Research on the Impact of Digital Technology Development on the Efficiency of Chinese Market Transactions

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Abstract

The increasingly mature development of digital technology affects the production methods and operating forms of various industries. From the perspectives of three industries, construct a mechanism model for the digital level of each industry to affect the efficiency of market transactions, and introduce market technology and institutional factors and prices Level factor. The panel data of 31 provinces from 2001 to 2020 is used to empirically test the degree of influence of the digitalization level of each industry on transaction efficiency. The results show that under the premise of controlling market technology, market system, and price levels, the improvement of the digital level of the three industries has a significant positive impact on transaction efficiency, and the impact of the tertiary industry is greater than that of the other two industries.

Keywords: *digital economy; technological progress; transaction efficiency*

1. Introduction

In recent years, with the development and wide application of digital information technology, countries have gradually entered the period of the fourth industrial revolution. Digital technologies such as 5G, artificial intelligence, and integrated circuits have developed rapidly, in order to adjust the traditional production mode of the industry, and to organize the industry. The structure is optimized and upgraded to improve the international competitiveness of various sectors of the national economy. According to the "2021 Global Digital Economy White Paper" (hereinafter referred to as the "White Paper") issued by the Institute of Information and Communications Technology, the scale of the global digital economy in 2020 will reach 3.26 billion U.S. dollars, accounting for 43.7% of GDP, a year-on-year nominal growth of 3.0%, which is significantly higher than the same period. GDP-2.8% growth rate (the average of 47 countries estimated). In addition, the advantages of the wide application of digital technology are also reflected in the micro-market level. The in-depth application of digital technology in traditional procurement, production, warehousing, transportation, sales and other links has greatly reduced transaction costs and significantly improved market transaction efficiency.

In the "Statistical Classification of Digital Economy and Its Core Industries (2021)" issued by the National Bureau of Statistics, the scope of the digital economy is clarified, one is digital industrialization and the other is industrial digitalization. The former refers to the separation of production, consumption and distribution from traditional industries, and independent new industries, including digital product manufacturing, digital product service industry, digital technology application industry, and digital factor-driven industry; the latter refers to the four major categories It refers to the increase in output and efficiency of traditional industries through the use of digital technology and data elements. It refers to the part of the digital efficiency improvement industry, which covers various sectors of the national economy such as smart agriculture, smart manufacturing, smart transportation, and digital commerce. Industry. The digital economy studied in this article is the part of industrial digitalization, that is, an analysis of the degree of integration between digital technology and the real economy. For the accounting of this part of the digital economy, The US Bureau of Economic Analysis (BEA) defines it in a narrow sense from the perspective of production law, including infrastructure, digital transactions, and "digital media"

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data; Xu Ji[1] summarized and reviewed foreign literature in the same period, and pointed out that there are roughly two ways to measure the contribution of digital technology. One is to use producer surplus; the other is to calculate profits and performance from the perspective of enterprises; Xu Xianchun[2] determined the scope of the digital economy from four aspects: digital empowerment infrastructure, digital media, digital transactions, and digital economy transaction products, and used BEA's calculation method to calculate the total output and added value of the digital economy; Zhao Hongjun[3] uses principal component analysis to divide transaction efficiency into three levels: system, communication infrastructure, and education from the perspective of new institutional economics, to measure transaction efficiency; Liu Chaoyang[4] draws on the concept of transaction cost and uses the ratio of sales, management, financial expenses and operating income to calculate transaction efficiency.

Based on the existing literature, most of the research related to the digital economy focuses on the macro level, such as studying its impact on the development of the entire national economy or on a specific industry; at the micro level, the research on how the digital economy affects market mechanisms is Slightly lacking. This paper studies the impact of the development of the digital economy in recent years on the efficiency of market transactions and finds a suitable direction for the development of the digital economy to promote the stable development of various sectors of the national economy.

2. Theoretical analysis and research hypothesis

The impact of the development of the digital economy on market transaction efficiency mainly comes from the improvement of production efficiency brought about by technological progress and the reduction of transaction costs brought about by the gradual improvement of the economic system. First, analyze technological progress. When analyzing enterprise production, we usually express the increase in residual value excluding the increase in factor input as technological progress. The advancement of information technology brought about by the development of the digital economy has revolutionized traditional production, logistics, and communications. The development of information technology has also changed the industrial structure of certain industries, causing them to merge or spawn new industries, such as unmanned The production of workshops, driverless cars, intelligent storage systems, etc., as well as the rise of taxi-hailing software, takeaway platforms, short video platforms, etc., the development and application of these digital technologies have improved transaction efficiency to varying degrees. Secondly, we analyze the perfection of the economic system. When studying the theory of market equilibrium, we always assume that the transaction subjects in the market have complete market information and information completeness. But in fact, due to the limitations of communication methods, the time difference between the dissemination and acceptance of price information, and other subjective or objective factors, transaction costs will be increased and transaction inefficiencies will be increased. The popularization of the Internet brought about by the digital economy has increased the information transparency of enterprises, reduced the information asymmetry between the parties to the transaction, and eased the financing constraints of SMEs to a certain extent, making transactions more efficient.

In summary, put forward the hypothesis of this article:

H1: Digital economy improves transaction efficiency through technological progress.

H2: Digital economy improves transaction efficiency by improving market operation mechanism

3. Research design

3.1. Basic model settings

Based on the assumptions put forward above, establish a measurement model to evaluate the impact of the digital economy on transaction efficiency. The basic model of setting panel data is as follows:

$$Eff_{it} = \alpha_0 + \alpha_1 \ln Agri_{it} + \alpha_2 \ln Indu_{it} + \alpha_3 Ser_{it} + \alpha_4 Tech_{it} + \alpha_5 System_{it} + \alpha_6 Price_{it} + \varepsilon_{it} \quad (1)$$

Among them, Eff_{it} is the explained variable, which represents the transaction efficiency of the market. $Agri_{it}$, $Indu_{it}$, and Ser_{it} are the core explanatory variables, which respectively represent the digital level of agriculture, industry, and tertiary industry. Others are controlled variables, including Tech for technical level, System for system level, and Price for household consumption level. ε_{it} represents the random error term. The specific description of each variable is as follows.

3.2. Selection of main variables

3.2.1. The explained variable

The transaction efficiency of the market (Eff) . Regarding the measurement of transaction efficiency, there are many existing methods, including empirical analysis based on the DEA model, building a comprehensive evaluation index system, and using the input-output relationship for measurement. This article quotes Liu Chaoyang's (2020) method of measuring transaction efficiency, and defines the sum of sales expenses, management expenses and financial expenses

as transaction costs, and the ratio of its ratio to operating income is the transaction efficiency coefficient. The larger the coefficient, the lower the transaction efficiency.

3.2.2. Explaining variables

Regarding how to measure the level of digital economy development, existing research is usually carried out from two aspects: digital industrialization and industrial digitization. This article only studies the latter, and measures the degree of industrial digitization from the primary, secondary, and tertiary industries. Among them, the degree of agricultural digitalization (Agri) is measured by the total output value of agriculture, forestry and animal husbandry, the degree of industrial digitalization (Indu) is expressed by the number of patent applications of industrial enterprises above designated size, and the degree of industrialization of the service industry (Ser) is expressed by the penetration rate of mobile phones. In order to make the data more stable and eliminate the collinearity between the explanatory variables, the agricultural digitalization and industrial digitalization levels are processed logarithmically.

3.2.3. Control variable

In addition, drawing on the research of Gao Fan et al., this article also divides the factors that affect transaction efficiency into technology (Tech) and system (System) for comprehensive measurement. The technology includes traffic (Traffic), communication (Comm) and education (Edu), and the system includes the degree of marketization (Mar) and capital structure (Capital). Transportation uses highway operating mileage to indicate the level of infrastructure, communication uses the number of Internet users to indicate the level of informatization, education uses the number of students enrolled in ordinary colleges and universities to measure the population's education, and the degree of marketization uses the proportion of non-state-owned economies in each region in the total industrial output value. Said that the capital composition uses the ratio of the paid-in capital of non-state-controlled industrial enterprises to the paid-in capital of industrial enterprises above designated size. The three indicators of transportation, communication and education are combined and their average value is used to represent the technical indicators, and the two indicators of marketization and capital are weighted and averaged to represent the system indicators.

3.3. Data source and processing

This paper uses panel data from 31 provinces from 2001 to 2020 for empirical analysis. The original data mainly comes from the official website of the National Bureau of Statistics, the Ministry of Industry and Information Technology, CSMAR database, China Statistical Yearbook, China Science and Technology Statistical Yearbook, etc. In order to eliminate the possible instability of panel data, logarithmic processing is performed on each explanatory variable.

4. Empirical results and analysis

4.1. Descriptive statistics of variables

Table.1 shows the descriptive statistical results of the variables. It can be seen from Table 2 that the transaction efficiency of the explained variables presents a right-skewed distribution, with a maximum value of 0.99, a minimum value of 0.755, and an average value of 0.902, indicating that the transaction efficiency of enterprises in the Chinese market measured by this measure is relatively high; agriculture, industry, The data on the digitalization level of the three industries in the service industry shows that agriculture and industry present a right-biased form, while the service industry presents a left-biased form, indicating that the digital level of agriculture and industry is better than that of the service industry; the minimum technical level is 1.343, and the maximum is 1.343 The average value is 3482, the average value is 498.9, and the standard deviation is 530.8, indicating that the technical level of each region is quite different; the minimum value of the institutional factor is 0.0998, and the maximum value is 0.9, indicating that the difference between the various systems is small; the minimum price level is 97.7, and the maximum value is 110.1, indicating that the differences in consumer price levels in various regions are relatively small.

Table.1 Descriptive statistical analysis results of variables

VARIABLES	N	mean	sd	min	max
Eff	620	0.902	0.0296	0.755	0.990
lnAgri	620	7.258	1.170	3.966	9.229
lnIndu	615	7.943	2.047	0	12.60
Ser	620	68.13	39.35	4.310	189.5
Tech	620	498.9	530.8	1.343	3,482
System	618	0.536	0.199	0.0998	0.900
Price	620	102.4	1.833	97.70	110.1

4.2. Benchmark regression

Before the benchmark regression, first analyze the correlation relationship. The empirical results of Stata show that the mean value of the variance inflation factor between the explanatory variables is 2.39, and they are all far below 10. Therefore, the model does not consider

the problem of multicollinearity. The results of Hausman's test indicate that the empirical regression of this article should adopt a fixed-effects model, and in turn add control variables to the model for benchmark regression.

Table.2 The regression results

	(1)	(2)	(3)
VARIABLES	Eff	Eff	Eff
lnAgri	0.233***	0.214***	0.211***
	(9.71)	(8.78)	(8.21)
lnIndu	0.113***	0.103***	0.094***
	(7.08)	(7.29)	(7.99)
Ser	0.460***	0.370***	0.352***
	(14.30)	(11.57)	(11.41)
Tech		0.106***	0.083***
		(4.60)	(4.98)
System		0.092***	0.088***
		(9.01)	(9.10)
Price			0.013***
			(8.95)
Constant	0.656***	0.738***	0.468***
	(33.03)	(35.42)	(13.02)
Observations	615	613	613
R-squared	0.435	0.528	0.585
Number of Pro	31	31	31

t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table.2 shows that no matter what control variables are added, the digitization level of the three industries promotes the transaction efficiency of my country's market, and it is always significant at the level of 1%. In terms of other control variables, technology level, system level and consumer price level all have a positive impact on the transaction efficiency of my country's market.

4.3. Robustness test

The test results of the above three models all show that the improvement of the digitalization level of the three industries has a significant positive impact on the improvement of transaction efficiency. In order to effectively demonstrate the robustness of the above results, the measurement index of transaction efficiency is replaced with labor productivity in the entire industry market in China, and the results are shown in Table.3. Similar to the above analysis results, the core explanatory variables and control variables have a significant impact on transaction efficiency, especially when the control variables are added, the comprehensive impact coefficient is 0.781, which clearly shows that the improvement of the digitalization level of various industries can better affect the improvement of transaction efficiency.

Table.3 Results of robustness test

	(1)	(2)	(3)
VARIABLES	Eff	Eff	Eff
lnAgri	6.164***	5.374***	5.488***
	(4.63)	(3.96)	(4.03)
lnIndu	2.651***	1.656***	1.685***
	(4.77)	(3.14)	(3.19)
Ser	1.290***	1.216***	1.217***
	(12.94)	(10.21)	(10.23)
Tech		1.514***	1.610***
		(9.58)	(9.57)
System		21.391***	21.581***
		(5.41)	(5.45)
Price			0.113***
			(0.88)
Constant	24.631***	9.357***	1.515***
	(3.17)	(1.17)	(1.10)
Observations	614	612	612
R-squared	0.732	0.763	0.781
Number of Pro	31	31	31

t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

5. Conclusions and policy implications

This article uses data from 31 provinces in China for 20 years as a sample to analyze the impact of the digitalization level of the three industries on transaction efficiency, and adopts a fixed-effect model and gradually adds control variables to test the degree of influence, and replaces the explained variables on the model. Robustness is tested. Through the research of this article, the main research conclusions are as follows: First, the digital level of the three industries has a significant positive impact on the transaction efficiency in the market. The higher the level of digitization in each industry, the better the efficiency of transactions in the market. Second, among the three industries of agriculture, industry, and service industry, the digital level of the service industry has the greatest impact on transaction efficiency. An increase in the digital level of the service industry by one unit can significantly increase transaction efficiency by 0.352 units; and the degree of influence of industry It is smaller. Third, the market transaction system, infrastructure level, and price level all have varying degrees of impact on transaction efficiency. It is also possible to consider how to improve market transaction efficiency from these perspectives. The policy implications are as follows: First, it is necessary to accelerate the development of digital technology, and accelerate the realization of digital technology productization, more quickly integrate R&D and production, and promote the digital realization of productivity. Second, the degree of integration between digital technology and various industries is different. While accelerating the steady

improvement of the digitalization of the tertiary industry, attention should also be paid to the optimization and upgrading of the industrial structure that agriculture and industry rely on digital technology to complete. Third, in addition to improving the digitalization level of various industries, it is also possible to promote the improvement of transaction efficiency by accelerating the construction of the market transaction system and the construction of basic information technology.

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