The Level of Financial Development, Digital Inclusive Finance and the Upgrading of China's Industrial Structure

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Abstract: Economic theories that explain the transformation of industrial structure focus on factors such as fluctuations in relative prices of products and income growth. In addition, in recent years, with the characteristics of increasing financial development, rapid development of digital economy and fluctuating inward investment, the existing literature lacks a unified theoretical framework to evaluate the relative importance of all these factors. To this end, this paper studies the influencing factors of China's industrial structure transformation, and constructs a panel model by using the data of each index of 282 prefecture-level cities in China from 2011 to 2019, and quantitatively evaluates the impact of the five effects on the industrial structure transformation. The results show that: first, the financial level has a significant role in promoting China's industrial structure; second, in recent years, China's investment in the service industry, information industry and financial industry has been increasing; third, at the regional level of China, there is a positive relationship between per capita GDP and industrial structure. Therefore, in the future, China needs to focus on guiding the development of the financial market and making the industrial structure move in the direction of optimization.

***Keywords*:** industrial structure upgrading, financial development level, empirical analysis

1. Introduction

1.1 Introduction

With the further deepening of the reform of the world economy today, our country's economy is at an unprecedented critical stage. It has become a top priority to promote the equal development of local governments and increase the proportion of secondary and tertiary industries. According to the latest data research, the proportion of secondary and tertiary industries has increased from 72.84% in 1990 to 92.8%, and this achievement has benefited from China's initiative to open up to the outside world. In recent years, as the domestic economy has continued to expand, China's foreign direct investment has also grown. From 10.289 billion US dollars in 1990 to 134.97 billion US dollars, an increase of 13.12 times. With China's economic growth and the development of digital finance, it is necessary to introduce variables such as financial development level and digital inclusive financial index to analyze their relationship with industrial structure. And with China's participation in the international market, the flow of FDI has intensified, making China more closely involved in the international economy, which not only promotes China to better participate in the international economic competition, but also prompts China to participate more actively in the development of the international economy, so as to better promote economic prosperity. This study comprehensively explores the current economic situation in China from multiple perspectives, including literature research, descriptive statistical analysis, financial development, financial inclusion, and FDI, and deeply analyzes the variables to gain a more accurate understanding, establishes a panel model, and empirically examines the impact of factors such as financial development level on the industrial structure from 2011 to 2019 at the regional level.

1.2 Literature review

In recent years, many scholars have begun to think deeply about how to promote the development of finance and how to achieve industrial upgrading. Gurley and Shaw (1967) regard banking theory and monetary theory as an important component, and point out that as long as the financial diversity is fully reflected, the transformation from deposits to financing can be completed, so as to achieve a rational allocation of funds to promote sustainable economic growth, and the study also shows that the growth of the national economy and the construction of financial institutions are mutually reinforcing. The publication of Goldsmith's (1969) book Financial Structure and Financial Development has opened up a new mode of thinking for us, which establishes a complete theoretical framework for financial development, and uses its unique financially relevant ratio as a measure, thus verifying the close relationship between economic growth, industrial upgrading and financial development. Many well-known researchers such as King, Levine, Galbis, and Kapur (1993),

drawing on the research results of McKinnon and Shaw (1973), emphasized the need to remove financial restrictions and promote financial liberalization in order to better promote economic growth in developed regions. In addition, they pointed out that only by establishing sound financial institutions can we promote the continuous reform of science and technology, so as to promote the sustainable development of society. Wurgler's (2000) study of manufacturing industry growth and overall input in 65 countries shows that in economically developed regions, the distribution and use of resources are less efficient. This suggests that economic prosperity and stability can help improve the distribution and use of capital, thereby promoting economic transformation and upgrading. In recent years, researchers such as DaRin and Hellmann et al. (2002) have conducted empirical studies to analyze the importance of finance in promoting the growth of emerging industries, curbing the transformation of declining industries, and upgrading industrial structures, in order to better understand the importance of finance in the economy. Empirical research conducted by Yang Lin, Li Jianwei et al. (2002) shows that with the continuous growth of China's economy, the structure of industry is also evolving, and in the context of this evolution, the development of finance lags behind, so it is necessary to rapidly promote the adjustment of the financial system to meet the needs of the economy. Through the research of Fan Fangzhi and Zhang Lijun (2003), they pointed out that there are differences in the reform of financial structures and their impact on the local economy in three different regions, namely the eastern, central and western regions. In particular, in China, the continuous improvement of the industry has led to the restriction of financial development, which has dragged down the adjustment of the economy. Zhang Lijun (2002) concluded that the development of finance can promote the transformation and improvement of industries through regression analysis from 1978 to 2002. In addition, they delved into the internal dynamics of this shift and conducted empirical studies using VAR models to identify financial developments and industrial shifts between 1992 and 2012. After in-depth research, we found that domestic scholars did not fully consider regional factors in discussing industrial structure upgrading and financial development, nor did they deeply explore the relationship between these two fields. Therefore, when taking into account China's special economic environment and the process of industrial and financial development, it is necessary to combine the statistical data of prefecture-level cities and select more comprehensive indicators for more in-depth research.

2. Analysis of the current situation

2.1 Analysis of the current situation of China's industrial structure

2.1.1 Labor force changes in the three industries

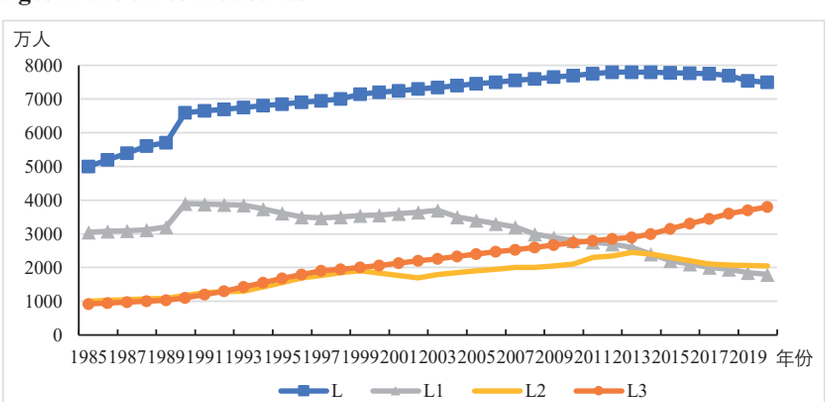

Figure 1. Employees in the three industries (unit: 10,000 people). (Data source: Compiled and plotted according to the data of the National Bureau of Statistics)

Among them, L represents the total number of employees in China, L1 represents the number of employees in the primary industry, L2 represents the number of employees in the secondary industry, and L3 represents the number of employees in the tertiary industry. It can be seen from Figure 1 that the number of employees in China's primary industry is declining, the number of employees in the secondary industry is gradually rising to stable, and the number of employees in the tertiary industry is rising. On the whole, China's industrial structure is gradually becoming more advanced. (Industrial structure upgrading index = added value of tertiary industry/added value of secondary industry, which can also be measured by the ratio of employees.)

2.1.2 Changes in the output value of the three industries

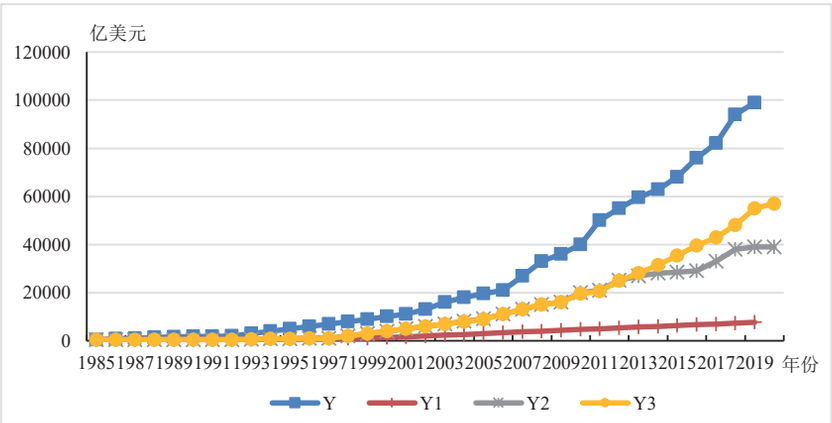

Figure 2. Gross Output of the Three Industries (unit: 10,000 people). (Data source: Compiled and plotted according to the data of the National Bureau of Statistics)

Among them, Y represents China's GDP, Y1 represents the GDP of the primary industry, Y2 represents the number of employees in the secondary industry, and Y3 represents the GDP of the tertiary industry. As can be seen from Figure 2, the GDP of the three industries is rising, the growth rate of the primary industry is slow, and the growth rate of the GDP of the tertiary industry is greater than that of the secondary industry and greater than that of the primary industry, indicating that the tertiary industry has the highest economic benefits. At the same time, Figure 2 also reflects the gradual upgrading of China's industrial structure.

2.2 Analysis of the role of financial development on the industrial structure

With economic growth, the financial industry is playing an increasingly critical role in driving changes in the industrial structure. A major change may include the fact that the financial sector can help companies shift from a consumer-oriented to a service-oriented one, and that companies can better control market competition to achieve sustainable economic growth. Another possible change may include: financial services can help companies transform from a consumer-oriented to a service-oriented one that can lead to sustainable growth. With the continuous emergence of high technology, the requirements for financial services are also increasing, which will promote the rational allocation of financial service information resources, thereby promoting the sustainable development of China's market economy and social development and industrial optimization and transformation.

2.2.1 Indirect financing in the bank credit market

The role of finance is not only reflected in direct financing, but also in how they drive the transformation and efficiency of industries. This transformation is likely to rely on government support and bank help. For example, providing subsidies and support, or relying on the help of commercial banks. These measures will help to promote the transformation of the industry and improve efficiency. Market-based commercial credit is an important fiscal policy, which can not only help enterprises allocate funds across periods, but also promote them to provide more innovation capabilities in the fields of more use of emerging technologies, emerging services, emerging materials, etc., and can effectively improve economic efficiency and promote sustainable and healthy economic development.

2.2.2 Direct financing in the capital market

Both different types of financial resource allocation models can be used for direct financing. Among them, the government can take a variety of measures, such as providing more market access and stricter regulation, and setting up investment funds specifically for companies with high scientific research and development potential. These measures are designed to help the company grow more efficiently and improve its value chain. [1]The marketplace is a platform for investment and financing, which can raise funds from the primary market and use its unique screening function to transfer more investment to better companies and those areas with more room for growth. The company can also use mergers and acquisitions to optimize the company's business, and then promote the company's transformation and upgrading. This market with a strong market can more flexibly reflect the return on investment, information disclosure and risk identification of all walks of life, so that the technical level and scale structure of all walks of life can be advantaged, and can be adjusted accordingly according to the allocation of resources, so that companies with capital advantages can make more use of market investment, and then obtain greater social benefits[2]. Due to the development of the national economy, the traditional industry model has been reshaped,

and a new industry pattern has emerged.

3. Model setting and variable handling

3.1 Build a panel regression model

Among them, it is the $Industry_{i,t}$ industrial upgrading index of city I in the t-year and the $Finance_{i,t}$ financial development level of city i-city in the t-year period $\alpha X_{i,t}$ represents a series of control variables and $\dot{o}_{i,t}$ is an error term.

3.2 Indicator data setting

According to the national economic situation from 2011 to 2019, the annual data of prefecture-level cities collected from the China Statistical Yearbook, the China Torch Yearbook, and the Peking University Digital Inclusive Finance Database can be used as an important reference for studying the independent variables of changes in the industrial structure at the municipal level. Gurley and Shaw (1967) first explored the concept of development in depth and applied it to the improvement of the industrial structure, thus ushering in a new period in which the concept was realized. With the progress of the times[3], Goldsmith (1969) first introduced the concept of FIR, which reflects a new way of assessing changes in the level of finance, and this new way of measuring financial development is the financial-related ratio, which can be used to reflect the growth of financial assets. We can get a more accurate picture of the current financial development by using the ratio of "total loans to financial institutions in the region in the current year" and "GDP of the region in the current year", which is a measure of the total credit of local financial institutions in the current year. The specific settings of each indicator are as follows:

Table 1. Variables and Measurement Methods

	variable	Measurement method
Explanatory variables	Upgrading of Industrial Structure (Industry)	Value-added of tertiary industry/value-added of secondary industry
Core explanatory variables	Finance	Total loans of financial institutions in the current year by region/GDP of each region in the current year
Control variables	Digital Financial Inclusion Index (Digitalfin)	Peking University Digital Inclusive Finance Index* Internet penetration rate by region in the current year
	Restraint	The government of each region stipulates the expected deposit-to-loan ratio/actual deposit-to-loan ratio in the current year
	Gross Domestic Product Per Capita (AverageGDP)	The amount of GDP per capita in each region in the current year
	Foreign Direct Investment (FDI)	I do it with the GDP deflator to FDI Actuals are processed

The above data are from the China Statistical Yearbook from 2011 to 2019 in various provinces in China (except Tibet Autonomous Region, Hong Kong, Macao and Taiwan). Among them, the data of financial development level, financial constraint level, per capita gross domestic product, and foreign direct investment are obtained from the statistical yearbooks of various regions, and the digital inclusive finance index of Peking University is multiplied by the Internet penetration rate in the China Torch Statistical Yearbook. [4]

4. Empirical results and analysis

4.1 Descriptive statistics

Table 2. Descriptive statistical results

Stats	Industry	Finance	Digitalfin	Restraint	AverGDP	FDI
Max	3.378788	6.725473	260.0415	9.622104	290477	20500000
Min	0.3046448	0.9868386	1.164335	0.1179734	6457	0
Mean	0.9750649	2.399818	50.80274	0.9892575	51860.1	603561
p50	0.8520971	2.086641	35.02709	0.8133305	42688	154718.7
SD	0.5100814	1.101836	50.56597	0.616067	32551.81	1425165
N	2511	2511	2511	2511	2511	2511

4.2 Haussmann test

As can be seen from the Haussmann test below, the p=0 value is chosen for fixed-effect regression.

	Coefficients			
	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
Finance	.4181874	.405761	.0124265	.0054622
Digitalfin	.0024213	.0024068	.0000146	.0000233
Restraint	-.2076736	-.2068354	-.0008382	.0040103
AverGDP	3.61e-07	3.73e-07	-1.16e-08	2.29e-08
FDI	-8.70e-09	-6.63e-09	-2.06e-09	3.02e-09
_cons	.0404266	.0683104	-.0278839	.

b = Consistent under H0 and Ha; obtained from **xtreg**.
B = Inconsistent under Ha, efficient under H0; obtained from **xtreg**.

Test of H0: Difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 38.06
Prob > chi2 = 0.0000

Figure 3. Hausman test results (Data source: Plotted by Stata based on variable data)

4.3 Benchmark regression

Therefore, through the fixed-effect regression results in the first column of Table 3, it can be seen that at the regional level in China, the level of financial development has a significant positive effect on the upgrading of industrial structure.[3] Through the analysis[5], it can be concluded that the development of the tertiary industry has been mainly developed in recent years, indicating that the development of the tertiary industry in China's prefecture-level cities has played a role in promoting the development of the tertiary industry, but the development of the secondary industry is relatively limited. As scholar Sun Yulin (2022) has studied, the more developed the financial market, the better the development of industries that require faster and more efficient capital circulation, such as the service industry and high-tech industries. Second, digital inclusive finance has a negative effect on the development of industrial structure, because the development and popularization of the digital economy will strengthen the development of human capital and service industry, so it is beneficial to the upgrading of industrial structure[6]. Third, financial constraints have a negative inhibiting effect on the development of industrial structure, because the degree of local constraints on financial development restricts the flow of talents and capital to a certain extent, thereby restricting local industrial clusters and inhibiting the upgrading of industrial structure[7]. Fourth, the increase in per capita GDP has also had a significant effect on the upgrading of the industrial structure, because the development of manpower and science and technology can promote the upgrading and intelligent development of the industry; fifth, foreign direct investment has a negative effect on the upgrading of the industrial structure, and scholar Sun Yulin (2022) believes that foreign direct investment has mainly invested in the secondary industry in the past few decadesForeign direct investment (FDI) has promoted the development of China's secondary industry, especially the manufacturing industry, but has limited the development of the service industry and high-tech industry. [8]

4.4 Robustness test

The second and third columns of Table 3 show the regression results obtained by different robustness tests: the second column is the regression after the variable lags for one period[9], which is based on the principle of testing the robustness of the results and excluding potential problems with other control variables. The third column is an index that uses the method of substitution dependent variable to test the robustness and uses the industrial structure upgrading index formula to measure the degree of industrial structure upgrading of China's prefecture-level cities[10], and the algorithm is (added value of each industry/gross added value) × (the difference between the added value of each industry and the national average added value/ national average added value)[6]. Therefore, from the results of robustness regression, it is known that the level of financial development has always had a significant positive impact on the industrial structure. [11]

Table 3. Baseline regression results

Regression	FE	Robust Test 1	Robust Test 2
VARIABLES	Industry	Industry	substitution variable of Industry
Finance	0.418***	0.256***	0.039***
	(0.045)	(0.042)	(0.010)
Digitalfin	0.002***	0.002***	-0.000*
	(0.000)	(0.000)	(0.000)
Restraint	-0.208***	0.089*	-0.034***
	(0.057)	(0.049)	(0.008)
AverageGDP	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
FDI	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	0.040	0.163*	0.219***
	(0.071)	(0.093)	(0.017)
Observations	2,511	2,232	2,511
Number of city	279	279	279
R-squared	0.569	0.487	0.017

Note: Robust standard errors in parentheses;*** means p<0.01, ** means p<0.05, and * means p<0.1.

5. Conclusions, analysis and recommendations

In view of the impact of China's financial development level on the upgrading of industrial structure at the regional level, this paper draws the following conclusions[8]. (1) From the analysis of the phenomenon, it can be concluded that China's industrial structure is gradually upgrading, and the tertiary industry has the fastest growth rate; in recent years[12], China's service industry, information industry and financial industry have been expanding; (2) At the regional level of China, the level of financial development has a significant positive effect on the development of China's tertiary industry, and the convenience of transportation and the level of scientific and technological development have significantly promoted the upgrading of industrial structure[13]. In order to promote the optimization of China's industrial structure and improve the level of industrial development, the analysis results of this paper provide us with important enlightenment[14].

First, in light of China's industrial structure and productivity, relevant policies should be introduced to guide foreign direct investment into China's industries that need to be developed urgently, so that foreign investment can be transferred in a direction conducive to high-quality economic development. Second, in view of the current economic situation, the government should take proactive measures, including improving preferential tax policies, formulating and improving investment protection mechanisms, innovation policies, and actively supporting the government's "going out" policies[15], in order to form a positive economic policy and form a competitive economic pattern. Third, it is necessary to strengthen the construction of transportation infrastructure to promote the transformation of scientific and technological achievements.

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