

Analysis of the effects of logistics efficiency on trade and economic cooperation in APEC areas

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Abstract. In this study, the efficiency of logistics is as the research subject. It analyzes the influence to trades of the APEC areas and economic cooperation. Bilateral trade of two countries can increased by about 14.7% if the domestic efficiency of logistics increases 10%; and if the efficiency of logistics of the other countries increases 10%, can make the bilateral trade increased by about 17.4%. That is to say, the other country's logistics efficiency has a greater influence on the trade between the two countries. In order to promote the APEC international trade continued to expand and strengthen economic cooperation, we also should consider to provide truth support conforms to improve logistics efficiency for member countries, especially low level members.

Keywords: Logistics Performance Index; Gravity Model; APEC.

1. Introduction

Increased logistics costs between countries will have a great impact on the international trade model. Moreover, it's not only in the own country, but also the trade partners of logistics infrastructure and standards should be perfect together. Therefore, when proposing the policy proposal, it should consider the mutual influence between the APEC countries through the regional logistics efficiency in the trade economy. In particular, the APEC is made up of the developed countries, Medium level development and developing countries, which the economic scale of the countries are differences, so as to reduce the cost of trade, the logistics conditions will be different. This research will make an empirical analysis and Research on the development and investment of APEC to improve the infrastructure, such as transportation, roads, ports and other infrastructure in the area.

2. Logistics efficiency empirical analysis model and data

In order to analyze the effect of trade and economic cooperation, this paper use the gravity equation of national panel data between 2004~2015, take APEC21 as the object. APEC21 country's population is about 2 billion 790 million, accounting for 39.6% of the world's population. According to the data of 2015, APEC countries accounted for about 59% of world GDP, the world trade volume of about 51.2%, is worthy of the world economic center. Meanwhile APEC members are the main trade partners China economy.

The gravity model stipulates that the trade between the two countries is related to the GDP, the population, the area and so on, and the distance between the two countries, the cultural similarity and so on. And together with the consideration of distance, population, language, proximity and other geographical factors, to explain the scale of bilateral trade. That is to say, the bilateral trade between countries (import and export) is directly proportional to the GDP of the two countries, and is inversely proportional to the distance between the two countries. Whether the land borders, whether the common language will influence the amount of trade between the two countries, if the two countries bordering and use a common language, similar culture, the same way of life and thinking, so the two countries will increase the trading volume.

Bougheas et al. (2014), Hongzhi, Li, Gaojing Fang (2013) use logistics performance to analyze the effects of trade in their study. On the basis of this model, we use the logistics performance index (LPI) which can reflect the efficiency of bilateral trade in the two countries to analyze the effect of trade. The gravity model of the study have such advantages: by using panel data and time series data section,

we not only can use a particular point of view of the results, but also can also use the time series data from the analysis of panel data .This leads to a relationship with other variables, and also reduces the probability of multiple collinearity problems. In the panel data analysis, the random effects model and effect estimation fixed were analyzed.

In addition, The World Bank based on the survey of 155 countries measures the logistics performance indicators which is the most important in this study .LPI provides an international comparison of the system data, and play the score to the country's logistics infrastructure level and logistics efficiency .In this study, beyond the simple level of logistics infrastructure, we use the country's logistics performance indicators which are published by the world bank to reflect the efficiency of the logistics system , to analyze the effect of trade.

Empirical analysis in the use of variable data World Development Indicator of World Data bank and the world economic forum 2004-2005, 2011-2014 years of the global competitiveness report". The actual trade volume between the two countries used in the gravity model is derived from the trade statistics provided by IMF,GDP and population from the IMF's international financial statistics, The distance between countries, whether the land border, whether the use of common language, etc. from CEPII Research Center.

In addition, information on whether to conclude a free trade agreement is provided by RTA Database of WTO. Whether a trade agreement directly affects the volume of trade between the two countries, so as a measure of the outcome of the variables, its calculated values are statistically significant. If the value is positive (+), FTA plays a role in the expansion of trade, if the value is negative (-), the reduction in the volume of trade, it can be considered a trade conversion. In order to use LPI to analyze the trade effects, the gravity model equation is as follows.

$$\begin{aligned} \ln(\text{Trade}_{ijt}) &= c_0 + \beta_1 \ln(\text{GDP}_i + \text{GDP}_j)_t \\ &+ \beta_2 \ln\left(\frac{\text{GDP}_i \text{GDP}_j}{\text{Pop}_i \text{Pop}_j}\right)_t + \beta_3 \ln(\text{Dist})_{ij} \\ &+ \beta_4 \ln(\text{Area}_i \text{Area}_j)_t + \beta_5 (\text{Border})_{ij} \\ &+ \beta_6 (\text{comlang})_{ij} + \beta_7 (\text{RTA})_{ij} \\ &+ \gamma_1 \ln(\text{Efficiency})_i + \gamma_2 \ln(\text{Efficiency})_j \\ &+ \delta \text{YEAR}_t + e_{ijt} \end{aligned}$$

c_0 : Constant term

Trade_{ijt} : Actual trade volume between I countries and j countries in t year

GDP_{it} , GDP_{jt} : I, J country's GDP in t year

POP_{it} , POP_{jt} : I, J country's population in t year

Dist_{ij} : I, J country's distance in t year

Area_i , Area_j : I, J country's land area in t year

Border_{ij} : Whether the I country border j country dummy variable in t year (with border to be 1, without border to be)

comlang_{ij} : Whether the I country and the country of J use the same language dummy variable (Use the same language as 1, no 0)

RTA_{ijt} : Whether the virtual variables of regional trade agreements and free trade agreements between I countries and j countries in the year of T (Concluded a free trade or regional trade agreement was 1, not concluded as 0)

Efficiency_i , Efficiency_j : Logistics performance variables of I and j countries in t year

e_{ijt} : Error term

As Hongzhi Li, Gaojing Fang (2013) and Hoekman & Nicita (2014) pointed out that the analysis of influence of logistics variables on trade, if the log linear equation exclude the Country with no trade volume from the analysis object, the presumption of value will produce selection bias problem. So this study uses the nonlinear equation, and all the total number of data are two sided board data in 1676 countries. Table 1 is the basic statistics for the main variables used in the inference below.

Table 1 Statistical values of the variables used in the estimation

variables	average	standard deviation	maximum value	Minimum value
$\ln Trade_{ijt}$	7.870	2.554	13.338	-4.135
$\ln(GDP_i + GDP_j)_t$	14.678	1.091	17.166	11.807
$\ln(\frac{GDP_i GDP_j}{Pop_i Pop_j})_t$	14.627	1.417	17.255	9.429
$\ln(Dist)_{ij}$	8.903	0.799	9.889	5.754
$\ln(Area_i Area_j)_t$	26.367	3.428	32.769	13.467
$Border_{ij}$	0.050	0.218	1.000	0.000
$comlang_{ij}$	0.179	0.383	1.000	0.000
RTA_{ijt}	0.277	0.448	1.000	0.000
$\ln(Efficiency)_i$	1.203	0.159	1.435	0.863
$\ln(Efficiency)_j$	1.191	0.171	1.435	0.619

3. Empirical analysis of the results of interpretation and the role of economic cooperation

The following table 2 uses the gravity model of effect estimation random and the effect estimation fixed model of the estimated results. The results of the empirical analysis can be found that the results of the estimation of the variables used in the gravity model are consistent with the results of the theoretical model, showing statistical significance. The distance between the two countries and the area of the two countries are both negative (-), showing statistically significant. This shows that the farther away the two countries, the less trade between the two countries. In addition, real GDP, per capita real GDP, phase boundaries or not, whether to use a common language have shown a statistically significant, were positive (+) associated with the bilateral trade volume. Therefore, the higher the GDP, the higher per capita GDP, the bilateral trade between the countries will increase. In contrast, if the mainland close to dose not show statistically significant.

Further concrete observation can be found that the increase in GDP of 10% can make bilateral trade increased by about 11% in the random effect model. And the increase in per capita GDP of 10% can increase the volume of trade by about 1.3%. In fixed effects model, a 10% increase in the GDP can make bilateral trade volume increased by about 12%, while real per capita GDP is different from random effects, it will reduce the bilateral trade instead. In $Dist_{ij}$ is negative (-) coefficient values, and t values is -25.65, only 1% of significance, which go without a contrary hypothesis.

Whether the mainland close to do not show statistical significance. $Comlang_{ij}$ represents whether or not to use the common language, value is positive (+), statistics on 1% of the significance, showed a significant value. Conclusion of regional trade agreements among APEC countries is positive (+) value, statistically significant, random effects model manipulation trade volume increased by approximately 8.3%, fixed effects model manipulation trade volume increased by approximately 6.6%.(according to $[\exp(0.080)-1] \times 100$, $[\exp(0.064)-1] \times 100$)

In this study, logistics performance indicators (LPI) to measure the impact on bilateral trade logistics efficiency generated, which is expressed In Efficiency items, and represents the other country for logistics efficiency In Efficiency_j item. The estimated coefficient values are both positive (+) value, exhibited statistically significant. It is proved that the logistics performance impact on the country's trade, not only the country's logistics performance, the other country's logistics performance will have a major impact. Observation of the estimated value of the random effects model can be found that their logistics performance increase of 10%, so that bilateral trade can increase 14.7%. And logistics performance of other countries increased by 10%, it can make bilateral trade grew by about 17.4%. In the fixed effects model, we also obtained similar results. This shows that not only the own country's logistics performance, logistics performance of other countries also have an impact on bilateral trade. This result is similar to Li Hongzhi, and Fang GaoJing's (2013) study which the other country logistics performance greater than their impact on bilateral trade logistics performance results.

Table 2 trade facilitation effect on trade

variables	Random Effect	Fixed Effects
<i>c</i>	-14.178*** (-14.876)	-22.87** (-21.35)
$\ln(GDP_i + GDP_j)_t$	1.116*** (28.278)	1.214*** (32.77)
$\ln(\frac{GDP_i GDP_j}{Pop_i Pop_j})_t$	0.129*** (3.256)	-0.089** (-1.863)
$\ln(Dist)_{ij}$	-1.262*** (-25.650)	-
$\ln(Area_i Area_j)_t$	-0.074*** (5.606)	-
<i>Border</i> _{ij}	0.211 (1.293)	-
<i>comlang</i> _{ij}	0.264*** (3.069)	-
<i>RTA</i> _{ijt}	0.080*** (4.956)	0.064*** (12.01)
$\ln(Efficiency)_i$	1.470*** (15.516)	1.603*** (15.405)
$\ln(Efficiency)_j$	1.740*** (18.063)	1.789*** (16.705)
<i>R – squared</i>	0.750	0.625

Note: ***, **, *, respectively 1%, 5%, 10% of statistical significance, () is a t value

Such analysis results and the APEC (2013) "APEC supply network links framework implementation plan" put forward by the report content is consistent, can be said to be able to support the accord with the actual situation of each member state implementation plans. That is to say, this is in order to improve the supply network links, including logistics, transportation, energy and communications infrastructure, such as physical connection with the function of connection and system, procedures of consistency, such as institutional links, In addition to promote cooperation exchanges and assistance to developing countries to improve logistics performance. When concluded WTO/DDA negotiations was in trouble, APEC as a spontaneous cooperation organization can be a good demonstration, which is to promote the sustainable economic development of important enlightenment.

4. Conclusion

With gravity model variables used in the analysis of the results of estimation results consistent with the predictions of a theoretical model, showed statistically significant. In particular, the Logistics

Performance Indicators (LPI) to measure the impact on bilateral trade logistics efficiency generated In Efficiency_i term, and the other represents national logistics efficiency In Efficiency_j, the estimated coefficient values are both positive (+) value, performance the statistical significance. It is proved that the logistics performance impact on the country's trade, including not only the country's logistics performance, also including the other country's logistics performance. From the estimated value of the random effects model can be found, their logistics performance increase of 10%, so that bilateral trade can increase 14.7%, logistics performance of other countries increased by 10%, the bilateral trade increased by about 17.4%. This conclusion also shows that the APEC to promote the growing of international trade and economic cooperation continued to strengthen, it is necessary to take into account together member states, especially in countries with low level of development of the actual conditions, targeted to provide support to improve logistics performance. Not only that, the differences between developed countries and developing countries position, trouble exist in WTO/DDA negotiations .In this case, APEC becomes a very good example through paying such efforts as a spontaneously cooperative organization, will eventually become an important revelation continue to promote regional economic development, which will eventually become an important revelation promote sustained economic development in the region.

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