

The Relationship between China's Inter-Provincial Trade Barriers and Economic Growth

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Abstract. In the background of trade globalization, trade barriers between countries are being reduced, which promotes the prosperity of global trade and the growth of global economy. At the same time, China's inter-provincial trade barriers still maintain a high level. With the proposal of the national unified big market, the reduction of inter-provincial trade barriers has become the main problem in China. This paper first uses the "iceberg cost" model to measure our inter-provincial trade barriers, then use a spatial econometric model to analyse it. Finally, the threshold effect model is constructed to explore the relationship between economic growth and trade barriers. The results show that China's inter-provincial trade barriers show a downward trend from 2009 to 2020. Trade barriers have a significant negative impact on economic growth and there is a threshold effect between trade barriers and economic growth.

Keywords: Inter-provincial Trade Barriers; Economic Growth; Spatial Econometric; Model Threshold Effect.

1. Introduction

In October 2020, the Fifth Plenary Session of the 19th CPC Central Committee adopted the "Proposal of the CPC Central Committee on Formulating the 14th Five-Year Plan for National Economic and Social Development and the Long-term Goals for 2035" [1], which was the first to put forward 'We will adhere to the strategic basis of expanding domestic demand, accelerate the development of a complete domestic demand system and integrate the implementation of the strategy of expanding domestic demand with deepening Supply-side Structural Reform. We will promote innovation-driven, high-quality supply and create new demand. We will accelerate the building of the new development paradigm with domestic circulation being the mainstay and the two circulations reinforcing each other.' The proposal firstly introduces the concept of a new pattern of development. A national unified market with smooth circulation, perfect system and systematic coordination is indispensable for building the new development paradigm. A national unified market with smooth circulation, perfect system and systematic coordination is indispensable for building a new development pattern. The Opinions of The State Council on Accelerating the Construction of a National Unified Large Market issued by the CPC Central Committee on March 25, 2022 [2] clearly proposes to accelerate the establishment of a national unified market system and rules, break through local protection and market segmentation, break through the key blocking points restricting the economic cycle, and accelerate the construction of a national unified large market that is efficient, standardized, fair competition and fully open. It can be seen that local protectionism and trade barriers are closely related to the construction of a unified national market. It also directly affects economic growth [1-2]. [3-4]studied the impact of local protectionism on the economic development of provincial capital cities in China and found that the increase of trade barriers by local protectionism would lead to unbalanced regional development. This shows that the relationship between trade barriers and economic growth is not only a direct effect, but may be from the spatial effect and nonlinear effect. After some investigation, I found that most studies on economic growth and trade barriers only stayed on the traditional econometric panel model. They don't look at the role of spatial factors. Therefore, the purpose of this paper is as follows. Firstly, I would like to explore the spatial correlation between economic growth and trade barriers and further explain the relationship between them. Secondly, the non-linear relationship between inter-provincial trade barriers and economic

growth is found. Lower inter-provincial trade barriers can effectively promote economic growth, indicating the necessity of building a new development pattern and a unified large market [3].

In this paper, the measurement model of trade barrier is constructed based on price index method. Compared with other methods, price index method can reflect the degree of regional market segmentation more directly. In the study of the relationship between trade barriers and economic growth, this paper adopts the spatial econometric model. The relationship between economic growth and trade barriers can be explained more comprehensively by making up for the shortcomings of traditional econometric models that do not take spatial location into account. Finally, based on the above research, this paper constructs a threshold model to explore deeper nonlinear relationships.

2. Model

2.1 Measurement of Trade Barriers

Data in this part are selected from commodity price retail index by region in China Statistical Yearbook 2008-2020. This includes 31 provinces and 22 commodity types. The model used in this paper to measure trade barriers is "iceberg cost" model. Since the land value of commodities may be lost during transportation, there must be some differences in commodity prices between regions. In this paper, the volatility of commodity prices is used to describe the degree of market integration.

For, two regions i and j . $p(i,k,t)$ is the price of good k in region i at time t . $p(j,k,t)$ is the price of k in region j at time t . C is the cost of commodity arbitrage.

$$\ln p(i,k,t) + \ln C(ij,k,t) \geq \ln p(j,k,t)$$

or

$$\ln p(j,k,t) + \ln C(ij,k,t) \geq \ln p(i,k,t)$$

The following results can be obtained from the above two formulas:

$$-\ln C(ij,k,t) \leq \ln p(i,k,t) - \ln p(j,k,t) \leq \ln C(ij,k,t)$$

Let $Q(ij,k,t) = \ln p(i,k,t) - \ln p(j,k,t)$. The range of transaction costs can be obtained:

$$|Q(ij,k,t)| \leq \ln C(ij,k,t)$$

The same can let $Q(ij,k,t-1) = \ln p(i,k,t-1) - \ln p(j,k,t-1)$

Then

$$\Delta Q(ij,k,t) = Q(ij,k,t) - Q(ij,k,t-1)$$

So

$$\Delta Q(ij,k,t) = \ln p(i,k,t) - \ln p(j,k,t) - [\ln p(i,k,t-1) - \ln p(j,k,t-1)]$$

Thus

$$|\Delta Q(ij,k,t)| = \left| \ln \frac{p(i,k,t)}{p(j,k,t)} - \ln \frac{p(i,k,t-1)}{p(j,k,t-1)} \right|$$

The nature of a commodity is also closely related to price fluctuations. For example, the more widely used the commodity, the greater its price elasticity. So we have to take into account price differences due to commodity heterogeneity. $|\Delta Q(ij,k,t)|$ can be broken down into two parts. Firstly, changes only affected by the characteristics of the commodity itself. Such as changes in some external conditions lead to fluctuations in commodity supply. Secondly, changes unrelated to the commodity itself, but related to market conditions or other factors. Such as the increase in food prices caused by the strengthening of trade barriers. The impact of the first may lead to an overestimation of trade barriers. Therefore, we adopt the method of average value to reduce the influence. Let $|\Delta Q(ij,k,t)|$ be composed of $e(k)$, a fixed effect brought by the nature of a commodity, and $\varepsilon(ij,k,t)$, such as the effect of market environment. Find the average $|\overline{\Delta Q(k,t)}|$ of the trade mix of all different regions for a given year t and a given commodity category k for all regions. So

$$q(ij,k,t) = [e(k) - \overline{e(k)}] + [\varepsilon(ij,k,t) - \overline{\varepsilon(ij,k,t)}]$$

$q(ij, k, t)$ is the variance data of price changes, here we take it as the value of trade barriers, denoted as $varq(ij, k, t)$.

In this paper, it is assumed that each province builds a trade portfolio with its neighboring provinces, and the specific value of trade barriers of the province is taken as the average value of all trade barriers of the province. 72 trade pairs are selected based on geographical proximity.

2.2 Spatial Econometric

The explained variable selected in this paper is the GDP of 31 provinces and cities in China from 2009 to 2020. In order to facilitate calculation, logarithmic processing is adopted in this paper.

In terms of explanatory variables, trade barriers of each region from 2009 to 2020 calculated above are adopted. In terms of control variables, logarithm of gross regional tax revenue (LNTAX) is adopted in this paper as the first control variable. At the same time, per capita fiscal income is selected as the second control variable.

Table 1. Spatial measurement model index

Variables	Variable	symbol	Number
Explained variable	The logarithm of the regional GDP	LNGDP	372
Core explanatory variable	Trade barrier	BL	372
Control variable	the logarithm of the regional tax	LNTAX	372
	Government influence	AFI	372

In order to explore the direct and spatial spillover effects of inter-provincial trade barriers, regional taxes and government influences on economic growth, two models are designed in this paper to explore their effects. They are respectively spatial lag model (SAR) and spatial Durbin model (SDM).

Spatial Lag Model (SAR):

$$\ln GDP_{it} = \rho_1 \sum_{j=1}^n W_{ij} \times \ln GDP_{it} + \alpha BL_{it} + \delta_k Z_{kit} + \varepsilon_{it}$$

Spatial Durbin Model (SDM):

$$\ln GDP_{it} = \rho_1 \sum_{j=1}^n W_{ij} \times \ln GDP_{it} + \alpha BL_{it} + \rho_3 \sum_{j=1}^n W_{ij} \times BL_{it} + \delta_k Z_{kit} + \varepsilon_{it}$$

2.3 Panel Threshold Model

Table 2. Threshold effect model index

Type of variable	Variable	symbol	Number
Explained variable	The logarithm of the regional GDP	LNGDP	372
Core explanatory variable	Trade barrier	BL	372

The relationship between trade barriers and economic growth is not a simple linear relationship, and there is a "threshold value". In order to further explore the relationship, this paper constructs the threshold panel data model [4]. The model construction results are as follows:

$$y_{it} = \mu_i + \alpha_1 k_{it} I(k_{it} \leq \gamma) + \alpha_2 k_{it} I(k_{it} > \gamma) + \theta' x_{it} + \varepsilon_{it}$$

In the formula, i represents province, t represents time, and y reflects regional economic growth. $I(\cdot)$ is an indicative function. The value is 1 if the condition in parentheses is satisfied, otherwise the value is 0. α_1 、 α_2 、 θ' represents the coefficient of the respective variable. γ is the threshold value and μ_0 represents the individual fixed effect, which is used to reflect the differences between provinces. x represents a series of control variables and ε_{it} represents a random disturbance subject to an independent, identically distributed normal distribution.

3. Result

3.1 Spatial Econometric

3.1.1 The Result of Regression

Before SDM and SAR regression, the hausman test was conducted to determine that fixed effects model should be used for analysis. Therefore, time fixation effect, individual fixation effect and bidirectional fixation effect are selected for analysis in this paper. After stata software analysis, the results are shown in Table 9.

Table 3. Estimation results of spatial metrology model.

Variable	SDM model			SAR model		
	Time FE	Individual FE	Two-way FE	Time FE	Individual FE	Two-way FE
BL	-129.7 *** (-4.26)	1.420 (-0.37)	4.5277 (-0.34)	-114 *** (-4.25)	19.175 (1.54)	2.135 (0.03)
LNTAX	1.0091 *** (79.49)	0.36 *** (10.46)	0.381 *** (10.52)	1.013 *** (78.17)	0.30 *** (10.94)	0.405 *** (11.58)
AFI	-0.530 *** (-18.34)	0.11 *** (3.78)	0.100 *** (3.42)	-0.47 *** (0.87)	0.09 *** (3.43)	0.0610 *** (2.31)
W*BL	55.81 (0.88)	66.50 ** (2.46)	31.56 * (1.42)			
W*LNTAX	-0.0018 (-0.02)	0.0658 (1.28)	0.291 *** (4.07)			
W*AFI	0.248 *** (3.36)	-0.130 ** (-2.15)	-0.178 *** (-2.86)			
ρ	0.0989 (1.24)	0.615 *** (14.67)	0.399 *** (7.23)	0.0153 (0.87)	0.624 *** (21.21)	0.510 *** (11.86)
R^2	0.9613	0.7167	0.7021	0.9586	0.7202	0.7859
σ^2	0.0341	0.0047	0.0043	0.0359	0.0048	0.0044

Note: *, **, *** respectively means passing the significance test at the level of 10%, 5% and 1%; The values in parentheses are the corresponding Z-statistics.

As can be seen from Table 3, the spillover effect at 1% significance level is all greater than 0, indicating the existence of positive spillover effect. In terms of core explanatory variables, the coefficient of trade barriers passing the 1% significance level test is less than 0, indicating that trade barriers inhibit regional GDP growth. Increasing trade barriers will lead to a decline in GDP, which will have a negative impact. LNTAX has a significant positive impact on regional GDP, indicating that at the present stage, the tax revenue of all provinces and cities is still within a reasonable range, which will promote economic growth to a certain extent. Government influence (AFI) also plays a significant positive role, indicating that the adjustment of government macro policies plays a positive role in regional economic growth [4].

3.1.2 The Estimation of Direct Effect and Indirect Effect

Table 4. Spatial spillover effects of trade barriers

Variable	Direct Effect	Indirect Effect	Total Effect
BL	-128.6598 *** (-4.12)	53.749 (0.84)	-74.910 * (-1.41)
LNTAX	1.008 *** (82.18)	-0.0059 (-0.28)	1.002 *** (43.62)
AFI	-0.5281 *** (-18.56)	0.2504 *** (3.72)	-0.277 *** (-4.54)

Note: *, **, *** respectively means passing the significance test at the level of 10%, 5% and 1%; The values in parentheses are the corresponding Z-statistics.

When spatial correlation exists, there are direct and indirect effects. When spatial correlation exists, there are direct and indirect effects. The former indicates that the explanatory variable of this region

will have an impact on its explained variable, while the latter indicates that the explanatory variable of this region will also have an impact on the explanatory variable of other regions. Since SDM model has better fitting results, we also use SDM model to estimate the impact here. The final spatial spillover effect estimation results are shown in Table 10.

As can be seen from Table 4, the direct effect of trade barriers is significantly less than 0. The spillover effect did not pass the significance test and the total effect was negative. It indicates that if the inter-provincial trade cost increases, resulting in the cost of goods entering neighboring provinces. This may be good for the protection of local enterprises, but it has a negative effect on the development of regional economy.

The direct effect and total effect of tax (LNTAX) are both significantly greater than 0, and the spillover effect does not pass the significance test. The direct effect and total effect of government influence (AFI) are both significantly less than zero, indicating that excessive government influence will have a negative effect on regional economy, resulting in the suppression of regional economic growth. The indirect effect is significantly greater than zero, indicating that for neighboring regions, the government influence of other regions will have a positive impact on their economic growth [5-6].

3.2 Panel Threshold Model

Firstly, the threshold effect regression analysis of panel model is carried out. In addition to determining whether there is a threshold effect, we can also determine the number of thresholds. The effects of single threshold and double threshold are tested in this paper. The test results are shown in Table 12.

Table 5. Test results of threshold effect.

Type of threshold effect	RSS	F value	P value	Critical Value		
				10%	5%	1%
Single threshold effect	27.3260	44.49***	0.0057	33.4118	36.3529	43.7461
Double threshold effect	26.3854	12.83	0.1057	13.1550	14.7862	18.4285

Note: (1) F statistic and P value obtained through bootstrap repeated self-sampling 350 times (2) ***, ** and * represent significance levels of 1%, 5% and 10% respectively

As can be seen from Table 5, the single threshold effect is significant at the significance level of 1%, while the double threshold effect is not significant at the significance level of 10%. Therefore, the hypothesis of a double threshold effect is rejected. Next, a single threshold value is estimated.

Table 6. Model regression results

Threshold estimate	95% confidence interval
0.0004	[0.0004, 0.0004]

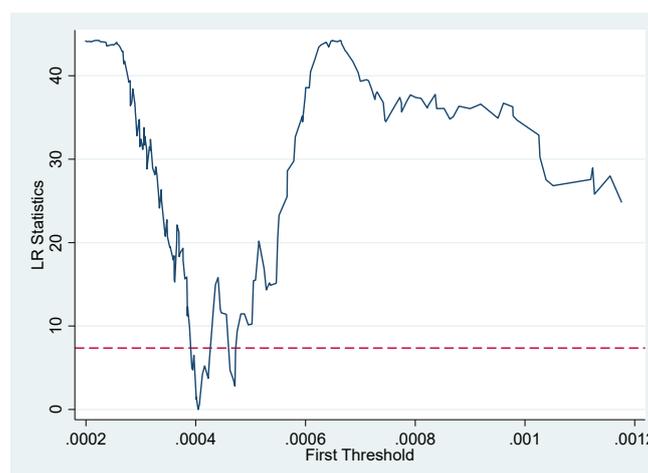


Figure 1. Threshold model regression result

Table 6 and Figure 1 show the regression results of linear model and threshold model.

Here, we take the point with the smallest sum of residual squares as the threshold value, which is 0.0004. The LR figure also clearly shows the confidence interval and threshold value.

Table 7. Results of regression estimation

Variable	Threshold regression	T value
θ'	9.716266***	259.93
$\alpha_1 I(k_{it} \leq \gamma)$	472.1868***	3.34
$\alpha_2 I(k_{it} > \gamma)$	-307.9217***	-7.61

After determining the single threshold equation, regression estimation is carried out. The regression results are shown in Table 7. It can be seen that all coefficients pass the significance test. When the trade barrier is less than the threshold value, it will promote economic growth. When it is larger than the threshold value, it will inhibit economic growth.

4. Conclusion

Through the research, this paper mainly draws the following conclusions.

Firstly, inter-provincial trade barriers have negative direct effect and spatial spillover effect on regional economic growth, but the spatial spillover effect is not significant. As a whole, trade barriers have a negative effect on regional economic growth and the negative impact of excessively high trade barriers on economic growth is very significant. However, we observe that the spatial spillover effect of trade barriers is positive, but it does not pass the significance test. This may be because "Prisoner's dilemma" may be encountered in practical application, that is, market segmentation will gain an advantage in competition with other provinces in the short term. When other regions adopt market segmentation policies, giving up the protection of local markets can have a negative impact on the local economy.

Secondly, there is a single threshold effect between trade barriers and economic growth. The relationship between trade barriers and economic growth is not a simple linear relationship. When the trade barrier is less than a certain value, it can promote economic growth, while when it is greater than a certain value, it will inhibit economic growth. 2. Only when inter-provincial trade barriers are controlled within a certain size can they not only protect mainland enterprises, but also promote the economic development of the province.

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