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The Influence of E-commerce on Commodity Circulation Cost -- Analysis based on Marx's Circulation Cost Theory

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Abstract

In order to make my country's commodity circulation more effective, this article starts from the perspective of Marx's theory, from the two parts of circulation costs, theoretically and empirically explain the influence of E-commerce on circulation costs. This paper uses the provincial data from 2015 to 2019 to construct a panel data model for quantitative analysis, and finds that the development of E-commerce can reduce the circulation costs of the two parts. Therefore, we must insist on advancing the development of E-commerce while also insisting on the construction of logistics infrastructure.

Keywords

Circulation Costs; E-commerce; Marxian Economics; Panel Data Model.

1. Introduction

In recent years, Internet-related industries have continued to expand, which has had a huge impact on my country's commodity circulation environment. At present, China proposes to build a new development pattern with "domestic cycle as the main body, domestic and international double cycles promote each other", and one of the key points of the domestic cycle is the efficiency and cost of commodity circulation. If you do not pay attention to the costs incurred in the circulation process, and do not pay attention to the efficiency of circulation, it will easily lead to the blockage of the domestic circulation. Therefore, reducing the cost of commodity circulation is the focus of building a new development pattern of "dual cycles". In the current era of informationization, it is even more necessary to study the changes and impact of commodity circulation costs from the development of E-commerce.

From the perspective of Marx's theory, circulation is an important link between production and consumption, and how to promote commodity circulation is of great significance to producers. The "circulation cost theory" put forward by Marx even provides a direction for reducing the circulation cost. With the development of science and technology, E-commerce, online shopping platforms, etc. can not only reduce production circulation costs by improving the speed and accuracy of logistics, but also reduce genuine costs of circulation by relying on information integration capabilities and big data processing capabilities. Simplification and convenience of transactions. And this article focuses on the development of commodity logistics in the current new era, based on the relevant data of the "China Logistics Yearbook", and analyzes the construction of a measurement model from 2015 to 2019, and provides suggestions for the optimization of my country's commodity circulation costs.

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2. Empirical Research on the Impact of E-commerce on Commodity Circulation Costs

2.1. Productive Circulation Costs

Because storage costs are not easy to quantify, the focus is on transportation costs. First, construct the index log, which measures the transportation distance required for unit sales of consumer goods. Because the transportation cost can basically be determined by the freight volume, the transportation distance and the unit freight. The unit freight is more determined by the transportation conditions, and the freight volume is related to local production and sales. Therefore, this article uses transportation distance as an indicator of transportation costs.

$$\log = \frac{\text{Cargo turnover}}{\text{The total retail sales of social consumer goods} \times \text{Freight volume}}$$

This article measures the level of E-commerce development by express business volume (ebv). With the development of online shopping platforms, most express delivery services serve online shopping. Therefore, express business volume is regarded as an indicator of E-commerce development, and at the same time an indicator that can represent the development of logistics industry, so it is used as an explanatory variable to participate in the regression. The volume of express delivery is also related to the local transportation infrastructure. The more complete the infrastructure, the greater the volume of express delivery.

Infrastructure also has a certain impact on commodity circulation, that is, it has a certain correlation with log. Therefore, this paper adds the variable of infrastructure level in the regression, and uses the calculation method of Demurger (2001) to calculate the density of the transportation network (infra) Is measured as a proxy variable of logistics infrastructure.

$$\text{infra} = \frac{\text{Railway mileage} + \text{Grade highway mileage} + \text{Inland shipping mileage}}{\text{Area}}$$

This article will use the provincial panel from 2015 to 2019 for quantitative analysis. Since Tianjin and Shanghai are port-type cities, cargo turnover and freight volume have a large amount of transit logistics components, so they are excluded from the scope of this article. The model in this article is set as:

$$\text{Log}=\beta_0 + \beta_1 \text{evb} + \beta_2 \text{infra}_i + \mu_{it}$$

This article first uses mixed regression as the frame of reference, and the results are shown in Table 1.

Table 1. Mixed regression model of productive circulation costs

log	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	.032	.047	0.68	.504	-.064	.128	
ebv	-.083	.037	-2.25	.033	-.158	-.007	**
Constant	.937	.39	2.40	.023	.139	1.736	**
Mean dependent var		0.096	SD dependent var		0.211		
R-squared		0.392	Number of obs		145		
F-test		2.601	Prob > F		0.092		
Akaike crit. (AIC)		-106.106	Bayesian crit. (BIC)		-97.176		
*** p<.01, ** p<.05, * p<.1							

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In addition, because each province and city may have missing variables that do not change with time, this paper considers the use of a fixed-effect model, as shown in Table 2:

Table 2. Fixed-effect model of productive circulation costs

log	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	.043	.045	0.97	.34	-.048	.135	
ebv	-.026	.014	-1.81	.08	-.056	.003	*
Constant	.333	.12	2.77	.01	.087	.58	***
Mean dependent var							
R-squared	0.096		SD dependent var		0.211		
F-test	0.018		Number of obs		145		
Akaike crit. (AIC)	2.217		Prob > F		0.148		
	-372.559		Bayesian crit. (BIC)		-366.606		
sigma_u .18492364 sigma_e .07448553 rho .86040722 (fraction of variance due to u_i)							

*** p<.01, ** p<.05, * p<.1

At this time, the LSDV method is further used for investigation, and the results are shown in Table 3:

Table 3. The LSDV method

Linear regression		Number of obs = 145				
		F(1, 28) = .				
		Prob > F = .				
		R-squared = 0.9018				
		Root MSE = .07449				
		(Std. Err. adjusted for 29 clusters in reg)				
		Robust				
log	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
infra	0.0433549	.0498267	0.87	0.392	-.0587105	.1454204
ebv	-0.0260705	.0160418	-1.63	0.115	-.0589307	.0067897
reg						
Inner Mongolia Autonomous Region	0.0167938	.0109413	1.53	0.136	-.0056185	.039206
Beijing	0.0372294	.022083	1.69	0.103	-.0080057	.0824644
Jilin	0.0358774	.0040835	8.79	0.000	.0275128	.0442421
Sichuan	0.0253373	.0216485	1.17	0.252	-.0190077	.0696822
Ningxia	0.1159523	.0277055	4.19	0.000	.0592001	.1727046
Anhui	-0.0013682	.029701	-0.05	0.964	-.062208	.0594716
Shandong	-0.0138962	.0391783	-0.35	0.725	-.0941494	.0663569
Shanxi	-0.0022435	.0187208	-0.12	0.905	-.0405913	.0361042
Guangdong	0.0675191	.0377006	1.79	0.084	-.009707	.1447452
Guangxi	0.0245222	.0072225	3.40	0.002	.0097275	.0393168
Xinjiang	0.0572685	.0132633	4.32	0.000	.0300998	.0844371
Jiangsu	0.0214348	.0260172	0.82	0.417	-.031859	.0747286
Jiangxi	0.0191047	.0095592	2.00	0.055	-.0004763	.0386858
Hebei	0.0450766	.0139913	3.22	0.003	.0164167	.0737365

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Henan	0.0019829	.0252268	0.08	0.938	-.0496919	.0536578
Zhejiang	0.0625725	.0337966	1.85	0.075	-.0066567	.1318017
Hainan	0.2568711	.0408311	6.29	0.000	.1732323	.3405099
Hubei	0.0002042	.0261122	0.01	0.994	-.0532842	.0536926
Hunan	-0.0041637	.0143498	-0.29	0.774	-.0335578	.0252305
Gansu	0.0725702	.0109023	6.66	0.000	.0502379	.0949025
Fujian	0.0598757	.022735	2.63	0.014	.0133053	.1064462
Tibet	0.9696857	.0376567	25.75	0.000	.8925495	1.046822
Guizhou	-0.0085506	.020857	-0.41	0.685	-.0512743	.034173
Liaoning	0.0355393	.0066746	5.32	0.000	.0218669	.0492116
Chongqing	-0.0201782	.0453322	-0.45	0.660	-.113037	.0726807
Shaanxi	0.0138153	.0062575	2.21	0.036	.0009973	.0266333
Qinghai	0.2692982	.0289881	9.29	0.000	.2099188	.3286776
Heilongjiang	0.0339712	.0126125	2.69	0.012	.0081355	.0598068
_cons	0.2577401	.1381896	1.87	0.073	-.0253285	.5408087

As can be seen from the above table, most individual variables are significant, so mixed regression is not used. In order to judge whether there is a time effect, an annual time dummy variable will be added to the model, and the fixed effect model will continue to be tested, as shown in Table 4:

Table 4. Fixed effect model

log	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	.083	.091	0.91	.371	-.104	.269	
ebv	.201	.156	1.28	.209	-.119	.52	
year2	-.098	.07	-1.41	.169	-.241	.044	
year3	-.155	.107	-1.44	.161	-.375	.065	
year4	-.229	.163	-1.40	.172	-.563	.105	
year5	-.274	.207	-1.33	.195	-.697	.149	
Constant	-1.934	1.591	-1.22	.234	-5.192	1.325	

Mean dependent var	0.096	SD dependent var	0.211
R-squared	0.187	Number of obs	145
F-test	2.437	Prob > F	0.059
Akaike crit. (AIC)	-392.027	Bayesian crit. (BIC)	-374.166

*** p<.01, ** p<.05, * p<.1

Among them, year1 corresponds to the constant in the base period, and the signs of the time effects are all negative, but they are not very significant. Therefore, this article continues to test the joint significance of all annual dummy variables, as shown in Table 5:

Table 5. Joint significance of dummy variables of productive circulation costs

(1)	year2 = 0	
(2)	year3 = 0	
(3)	year4 = 0	
(4)	year5 = 0	
	F(4, 28) =	1.18
	Prob > F =	0.3424

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Therefore, "no time effect" is accepted, but individual effects may also exist in the form of random effects, so random effects are used to estimate. As shown in Table 6:

Table 6. Random effect model of productive circulation costs

log	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	-.015	.035	-0.44	.661	-.083	.053	
ebv	-.045	.022	-2.05	.04	-.087	-.002	**
Constant	.579	.262	2.21	.027	.065	1.093	**
Mean dependent var	0.096		SD dependent var	0.211			
Overall r-squared	0.383		Number of obs	145			
Chi-square	4.258		Prob > chi2	0.119			
R-squared within	0.016		R-squared between	0.436			
*** p<.01, ** p<.05, * p<.1							

The LM test is used to judge the accuracy of random effects and mixed regression, and the results are shown in Table 7:

Table 7. LM inspection of productive circulation costs

Breusch	and Pagan Lagrangian multiplier test for randomeffects
	log[reg,t] = Xb + u[reg] + e[reg,t]
	Estimated results:
	Var sd = sqrt(Var)
	log .0447237 .2114799
	e .0055481 .0744855
	u .0235244 .1533766
	Test: Var(u) = 0
	chibar2(01) = 173.45
	Prob > chibar2 = 0.0000

According to the p-value of the LM test is 0, we can conclude that the "random effects" model should be selected.

Table 8. Hausmann test of productive circulation costs

	Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	re	Difference	S.E.
infra	.0433549	-.0152683	.0586233	.107895
ebv	-.0260705	-.0446269	.0185564	.0133777
_cons	.3333298	.5788067	-.2454769	.0974336
	b = consistent under Ho and Ha; obtained from xtreg			
B =	inconsistent under Ha, efficient under Ho; obtained from xtreg			
Test: Ho:	difference in coefficients not systematic			
	chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)			
	6.27			
	Prob>chi2 = 0.0993			
	(V_b-V_B is not positive definite)			

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Finally, the optimal choice of the Hausman test model is passed, and the results are shown in Table 8.

Its P value is 0.0993, so it can be considered that the fixed-effects model is more suitable at a significant level of 10%. Therefore, a fixed effects model is used.

Therefore, it is obvious from the results of the fixed effects model that the express business volume (ebv) and the transportation distance (log) of unit sales are negatively correlated, indicating that E-commerce can significantly reduce the cost of productive circulation. The transportation infrastructure (infra) basically has no effect on productive circulation costs. The reason may be that the reduction of productive circulation costs nowadays depends on technological innovation. E-commerce can provide more convenient transportation routes and more reasonable transportation methods for logistics, and it has a more obvious effect on productive circulation costs.

2.2. Genuine Costs of Circulation

Compared with productive circulation expenses, pure circulation expenses are not easy to measure quantitatively because they are not calculated in statistics. With the help of Xie Lijuan, Wang Xiaodong and others, they are studying the logic of pure circulation expenses, and put the emphasis of pure circulation expenses on the middle link of business flow. The sum of the sales expenses, management expenses, and financial expenses of wholesale and retail enterprises is regarded as the pure circulation expenses, and then divided by the total retail sales of consumer goods to obtain the pure circulation expenses (gcc) per unit of retail sales.

$$\text{gcc} = \frac{\text{Sales Expenses} + \text{Management Expenses} + \text{Financial Expenses}}{\text{The total retail sales of social consumer goods}}$$

Similarly, we select the provincial panel data from 2014 to 2019 for regression. Therefore, the establishment of the measurement model is as follows:

$$\text{gcc}=\beta_0 + \beta_1 \text{evb} + \beta_2 \text{infra}_i + \mu_{it}$$

The same as the analysis process of the production circulation cost, the panel data is tested, and the fixed effect model is significantly better than the random effect model and the mixed regression, and the model does not include the time dummy variable, so this article only the analysis results of the fixed effects model and the random effects model are imported and Hausmann test is performed on them. The fixed effects model and the random effects model are shown in Table 9 and Table 10, respectively.

Table 9. Fixed-effect model of the circulation cost

coc	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	-226.663	62.085	-3.65	0	-349.652	-103.673	***
ebv	3.564	9.986	0.36	.722	-16.218	23.345	
Constant	426.917	81.073	5.27	0	266.311	587.522	***
Mean dependent var	269.892		SD dependent var		105.513		
R-squared	0.152		Number of obs		145		
F-test	10.242		Prob > F		0.000		
Akaike crit. (AIC)	1426.616		Bayesian crit. (BIC)		1435.546		
*** p<.01, ** p<.05, * p<.1							

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Table 10. The Random Effect Model of Circulation Costs

coc	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
infra	-34.198	41.843	-0.82	.414	-116.208	47.813	
ebv	-4.241	8.804	-0.48	.63	-21.497	13.015	
Constant	343.841	76.628	4.49	0	193.652	494.03	***
Mean dependent var		269.892		SD dependent var		105.513	
Overall r-squared		0.069		Number of obs		145	
Chi-square		2.505		Prob > chi2		0.286	
R-squared within		0.124		R-squared between		0.092	
*** p<.01, ** p<.05, * p<.1							

Then the Hausmann test is performed. The results are shown in Table 11. The P value is 0.0004. Therefore, the fixed-effects model is considered to be the correct model.

Table 11. Hausmann's test of the cost of circulation

	Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	RE	Difference	S.E.
infra	-226.6628	-34.19771	-192.4651	50.99191
ebv	3.563641	-4.240702	7.804343	5.919457
_cons	426.9168	343.8409	83.07592	39.33907
	b = consistent under Ho and Ha; obtained from xtreg			
B =	inconsistent under Ha, efficient under Ho; obtained from xtreg			
Test: Ho:	difference in coefficients not systematic			
	chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)			
	17.97			
	Prob>chi2 = 0.0004			
	(V_b-V_B is not positive definite)			

It can be seen from the fixed-effect model that the express business volume(ebv) has no significant impact on the genuine costs of circulation. The reason may be: the current level of E-commerce has developed to a relatively mature stage, and to reduce genuine costs of circulation, it is necessary to make breakthroughs from high-end places. The transportation and logistics infrastructure (infra) has a significant impact on genuine costs of circulation. The reason may be that the focus of this article is the middle link of the business flow. The object of investigation is the sales expenses, management expenses, and financial expenses of wholesale and retail enterprises. The costs of wholesale and retail are related to the development of local transportation, especially the loading and unloading expenses in the sales expenses. , Packaging costs, business costs of sales organizations. If the local transportation is convenient, the costs will naturally be reduced. Therefore, the transportation infrastructure (infra) plays a role in promoting the storage and circulation costs.

3. Conclusion and Enlightenment

This article combines theoretical and empirical factors that may have an empirical analysis on circulation costs. The main conclusions include the following two aspects. First, the development of E-commerce can reduce the cost of productive circulation. Second, the logistics

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infrastructure can only reduce the storage and circulation costs, and the impact on the production circulation costs is not significant.

The main research inspiration of this article lies in the following two aspects, on the one hand. China should promote the development of E-commerce, and at the same time encourage the industry to accelerate informatization, and accelerate the transformation and development of physical commerce like E-commerce. At the same time, speed up the integration of science and technology with the logistics industry and other industries, so that new technologies can better play the role of reducing circulation costs. On the other hand, China should continue to build logistics infrastructure and further improve its planning and layout of the logistics industry.

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