

The environmental Environmental effects Effects of trade Trade and FDI between Between Shandong Province of China and Japan

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Abstract: Based on the data of Shandong province of china during 1998-2017, this paper examines the environmental effects of trade and FDI from Japan from regional perspective. The cointegration equation indicates the export volume from Shandong province to Japan is positively correlated with the environment, while import and inward FDI are negative. But there is no evidence the inward FDI from Japan, the export and import have effects on the environment as they are not Granger causalities of the environmental measure. The power to protect environment comes from inside instead of outside. The government plays an important role in promoting environmental protection.

1. INTRODUCTION

Since reform and opening up to the world, the scale of foreign trade and inward foreign direct investment (FDI) in China has increased tremendously and made great contributions to economy development. In 2018, the total import and export volume reached to USD 4610.72 billion, increased by 9.7% than that of 2017, and the import and export increased by 12.9% and 7.1% respectively. In the same period, the inward FDI reached to USD 134.97 billion, increased by 3 % than that of 2017. Comparing to 2000, according to 1978 constant consumer price index, the total import and export value of 2018 increased about 65.18 times and the total inward FDI improved about 2.31 times. At the same time, Chinese environmental quality is facing unpredictable pollution issues. According to the Environmental Performance Index (EPI) report on global 180 countries published by Yale University and Columbia University in 2018, China ranked 177th, only surpassing three countries: India, Bangladesh and Nepal [1].

In fact, Chinese central government has already realized the importance of environmental protection to economy development. Lots of measures has been applied to promote environmental protection by central and local governments, such as increasing special rectification of environmental pollution, closing those high-energy-consuming enterprises legitimately and significant achievements have made. The present Environmental Performance Index is still at the bottom in the world, but at least China has already controlled the trend of further environmental deterioration. The total annual emissions of most pollutants have declined since 2010.

How to improve environmental quality is not only an issue Chinese government needs to consider, but also a focus of researchers and has got great attention. How the foreign trade and inward FDI affect environment rom regional perspective is the focus of this paper.

2. LITERATURE REVIEW

Many believe theoretically that international trade and FDI harm the environment and the most famous are the race-to-the-bottom hypothesis and the pollution haven hypothesis. The pollution haven hypothesis posits that, when large industrialized nations seek to set up factories or offices abroad, they will often look for the cheapest option in terms of resources and labor that offers the

land and material access they require. However, this often comes at the cost of environmentally unsound practices [2].

Some researchers remain positive attitude to the environmental effect of free trade and inward FDI. Jeffrey A. Frankel and Andrew K. Rose (2005) recognized the possibility of an effect which is called the gains-from-trade hypothesis. they argued if trade raises income, it allows countries to attain more of what they want, which includes environmental goods as well as more conventional output. Openness could have a positive effect on environmental quality [3]. Eiras and Schaeffer (2001) found: "In countries with an open economy, the average environmental sustainability score is more than 30 percent higher than the scores of countries with moderately open economies, and almost twice as high as those of countries with closed economies." [4]

Also, some researchers analyzed influencing factors on environmental effect of free trade and inward FDI. Akihiko Yanase (2010) believed countries cooperatively determine their environmental policies, autarky and free trade in the absence of trade costs generate the same optimal solution. By contrast, if environmental policies are determined noncooperatively, the effects of trade on global pollution and welfare are ambiguous [5]. KONG Shu-hong, ZHOU Tian-tian (2012) believe the pollution emissions from export production have had a huge negative impact on ecological environment, and the environmental pollution in the eastern region is even more serious [6].

From the above review, we can find that the effect of trade and inward FDI on the environment are still theoretically ambiguous, or Controversy. The main reasons lie possibly on different research scopes, different research methods and different period data applied, etc. China is a big country with complicated geographical features, natural endowments, and different economic development levels, so studying the environmental effect of the inward FDI and foreign trade from a specific area will make more sense.

Shandong province is one of the most developed regions in the east part of China and the total GDP, foreign trade volume, inward FDI have occupied a great share in the whole country and got great achievement. While at the same time, the serious environmental degradation is drawing more and more attention. So, the relationship between foreign trade and environmental effect in Shandong province is a worthy research subject. This paper is attempting to explore the environmental effect of trade and inward FDI between Shandong Province and Japan instead of using the aggregate inward FDI from the world to China.

3. CHOICE OF DATA

The time series during 1998-2017 of Shandong Province of China about Real Investment from Japan, the import and export between Shandong Province of China and Japan has been used. Environmental pollution is proxied by Industrial Wastewater. All original data comes from Shandong Provincial Bureau of Statistics net and Department of Commerce of Shandong Province net. The logarithmic transformation of the initial variables is applied to this analysis. Finally, we get the time series LNFDI, LNIMP, LNEXP, LNWAT. donating the FDI from Japan to Shandong province (hereafter simplified as FDI), the import and export between Shandong province and Japan (hereafter simplified as import and export), the annual industrial wastewater discharge of Shandong province respectively. The software Eviews6.0 is applied in this analysis.

4. Co-integration test of variables

4.1 Unit Root Test

The Augmented Dickey-Fuller Unit Root Test method is commonly used before cointegration test in order to avoid spurious regression and table1 shows the results.

From the results in Table1: at 5% significance level, the ADF Test Statistics of time series LNFDI, LNEXP, LNIMP and LNWAT are higher than their critical values, so all of the these five time series are not stationary. But, the first-order difference of all of the above five time series are

stationary. So LNFDI, LNEXP, LNIMP, LNWAT, and LMSO2 are the same stationary I (1) process, and it is reasonable to make further co-integration test among them.

Table1: Augmented Dickey-Fuller Unit Root Test Result (ADF test)

Variables	Test Type (C, T,K)	ADF Test Statistic	5% Critical Value	10% Critical Value	P- value
LNWAT	(C,T,0)	-1.123437	-3.029970	-2.655194	0.6839*
LNEXP	(C,T,0)	0.106358	-3.673616	-3.277364	0.9946*
LNIMP	(C,T,0)	-0.483395	-3.673616	-3.277364	0.9747*
LNFDI	(C,T,1)	-3.529582	-3.690814	-3.286909	0.0663*
DLNWAT	(C,T,0)	-3.850051	-3.040391	-2.660551	0.0102**
DLNEXP	(C,T,1)	-4.636713	-3.690814	-3.286909	0.0089**
DLNIMP	(C,T,0)	-5.688197	-3.690814	-3.286909	0.0013**
DLNFDI	(C,T,0)	-4.571718	-3.690814	-3.286909	0.0100**

Note: C, T and K in test type(C, T, K) denotes intercept, trend and the lagged differences included in the test equation respectively. * denotes the time series aren't stationary at 5% significance level. **denotes the time series are stationary.

4.2 Co-integration test

As the Johansen cointegration test is sensitive to the lag order number, so the VAR model is estimated to determine the optimal lag order number. According to the LR statistic, FPE, AIC ,SC and HQ information criteria, the optimal lag order number is 3.

The Johansen test method is applied to carry out the cointegration test, and the results are in table2.

Table2: Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.822772	58.17754	47.85613	0.0040
At most 1	0.479326	25.30145	29.79707	0.1509
At most 2	0.406538	12.90147	15.49471	0.1185
At most 3	0.145503	2.987603	3.841466	0.0839

Notes:Trace test indicates 4 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level

Trace test indicates there is 1 cointegrating equation at 5% level, so there is long-term stable equilibrium relationship among the variables. The cointegrating equation under Max-Eigenvalue is as the following:

$$LNWAT=0.9682LNEXP- 0.3196LNIMP-0.3001LNFDI$$

The relevant adjustment coefficients are 0.076609, 0.671653,0.405124 and -1.010805, which meet the requirement that at least one coefficient should be negative. So the cointegrating equation is effective. The positive coefficient of LNEXP in the equation indicates that export is adverse to the environment. But the negative coefficients of LNIMP and LNFDI indicate import and inward FDI have beneficial effects the environment.

5. Granger Causality Tests

According to the Granger causality test results in table3, all of the null hypothesis are rejected at the 5% level of significance. This finding suggests that LNEXP, LNIMP and LNFDI are not Granger Cause of LNWAT.

Table 3: VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: LNWAT			
Excluded	Chi-sq	df	Prob.
LNEXP	2.443535	2	0.2947
LNIMP	3.630031	2	0.1628
LNFDI	1.426890	2	0.4900

6. Conclusion and suggestion

Based on the data of Shandong province in china over 1998–2017 periods, applying wasted water as environmental effect measure, this paper examines the environmental impacts brought by inward FDI from Japan, the export and import between Shandong province and Japan on the environment respectively.

The cointegration equation indicates the export volume from Shandong province to Japan is positively correlated with the environment, while import and inward FDI are negative. But there is no evidence the inward FDI, the export and import have effects on the environment as they are not Granger causality of the environmental measure. Such result is different from that of KONG Shu-hong, ZHOU Tian-tian(2012) who believe the pollution emissions from export trade production have had a huge negative impact on the ecological environment, and the eastern region is even more serious. Then we can get conclusion that decreasing export to Japan will not beneficial to the environment, and increasing import and FDI from Japan also will not have much effect on environmental improvement. The force to improve environmental situation comes from inside instead of outside.

Chinese government has adopted lots of measures to prevent further deterioration of the environment and have got great achievements. The sulfur dioxide discharge of Shandong province began to fall after peaking in 1997, and industrial wastewater discharge has decreased since 2010. The University of Chicago's Energy Policy Research Institute recently published a report in 2018 saying that China's air quality has improved significantly, and China is winning a war against air pollution [14]. China's industrial development is under great pressure posed by the trend of reindustrialization of developed countries and homogenous competition among emerging economies. After US President Trump announced his withdrawal from the Paris Agreement and try to improve pollution-intensive industry to gain back more jobs, Chinese companies are facing more cost pressures. But, Under the complicated international political and economic conditions, for our sustainable development and people's welfare, our government should stick to our environmental protection policy. Externally, unite with more countries in the world to promote environmental protection. Internally, continue to promote industrial restructure adjustment; optimize export commodity structure; aggressively promote companies' technological innovation; and strictly enforce environmental protection laws and regulations.

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