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Spatial Econometric Analysis of Port Throughput on the Quality of Economic External Circulation Development in Hebei Province

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Introduction

The 20th National Congress report pointed out that, when promoting the new development pattern of dual circulation, more attention should be paid to the quality and level of external circulation. As an important hub connecting domestic and foreign markets and a direct window for opening up to the outside world, ports have an important impact on the quality of economic external circulation development. The port throughput is an important indicator to measure the comprehensive strength of the port. Based on this, this article studies the influence relationship between port throughput and the quality of economic external circulation development to determine the role of ports in improving the quality of economic external circulation development and provide a theoretical basis for its improvement.

Research Questions

The study suggests that port logistics may have an impact on the quality of the development of the external economic cycle. Therefore, this paper takes Hebei Province as an example and takes the spatial factors between port cities into account to study the impact of port throughput on the quality of urban economic external circular development.

Methodologies

The LM and RLM tests, the LR test, and the Hausman test were used to determine the construction of a spatial Durbin model with double fixed effects in space-time, and its model was used to empirically analyze the impact of port throughput on the quality of the development of the economic external circulation in Hebei Province.

Mathematical Formula

$$Eecq_{it} = \rho\Sigma_{i=1}^{n} W_{ij} Eecq_{jt} + \delta TP_{it} + \gamma\Sigma_{j=1}^{n} W_{ij} TP_{jt} + \omega x_{it} + \sigma\Sigma_{j=1}^{n} W_{ij} x_{jt} + \varepsilon_{it} \quad (1)$$

In the formula, $Eecq_{it}$ represents the dependent variable, TP_{it} represents the independent variable, W_{ij} represents the spatial weight matrix, $\sum_{i=1}^{n} W_{ij} Eecq_{jt}$ and $\sum_{j=1}^{n} W_{ij} TP_{it}$ represent the spatial lag of the dependent and independent variables, x_{it} represents control variables, $\sum_{j=1}^{n} W_{ij} x_{it}$ represents the spatial lag of control variables, ρ represents the spatial autocorrelation coefficient, δ represents the coefficient of the independent variable, γ represents the coefficient of the spatial lag of the independent variable, ω represents the control variable coefficient, σ represents the coefficient of the spatial lag term of the control variable and ε_{it} represents the random error term.

Tables

TABLE 4. LM and RLM test results

Test variables	OLS estimation	Spatial fixed effects	Time fixed effects	Double fixed effects in space and time
LM-lag	4.349**	296.037***	9.649***	7.226***
	(0.037)	(0.000)	(0.002)	(0.007)
RLM-lag	2.769**	58.497***	1.247	15.371***
	(0.096)	(0.000)	(0.264)	(0.000)
LM-error	2.689*	244.074 ***	8.484***	5.175***
	(0.101)	(0.000)	(0.004)	(0.023)
RLM-error	1.110	6.534***	0.081	13.320***
	(0.292)	(0.011)	(0.776)	(0.000)
LR (SDM VS SAR)	17.650***		(0.000)	
LR (SDM VS SEM)	22.015***		(0.000)	
Hausman	62.318***		(0.000)	
LR (Spatial fixed effects)	369.221***		(0.000)	
LR (Time fixed effects)	236.971***		(0.000)	

TABLE 5. Estimation of SDM Model with Both Spatial and Temporal Fixed Effects

Statistical quantities	Spatial and temporal double fixed effects		Spatial and temporal double fixed effects (Bias correction)	
R^2	0.9867		0.9878	
σ^2	0.0003		0.0003	
Log-L	322.8326		322.8326	
CT	0.0001**	(0.0149)	0.0001**	(0.0131)
CV	-0.0002	(0.1316)	-0.0002	(0.1329)
WS	-0.0276*	(0.0693)	-0.0285**	(0.0348)
HC	-0.0809	(0.5560)	-0.0839	(0.4916)
GS	0.4249***	(0.0027)	0.4355***	(0.0005)
IN	-0.0857***	(0.0004)	-0.0833***	(0.0001)
*W*Eecq*	-0.6685***	(0.0026)	-0.9989***	(0.0000)
*W*CT*	-0.00003***	(0.0000)	-0.00002***	(0.0000)
*W*CV*	0.0029***	(0.0001)	0.0027***	(0.0000)

Conclusion

First, there is a spatial correlation between the quality of economic outer-cycle development in Hebei Province. Second, the quality of the development of the external economic cycle in Hebei Province cities has a significant negative spillover effect. Finally, the port cargo throughput in Hebei Province significantly contributes to the quality of the development of the external economic cycle.