

The Trade Potential between Northeast China and the Countries along “One Belt and One Road”

Xiaolin Jia

School of Economics, Harbin University of Commerce, Harbin, Heilongjiang 150028, China

Email: jxl8849@163.com

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Abstract. Based on the panel data of 45 countries along “One Belt and One Road” from 2006 to 2015, this paper uses the expanded trade gravity model to analyze the export potential between Northeast China and the countries along the route. Studies show that the trade in the countries along “One Belt and One Road” in the Northeast is affected by many factors, and they also have massive potential for cooperation. Therefore, the superior industries with the strength of creation in Northeast China should be “going out” and the products with excess capacity in Northeast China should be “going out”. At the same time, we will adjust the structure of imported products to diversify the types of imported goods and the structure of the imported regions.

Model Construction and Data Sources

Model Construction

The trade gravity model originated in Newton's gravity formula, the gravity between two objects is proportional to the mass between them and inversely proportional to their distance. In 1962, Jane Tinbergen first applied the physics formula to the estimation of international trade flow, and considered that trade volume between the two countries might be proportional to its economic scale and negatively correlated with the distance between the two countries. The formula used to describe the gravitational relationship of trade between the countries, which can be expressed as follows:

$$F_{ij} = G \frac{M_i M_j}{D_{ij}} \quad (1)$$

Above all, F_{ij} represents the trade flow from i to j ; M_i, M_j represent the gross domestic product (GDP) of the two countries, respectively; D_{ij} represents the distance between the two countries, usually the geographical distance between the capitals; G is the scale coefficient of the formula.

According to this model, the trade flow of country i to country j increases as the economies scale of the two countries increases, and the distance between the two countries decreases. In order to reduce the possibility of heteroscedasticity and facilitate regression, the nonlinear model (1) is converted from a natural logarithmic form to a linear form:

$$\ln F_{ij} = \beta_0 + \beta_1 \ln(M_i M_j) + \beta_2 \ln(D_{ij}) + \mu_{ij} \quad (2)$$

In the formula (2), $\ln F_{ij}, \ln(M_i M_j), \ln(D_{ij})$ are the natural logarithmic forms of $F_{ij}, M_i M_j, D_{ij}$, β_0 is a constant term, β_1 and β_2 are regression coefficients, μ_{ij} is a standard random error term.

The gross domestic product, population, and trade openness have a positive impact on trade flows between Northeast China and the countries along the route. Therefore, on the basic model, this paper adds variables that reflect GDP product of Northeast China and the countries along the route; adds variables that reflect the population of the consumption levels in Northeast China and the

countries along the route; adds variables that reflect the dynamics of trade development in the countries along the route; adds variables that reflect the development of manufacturing industry. Also, the countries along the route have a border with Northeast China and the coastal countries will also have a positive impact on the trade. After adding two dummy variables, the model has six variables, which constitutes the extension model of trade gravity in this paper:

$$\ln(T_{Dj}) = \beta_0 + \beta_1 \ln(Y_D^i Y_j^i) + \beta_2 \ln(P_D^i P_j^i) + \beta_3 \ln(OPENESS_{jt}) + \beta_4 \ln(M_{jt}) + \beta_5 \ln(D_{Dj}) + \beta_6 TIG_{Dj} + \beta_7 SEA_j + \mu_{ij} \quad (3)$$

In the formula(3), T_{Dj} is interpreted as a variable indicating the total import and export trade between Northeast China and the countries along the route, and its symbol is expected to be positive. $Y_D^i Y_j^i$ is the product of the gross domestic product of Northeast China and the countries along the route. It gives feedback on the economic aggregate of the northeast region and the countries along the route. The larger the value, the larger the scale of bilateral trade, the higher the amount of import and export trade in Northeast China, its expectation is positive. $P_D^i P_j^i$ represents the product of the total population of Northeast China and the countries along the route. Its role in the country's trade, different scholars have different conclusions, and its expected symbol is uncertainty. $OPENESS_{jt}$ indicates the level of trade openness of the countries along the route in the t period, expressed by the proportion of trade in GDP. The higher the degree of trade openness, the higher the level of trade with the country in Northeast China, and its expected symbol is positive. M_{jt} indicates manufacturing value added, reflects the impact of manufacturing on trade, and its symbol is positive. D_{Dj} indicates the geographical distance between Northeast China and the countries along the route, which is an important factor reflecting the hindrance of trade activities. The higher the value, the higher the transportation cost, the more unfavorable trade between Northeast China and the countries along the line, its expected symbol is negative. TIG_{Dj} is the dummy variable, it represents the border between Northeast China and the countries along the route. There is a common boundary value of 1, and there is no typical boundary value of 0. The lower the distance between countries, the lower the transportation cost, the higher the trade level, its expected symbol is positive. SEA_j indicates whether the land along the line along the coast, is also a dummy variable. If the countries along the route rely on the sea take 1, otherwise take 0, when the importing country depends on the sea, its traffic will be more convenient so that the trade level may be higher, and its symbol is expected to be positive.

Data Sources

Through the selection of Panel data, the sample data cover time series data and annual trade data between Northeast China and the countries along the route. Due to the lack of data in some countries and the different years of variable statistics, this paper selects as more countries and longer time span as possible, and finally decides 2006-2016, Mongolia, Malaysia, Indonesia, Philippines, Thailand, Singapore, Vietnam, United Arab Emirates, Iraq, Cyprus, Iran, Israel, Kuwait, Lebanon, Oman, Qatar, Jordan, Saudi Arabia, Turkey, Yemen, Bangladesh, India, Sri Lanka, Maldives, Pakistan, Kazakhstan, Uzbekistan, Kyrgyzstan, Armenia, Azerbaijan, Russia, Belarus, Georgia, Ukraine, Bulgaria, Estonia, Czech Republic, Croatia, Hungary, Lithuania, Romania, Latvia, Slovakia, Poland, Serbia, Slovenia as “One Belt and One Road” Initiative’s overall data.

In the trade gravity model, the import and export data between Northeast China and the countries along the route, the gross domestic product and the total population of Northeast China are all derived from Heilongjiang Statistical Yearbook, Jilin Statistical Yearbook and Liaoning Statistical Yearbook from 2007 to 2017, and obtained by calculation. The countries of the route’s GDP, total population, trade-to-GDP ratio, and manufacturing value added are all derived from the World Bank database. The distance between Northeast China and other countries is according to the distance calculator in Time and Date website. The border data between Northeast China and the countries

along the route come from the CEPII database; whether the countries along the route rely on the sea or not come from the World Book of the CIA.

Empirical Analysis based on Trade Gravity Model

Selection of Models

Based on the trade panel data of 45 countries along “One Belt and One Road” Initiative with Northeast China from 2006 to 2016, this paper has 495 samples. The quantitative analysis of formula (3) is carried out by using Stata12.1 software and mixed regression, fixed effect and random effect, respectively. Using the Stata12.1 software, the three methods are analyzed using mixed regression, fixed effect and random effect, and the applicability of these three methods is tested. The result of F test shows that fixed effect is better than mixed regression, the LM test shows that random effect is better than mixed regression, and the Hausman test shows that random effect is better than fixed effect. Therefore, the paper finally uses the random effect to carry out regression analysis on the model. Since the regression is carried out in different years, the sequence-related problem model does not exist. Besides, due to the logarithmic transformation of the data, the heteroscedasticity of the gravitational model is overcome.

Analysis of Estimated Results

From the estimation results of the panel random effect model, the regression coefficient of virtual variables depending on the sea is out of universal significance and is eliminated (See table 1). The model R2 is 0.8086, which indicates that the model-independent variable explains the dependent variable by 80.86%. Since the number of sections of the panel data used in the pattern is much larger than the number of its time series, the R2 value is in a reasonable interval. The four variables of the model are statistically significant in 0.1%, and the Wald chi-square test results indicate that the combined effect of the various independent variables in the model is exceptionally substantial ($\chi^2(6) = 231.55, p < 0.0005$).

According to the above fitting results, the trade gravity equation in this paper can be obtained:

$$\ln(T_{Dj}) = -27.24 + 0.27 \ln(Y_D' Y_j') + 0.36 \ln(P_D' P_j') + 1.03 \ln(OPENESS_{jt}) + 0.74 \ln(M_{jt}) - 1.1 \ln(D_{Dj}) + 2.68 TIG_j + \mu_{ij} \quad (4)$$

From the regression equation (4), the following conclusions can be obtained:

(1) The GDP regression coefficient is significantly positive, which indicates that the total trade volume of Northeast China to the countries along the route is positively correlated with the bilateral economic capacity, and the positive correlation which is the same as expected. The commercial-scale has always been an essential factor affecting bilateral trade, but the regression coefficient in this paper is only 0.27, which is not as high as that of the previous research results, indicating that the occupation of Northeast China to the countries along the route is not particularly dependent on the economic aggregate.

(2) The total population has contributed to bilateral trade. The regression coefficient of 0.85 also proves this hypothesis, indicating that the population increase of the countries along the route will create more demand, and affect the growth of national trade. But the role of population in promoting trade is fading.

(3) The trade openness of the countries along the route has a very positive effect on trade in Northeast China, which is the same as expected. For every 1% increase in the level of trade development of a country, the import and export trade between Northeast China and the country will increase by 1.04%. The closer its economic and trade relationship with Northeast China will be, the more the trade volume from Northeast China will be, and the closer the relationship between trade and investment will be.

(4) Manufacturing promotes bilateral cooperation and is very significant (0.1%), consistent with previous expectations. And manufacturing is an important factor affecting bilateral trade, which means that every 1% increase in manufacturing, trade flows will increase by 0.74%. Not only can bilateral trade promote the development of manufacturing but also manufacturing can promote the process of bilateral trade.

Table 1. Model estimation results

Explanatory variables	Explained variables	
	Model 1	Model 2
Constant C	-25.382 (-2.98)	-27.238 (-3.24)
GDP product($\ln(Y'_D Y'_j)$)	0.269** (3.04)	0.273** (0.0878)
Population product ($\ln(P'_D P'_j)$)	0.319. (1.79)	0.355* (2.01)
Trade openness ($\ln(OPENESS_{jt})$)	1.042*** (3.67)	1.027*** (3.61)
Manufacturing value added($\ln(M_{jt})$)	0.744*** (4.21)	0.739*** (4.17)
Geographic distance(D)	-1.266. (-1.88)	-1.103. (-1.66)
Coastal situation(SEA)	0.630 (1.41)	
Bordering situation(TIG)	2.780** (2.95)	2.681** (2.85)
Wald	$\chi^2(7) = 234.26$ Pr ob f $\chi^2 = 0.0000$	$\chi^2(6) = 231.55$ Pr ob f $\chi^2 = 0.0000$
R^2	0.8182	0.8086

Note 1: The z statistic is in parentheses.

Note 2: "****", "***", "**", "." indicate significant at levels of 0.1%, 1%, 5%, and 10%, respectively.

(5) The distance between Northeast China and the capitals along the route is negatively, which is consistent with the previous hypothesis. The distance factor plays an important role in bilateral trade. The farther the geographical distance, the higher the transportation cost, the greater the information exchange and cultural differences, thus restricting the trade between each other. The distance between Northeast China and the countries along the route is basically more than 3000 kilometers, and the distance from Albania is 8000 kilometers. The huge language and cultural differences have a great hindering effect on bilateral trade, for every 1% increase in distance, Northeast China exports to countries along the route will decrease by 1.27%.

(6) The regression coefficient of virtual variable TIG is significantly positive, which indicates that there are similar factors such as culture, society, and so on, which can promote the development of trade between the two regions. At the same time, the border between the two places also means that the distance between the two locations is close and the transportation cost is lower. Therefore, expanding economic and cultural exchanges between Northeast China and the countries along the route can increase trade exchanges, and reducing transaction costs can also improve the level of trade between the two places.

Estimation of the Trade Potential of the Countries along “One Belt and One Road” in Northeast China

The evaluation of trade potential is based on the potential trade value under the theoretical state simulated by the gravity model, and the actual trade level of the countries along the route is compared with the simulated value. If the real value is below the analog value, it is insufficient trade, and vice versa, it is excessive trade. Refer to Zhao Yilin, Lin Guanghua (2008), Chen Weiguang and Guo Qing (2016) for the classification of potential standards. According to the parameters estimated by the trade gravity model in this paper, due to the missing part of the data in 2016, the data of 2015 is selected, and the trade potential between Northeast China and the countries along the route are calculated, and the results are shown in Table 5.

According to the actual trade amount and the predicted value, the trade potential relationship between the countries along “One Belt and One Road” in Northeast China is divided into three types (Assume that $S = \text{actual value} / \text{predicted value}$):

First, the potential is mature. When $S > 1.20$, Northeast China and the countries along the route are over-traded. The way to further develop is to maintain the existing positive factors while paying attention to the cultivation of other promoting factors. This type include: South Korea, Indonesia, Malaysia, Philippines, Singapore, Thailand, Kuwait, Oman, Saudi Arabia, Turkey, Bangladesh, Maldives, Pakistan, Azerbaijan, Russia, Bulgaria, Czech Republic, Hungary, Poland.

The second is potential development. When $1.20 > S > 0.80$, the trade potential of Northeastern China to the countries along the route has not been fully utilized, and there is still room for expansion. In particular, Russia is the most important partner of trade with Northeast China. From the calculation results, its cooperation has yet to be developed in many areas. This type include: UAE, Belarus, and Romania. Northeast China does not trade with them frequently, and has trade potential in many areas of import and export.

Third, the potential is vast. When $S < 0.80$, the trade between Northeast China and the countries along the route still has great potential to tap, that is, there is a lack of trade. The main reason for lack of trade is that there are serious trade barriers, and relevant regional trade system arrangements are an effective means of breaking down trade barriers. This type include Mongolia, Vietnam, Iran, Israel, Lebanon, Qatar, Yemen, India, Sri Lanka, Kazakhstan, Kyrgyzstan, Armenia, Georgia, Ukraine, Estonia, Croatia, Lithuania, Latvia, Serbia, Slovakia, Slovenia.

Main Conclusions

Based on the data of trade import and export in Northeast China from 2006 to 2016, using gravity model, this paper constructs a panel stochastic effect model by adding population, trade openness and border variables, and empirically analyzes the trade situation and potential of Northeast China to countries along “One Belt and One Road”. The following conclusions can be drawn in this paper:

(1) The import and export trade between Northeast China and the countries along “One Belt and One Road” is affected by many factors. Based on the empirical analysis, the results show that the trade flow of Northeast China to the countries along the route is determined by GDP, population, the degree of trade openness, manufacturing value added and whether it is bordering or not. And the influence of different factors on regional trade is mixed. In particular, Northeast China should break the inherent trade pattern, start with import trade, optimize the commodity structure, promote the optimal allocation of resources in the international market, and promote the development of high-end production.

(2) The potential trade space between Northeast China and the countries along “One Belt and One Road” is vast. The research shows that the import and export of Northeast China to the countries along the route is mainly concentrated in the potential maturity and potential colossal type. The import and export trade in Northeast China is severely polarized, and the resources have not been allocated more reasonably and adequately in all regions. In particular, the countries have frequent trade with Northeast China, its trade cooperation has not yet reached the expected level, and its trade structure needs further adjustment.

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