \sum_{k=1}^{n} \beta_{0,k} \Delta LnY_{t-k} + \sum_{k=0}^{n} \beta_{1,k} \Delta LnUSCX_{t-k} + \sum_{k=0}^{n} \beta_{2,k} \Delta LnUSCM_{t-k} + \delta_0 LnY_{t-1} + \delta_1 LnUSCX_{t-1} + \delta_2 LnUSCM_{t-1} + \mu_t \quad (2b)$$

No matter for (2a) or (2b), the null hypothesis of no cointegration ($\delta_0 = \delta_1 = \delta_2 = 0$) against the alternative hypothesis of $\delta_0 \neq \delta_1 \neq \delta_2 \neq 0$ is tested. In order to justify cointegration among the variables in (2a) and (2b), we follow Pesaran at al. (2001) to carry out the F-test. The null hypothesis is rejected and the alternative hypothesis is accepted if and only if F-test is higher than the upper bound critical values, which suggesting cointegration among the variables in the equation.

3. Results

Annual data from 1985 to 2016 is employed for empirical analysis. Year 1985 is chosen because the U.S. bilateral trade data with China is only available from 1985 based on the Foreign Trade Statistics by U.S. Census Bureau.

In the empirical tests, we first carry out the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) testing for the unit root hypothesis among the variables. The results are reported in Table 1.

Table 1. DF and ADF Unit Root Test Results

DF and ADF Unit Root Test Results							
	DF	**ADF(1)**	**Critical Value**		**DF**	**ADF(1)**	**Critical Value**
LnUSX	-1.3498	-1.3231	-2.9798	DLnUSX	-4.7140	-3.6871	-2.9850
LnUSM	-1.5683	-1.5741	-2.9798	DLnUSM	-5.1941	-3.9901	-2.9850
LnY	-2.4737	-1.6555	-2.9798	DLnY	-2.7677	-2.5139	-2.9850
LnUSCX	-1.7316	-1.6953	-2.9798	DLnUSCX	-4.0546	-2.4077	-2.9850
LnUSCM	-4.0934	-3.1278	-2.9798				

Clearly, the test statistics for LnUSCM (-4.0934 and -3.1278) are less than the 95% published asymptotic critical value corresponding to ADF(0), -2.9798. Hence, LnUSCM has a unit root is firmly rejected. Since there is not possible to reject the null of unit root for LnUSX, LnUSM, LnY and LnUSCX, we continue to employ the DF and ADF tests for the first difference of each variable. The results are also reported in Table 1. The test statistics of DLnUSX, DLnUSM and DLnUSCM are all less than the corresponding critical value and the variable has unit root is rejected. The test statistics of DLnY are quite closer the critical value. Therefore, we are confident to proceed to ARDL empirical tests.

In order to apply ARDL, we impose 4 lags, then 6 lags on each first differenced variable and carry out the F-test. Table 2 reports the results of the calculated F-tests for the model with U.S. total exports and imports. Table 3 reports the results of the calculated F-tests for the model with U.S. bilateral trade with China. 95% upper bound and lower bound of critical values are also reported in the Table 2 and 3.

Table 2. The results of F-test for Model using U.S. Total Exports and Imports

Model Using Total U.S. Exports and Imports						
		4 Lags			**6 Lags**	
Calculated F-test		3.6061 (0.049)			2.9424 (0.200)	
F-statistics 95% Lower Bound		4.3272			4.3780	
F-Statistics 95% Upper Bound		5.4779			5.5531	
	AIC	**SBC**	**HQC**	**AIC**	**SBC**	**HQC**
Optimal Lags	(4,1,2)	(2,1,1)	(4,1,2)	(6,6,6)	(2,1,1)	(6,6,6)
F-test at Optimal lags	1.6428	1.0425	1.6428	3.5679	0.4549	3.5679
Ecm(-1)	-0.0534 (0.497)	-0.0103 (0.877)	-0.0534 (0.497)	0.4451 (0.172)	0.0027 (0.966)	0.4451 (0.172)

Note. The number inside the parenthesis is the probability of T-Ratio.

Table 3. The Results of F-test for Model Using U.S. Bilateral Trade with China

	Model Using U.S. Bilateral Trade with China					
		4 Lags			6 Lags	
Calculated F-test		1.1164 (0.384)			1.2257 (0.436)	
95% Lower Bound		4.3272			4.3780	
95% Upper Bound		5.4779			5.5531	
	AIC	**SBC**	**HQC**	**AIC**	**SBC**	**HQC**
Optimal Lags	(4,3,3)	(2,4,1)	(4,3,2)	(3,5,1)	(3,5,1)	(3,5,1)
F-test at Optimal lags	3.2224	10.5983	3.2268	9.7120	9.7120	9.712
Ecm(-1)	-0.1299 (0.033)**	-0.1734 (0.003)***	-0.1080 (0.055)*	-0.3045 (0.001)***	-0.3045 (0.001)***	-0.3045 (0.001)***

Note. The number inside the parenthesis is the probability of T-Ratio. * indicates 10% significance. ** indicates 5% significance. *** indicates 1% significance.

From Table 2, since the calculated F tests are all less than the lower bound critical values, cointegration among the variables is rejected. These results are preliminary because the lags are selected by random. Followed by Bahmani-Oskooee and Wang (2007), we continue with our empirical tests by choosing the appropriate number of lags on each variable. We use three different criteria to select the optimal number of lags. The three criterions are Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn Criterion (HQC). This means AIC, SBC, and HQC, respectively, is applied to select the optimum number of lags for each variable after imposing maximum number of lags on each first differenced variable in 2a and 2b.

The optimal lags and F-tests for the model with U.S. total exports and imports are reported in Table 2, while the results for the model with U.S. bilateral trade with China are reported in Table 3. As argued by Bahmani-Oskooee and Wang (2007), a negative and significant error correction term, Ecm(-1), is a good indicator of cointegration among the variables in the model. The results of Ecm(-1) for both models are also reported in Table 2 and 3, respectively.

From Table 2, when 4 lags are imposed on the each first differenced variable in equation 2a, the optimal lags selected based on AIC and HQC are (4, 1, 2), while the optimal lags selected based on SBC are (2, 1, 1). Clearly, from the Table 2, the F-test with optimal lags are all lower than the 95% upper bound critical values, while the error correction terms are all not significant. Both do not support cointegration among the variables in the model with U.S. total trade. It seems that either the total U.S. exports, imports or both are not important determinants of U.S. growth.

From Table 3, when 4 lags are imposed on the each first differenced variable in equation 2b, the optimal lags are not the same when different criterions are used. The optimal lags are (4, 3, 3) when lags are selected by AIC, (2, 4, 1) when lags are selected by SBC, and (4, 3, 2) when lags are selected by HQC. However, when 6 lags are imposed, the optimal lags are the same (3, 5, 1) regardless which criterion is used to select lags. More interestingly, unlike the model with U.S. total trade, the F-test at optimal lags for the model with U.S. bilateral trade with China are all greater than the 95% upper bound critical values except one case (4 lags by AIC), suggesting cointegration among the variables in the model with U.S. bilateral trade with China. Further, the error correction terms are all negative and significant, indicating cointegration among the variables.

Although it is lack of the proof of cointegration among the variables in the model with U.S. total trade, we still carry out the long-run estimation in order to compare results to the ones for the model with U.S. bilateral trade with China.

The long-run estimates for the model with total U.S. total exports and imports are in Table 4, while the long-run estimates for the model with U.S. bilateral trade with China are in Table 5.

Table 4. The Long-run Coefficient Estimates of Total U.S. Exports and Imports

Long-run Coefficient Estimates of Total U.S. Exports and Imports						
	4 lags AIC	**4 lags SBC**	**4 Lags HQC**	**6 Lags AIC**	**6 Lags SBC**	**6 Lags HQC**
LnUSX	-0.2068	0.1648	-0.2068	0.0939	-2.0117	0.0939
	(0.697)	(0.941)	(0.697)	(0.717)	(0.967)	(0.717)
LnUSM	0.6644	-0.0854	0.6644	0.6310	3.7649	0.6310
	(0.061)*	(0.986)	(0.061)*	(0.012)**	(0.959)	(0.012)**
INPT	10.2674	17.1911	10.2674	5.9157	-16.8811	5.9157
	(0.053)*	(0.795)	(0.053)*	(0.008)***	(0.976)	(0.008)***

Note. The number inside the parenthesis is the probability of T-Ratio. * indicates 10% significance. ** indicates 5% significance. *** indicates 1% significance.

Table 5. The Long-run Coefficient Estimates of U.S. Bilateral Trade with China

Long-run Coefficient Estimates of U.S. Bilateral Trade with China						
	4 lags AIC	**4 lags SBC**	**4 Lags HQC**	**6 Lags AIC**	**6 Lags SBC**	**6 Lags HQC**
LnUSCX	0.0324	0.0500	0.0029	0.0455	0.0455	0.0455
	(0.619)	(0.205)	(0.972)	(0.126)	(0.126)	(0.126)
LnUSCM	0.3056	0.3167	0.3451	0.3091	0.3091	0.3091
	(0.000)***	(0.000)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***
INPT	12.4251	12.0453	12.3029	12.1679	12.1679	12.1679
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***

Note. The number inside the parenthesis is the probability of T-Ratio. * indicates 10% significance. ** indicates 5% significance. *** indicates 1% significance.

From Table 4, the long-run coefficient estimates of total U.S. exports and imports when AIC is used to select lags are exactly same as the ones by HQC. This holds when 4 lags as well as 6 lags, respectively, are imposed on the first differenced variables in 2a. Obviously, the estimates of long-run coefficient of both US imports and intercepts carry positive sign and are significant, while the long-run coefficient of US exports are not significant when AIC or HQC is used to select the optimal number of lags. However, when SBC is used to select lags, the long-run coefficients are not significant no matter 4 lags or 6 lags are imposed. The results are mixed.

The main purpose of this study is to examine the effects of U.S. bilateral trade with China on U.S. growth. We turn our attention to the results of model 1b, where U.S. exports to China and U.S. Imports from China are the explanatory variables for U.S. growth.

From Table 5, the long-run estimates are very consistent when 4 lags are imposed regardless which criterion is used to select lags. The long-run estimates are exactly same when 6 lags are imposed irrespective the criteria for the selection of lags. Moreover, the long-run estimates with 4 lags are very similar to the ones with 6 lags. This is the evidence that the results are robust. Anyway, the estimates of long-run coefficients for U.S. imports from China are positive and very significant, while the estimates of long-run coefficient for U.S. bilateral exports to China are not significant. This suggests that in the long-run, U.S. exports to China do not affect U.S. growth, but U.S. imports from China actually encourage U.S. growth.

4. Conclusions

In the present study, we employ annual data from 1985 to 2016 and ARDL model to examine the effects of U.S. bilateral trade with China on U.S. growth.

It seems the effects of U.S. bilateral Tarde with China on U.S. growth are distinct from the effects of U.S. total exports and total imports. On one hand, the cointegration exists between U.S. output and U.S. bilateral trade with China, while there is no evidence of cointegration among the variables in the model with U.S. total exports and total imports. It suggests U.S. bilateral trade with China may affect U.S. growth and U.S. total exports and imports may not. On the other hand, even if we ignore no integration and carry out the estimation, the long-run results of the effects of U.S. total exports and imports on U.S. growth are mixed. However, the effects of U.S. bilateral trade with China on U.S. growth are consistent and robust. Specifically, our results suggest U.S. exports to China will not affect U.S. growth, while U.S. imports from China may actually boost U.S. growth in the long run.

The result is very interesting since this is not the common thoughts by the majority of the public. However, there are plausible explanations. As pointed out by Morrison (2017), U.S. runs trade surplus with China in services, but runs trade deficit with China in Merchandise. Most U.S. imports from China are labor-intensive products with low-value. This allows U.S. to specialize in the production of capital-intensive products. Therefore, U.S. may enjoy the benefits of comparative advantage and imports from China possibly encourage U.S. growth in the long run. Morrison (2017) further noticed U.S. imports more technologically advanced products from China in the last few year. Nevertheless, "China is often the final point of assembly for export-oriented multinational firms that source goods from multiple countries" (Morrison 2017) and the value added by China is minimum. Traditional trade data attributes nearly the full value of the product from China, which may "artificially inflates the size of the U.S. trade deficit with China" (Morrison 2017). Hence, the policymakers may want to realize the possible positive effects of U.S. imports from China on U.S. growth and be thoughtful about the policies regarding to U.S. imports from China. Further research may identify how the U.S. imports from China could promote the growth. Further research could also investigate the possible positive impacts of U.S. imports from China on specific factor productivity which leads to economic growth.

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