Research on the Impact of Financial Development on Industrial Structure Upgrading: Evidence from China's Provincial Panel Data

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Abstract: On the basis of analyzing the mechanism of the impact of financial development on industrial structure upgrading, this paper comprehensively considers the state of the industrial structure among provinces from three dimensions: rationalization, optimization, and equalization. This research finds that financial development promotes the rationalization and optimization of industrial structure but has no significant effect on the equalization of industrial structure.

Keywords: Financial development; Rationalization; Optimization; Equalization

1. Introduction

Finance, as the engine of modern economy, provides powerful resource support for industrial structure upgrading. Its abundance, depth, and support of investment are the core elements for the success of industrial structure upgrading. Therefore, the correlation between financial development and industrial structure upgrading is an important research topic.

With the gradual deepening of theoretical research on financial development, the significance of financial factors in promoting industrial structure upgrading and national economic growth is widely concerned and recognized [1]. According to research, financial development is closely related to changes in economic resources [2]. The former is reflected in the joint development of financial intermediaries and financial markets [3]. The development of financial markets plays a positive role in improving the allocation efficiency [4] and the growth rate of inter-industry correlation; thus, it can promote the upgrading of industrial structure [5].

In China, Gu studied the mechanism involved in the optimization and upgrading of China's financial industrial structure [6]. According to Qian and Zhou, financial development has a significant positive role in promoting industrial structure adjustment [7]. Zhou *et al*. have found that the effects of credit and stock market development on the optimization rate of industrial structure in China are different [8]. In a study, He found that financial development will change the internal structure and proportion of the tertiary industry and promote rationalization [9], but excessive financialization will squeeze out investment in the real economy and inhibit the rationalization of industrial structure. According to Luo, the expansion of financial development scale will improve the degree of industrial structure upgrading [10]. Financial development will also increase the investment in growth industries by allocating resources to promote industrial structure optimization [4]. However, excessive reliance on financial resources will have a negative effect on capital

accumulation, which is adverse to the optimization of industrial structure. According to Chen, speculative nature disrupts the industrial balance [11]. Hence, this paper aims to explore whether financial development, as the core of economic resources, would render industrial upgrading dependent upon it.

2. Functional mechanism

The mechanism of financial development and industrial structure upgrading can be analyzed from two aspects: direct financing and indirect financing.

In terms of direct financing, how to direct the flow of incremental funds into industries with high operating efficiency and great development potential depends on the issuance function of the primary market. The upgrading of industrial structure depends on the secondary market and is mainly achieved through mergers and acquisitions of enterprises, stock adjustments, and other means. In addition, the small and medium-sized enterprise (SME) board market is also very important, as it provides financial resources and services to high-risk industries and emerging industries.

In terms of indirect financing behavior in the bank credit market, the dependence of financial development and industrial restructuring on financial resources is reflected in policy subsidy and market commercial credits. The development and planning of specific industries in China are closely related to policy-based credit subsidies. It is through credit rationing, loan subsidies, and other means that credit funds are allocated to specific industries that need support, so as to achieve the purpose of macroeconomic regulation. Market commercial credit includes consumer loans and production loans. The former is aimed at adjusting the stock capital, which indirectly affects the level of industrial structure from the aspect of demand through the intertemporal allocation of consumption; the latter uses the incremental adjustment method of investment tilt to reshuffle and transfer financial resources and provide loans to specific industries, which have an indirect impact on industrial upgrading from the supply side.

3. Model construction

This paper selects 31 provinces (municipalities directly under the Central Government) in China as research samples and uses the annual data from 2009 to 2020. The data are mainly derived from China Statistical Yearbook (2009–2020), China Economic and Social Development Statistics Database, China Financial Yearbook, and WIND information. The definitions and calculation methods of the selected variables are described below.

3.1. Variable selection
3.1.1. Industrial structure upgrading
This article measures industrial structure upgrading from three levels.
(1) Rationalization of industrial structure (IR)

The rationalization of industrial structure not only reflects the degree of effective resource allocation and utilization among industries, but also the interaction and coordination between industries. In the past, most scholars used structural deviation measurement. Based on Gan's research [12], this paper uses Theil index to measure the rationality of industrial structure. Compared with the structural deviation index, the Theil index not only retains the theoretical basis and economic meaning of the structural deviation index, but also takes into account the relative importance of the industry without including absolute value calculation. IR is calculated as follows:

$$IR = \sum_{i=1}^{3} (\frac{Y_i}{Y}) \ln(\frac{Y_i}{L_i} \Big/ \frac{Y}{L}) \tag{1}$$

where Y represents output value, L represents employment, i represents industry, productivity, and the relative importance of industry. According to the assumption of neoclassical economics, when the economy is in equilibrium and the productivity level of each industrial sector is the same, IR is a reverse indicator.

(2) Optimization of industrial structure (IO)

The optimization of industrial structure is a process of promoting the development of sunrise industries by improving the level of resource utilization, so as to increase its proportion in the industry. This paper uses the ratio of output value of tertiary industry to output value of secondary industry as the measurement index of the optimization of industrial structure. Compared with the traditional measurement method, it clearly shows whether the industrial structure is advancing toward the tertiary industry.

$$IO = Y_3 / Y_2 \qquad (2)$$

Y_2 and Y_3 represent the output value of the secondary industry and the tertiary industry, respectively. A rising IO value indicates that the industrial structure is advancing toward the tertiary industry and the industrial structure is in the process of optimization. Therefore, IO is a positive indicator.

(3) Equilibrium of industrial structure (IE)

The equilibrium of industrial structure is the ultimate ideal state of industrial structure upgrading. The process of adjustment is a gradual transition from disequilibrium to equilibrium, from low-level equilibrium to high-level equilibrium, and the harmonious coexistence between industries. Based on Xu's general equilibrium analysis framework [13], this paper selects the economic deviation measure to represent the industrial structure equalization.

$$IE = \sqrt{\sum_{i=1}^{3} \left(\frac{y_i}{l_i} - 1 \right)^2 \Big/ 3} \qquad (IE \geq 0)$$

$$y_i = Y_i \Big/ \sum_{i=1}^{3} Y_i \qquad (3)$$

$$l_i = L_i \Big/ \sum_{i=1}^{3} L_i$$

Among them, y_i and l_i refer to the income composition and labor force composition of the i-th industry, respectively; y_i/l_i refers to the relative labor income ratio of the industry. When $IE = 0$, the industrial structure is in equilibrium; when $IE > 0$, the industrial structure is in an unbalanced state, in which the greater the IE value, the more unbalanced the industrial structure is. Therefore, IE is a reverse indicator.

3.1.2. Financial development

This paper uses the ratio of annual total stock price of listed companies in each region to regional GDP to measure the development scale of the stock market in different regions; the ratio of total amount of loans at the end of the year of financial institutions in different regions to regional GDP to measure the development scale of credit markets in different regions; and the ratio of sum of development scale of stock and credit markets in different regions to GDP to measure the overall development scale of financial markets in different regions.

3.1.3. Control variables

The factors that affect economic growth are important factors that affect the adjustment of industrial structure. This paper selects four factors as control variables, including physical investment, government behavior, openness, and human capital in each province (municipality directly under the Central Government).

3.2. Model construction

This paper uses a two-step system generalized method of moments (GMM) model for estimation. The upgrading of industrial structure is continuous, which implies that the upgrading effect of industrial structure in the early stage may have an impact on the later stage. Most of the explanatory variables in the empirical model are autoregressive, while the endogenous variables are the lagged terms of the explanatory variables. The GMM estimation method includes the most abundant dynamic panel data information, which makes the parameter estimation more accurate. At the same time, the tool variable rationality test and Sargan test are also better. This paper uses the financial development scale that lags behind two periods as a tool variable. This paper constructs the following dynamic panel model:

$$Ind\left(IR,IO,IE\right)_{i,t} = \beta_0 + \sum_{j=1}^{p} \lambda Ind_{i,t-j} + \beta_1 Equity_{i,t} + \beta_2 Credit_{i,t} + \beta_3 FAI_{i,t} + \beta_4 FE_{i,t} + \beta_5 Open_{i,t} + \beta_6 HC_{i,t} + \varepsilon_{i,t} \tag{4}$$

where, $Ind(IR,IO,IE)$ refers to the upgrading of industrial structure in region i during period t, including three indicators: IR, IO, and IE. $Ind_{i,t}$ represents the development of capital market and credit market. At the same time, control variables are introduced, including fixed asset investment variables and other control variables. in order to determine whether there is adjustment inertia in the industrial structure, the lag value is introduced into the model, and j is the maximum lag order.

4. Empirical analysis
4.1. Descriptive statistics

Table 1 is the descriptive statistics of variables.

Table 1. Descriptive statistics of variables

Variable name	Mean value	Standard deviation	Skewness	Kurtosis
Rationalization of industrial structure (IR)	1.172	0.446	0.341	2.664
Optimization of industrial structure (IO)	0.966	0.488	2.834	11.989
Equilibrium of industrial structure (IE)	0.884	0.431	2.706	14.752
Scale of stock market development (Equity)	0.562	1.587	9.008	100.797
Scale of credit market (Credit)	1.057	0.357	1.341	5.097
Fixed asset investment (FAI)	0.589	0.181	0.362	2.373
Fiscal expenditure (FE)	0.227	0.175	3.713	19.257
Total imports and exports (Open)	0.350	0.417	1.779	5.125
Human capital (HC)	0.013	0.007	0.949	3.873

4.2. Estimation results and analysis

Table 2 shows the estimation results. The second column shows that financial development plays a positive

role in promoting the rationalization of industrial structure. The coefficient of capital market development level is -0.003, which is significant at the level of 1%. This indicates that for every 1% increase in the degree of capital market development, IR will decrease by 0.3%, that is, the degree of rationalization of industrial structure will increase by 0.3%. Therefore, capital market development plays a positive role in promoting the rational development of industrial structure. On the other hand, the coefficient of credit market development level is -0.069, which is significant at the level of 1%. This indicates that the scale of credit market is negatively correlated with the IR index, suggesting that the scale of credit market has a positive interaction with the rationalization of the industrial structure. The degree of industrial rationalization depends on the scale of credit market by 6.9%.

The third column shows that financial development plays a positive role in promoting the optimization of industrial structure. The coefficient of capital market development level is 0.002, which is significant at the level of 1%. This indicates that for every 1% increase in capital market development, IO will increase by 0.2%, that is, the degree of industrial structure optimization will increase by 0.2%. On the other hand, the scale of credit market has no significant effect on the upgrading of industrial structure. The fourth column shows that the role of financial development in industrial structure equalization is not significant.

Table 2. Estimation results

Variable	IR	IO	IE
I(-1)	0.736***	0.799***	0.467***
	(36.587)	(20.452)	(4.548)
Equity	-0.003***	0.002***	-0.021
	(-2.913)	(3.109)	(0.574)
Credit	-0.069***	0.015	-0.856
	(-2.379)	(0.218)	(0.278)
FAI	-0.225***	0.329**	1.734***
	(-5.587)	(2.163)	(2.976)
FE	0.583***	-0.222***	2.925
	(4.832)	(-2.845)	(1.567)
Open	0.168*	0.276***	-1.789**
	(3.676)	(2.656)	(-2.535)
HC	0.435***	-0.178**	-1.721***
	(8.734)	(-2.234)	(-2.956)
Year	Yes	Yes	Yes
AR(2)	0.443	0.214	0.489
Sargan test	0.251	0.231	0.956

Note: ***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

5. Conclusions
This paper uses the GMM estimation method, empirically analyzes the role of financial development in the rationalization, optimization, and equalization of China's industrial structure. Several conclusions can be drawn.

5.1. Financial development promotes the rationalization of industrial structure
The influence of the credit market on the rationalization of China's industrial structure upgrading is evident. It may be attributed to problems in the development of China's stock market. For example, at the beginning

of the establishment of China's stock market, the selection of listed companies was administratively oriented due to policy considerations. Moreover, the legal supervision and initial public offering (IPO) review systems are still flawed. These problems have led to companies committing financial fraud at the beginning of listing, thus affecting the role of the stock market in promoting the upgrading of economic structure.

5.2. Financial development has multiple effects on the optimization of industrial structure

Capital market development plays a positive role in promoting the optimization of industrial structure. However, the scale of credit market development has not formed any positive interactions with the optimization of industrial structure.

5.3. Financial development has no significant impact on the equalization of industrial structure

Theoretically speaking, the speculative nature of financial resources tends to cause investment to flow into high profit sectors, which would result in industrial fluctuations and uneven development, reducing the degree of equilibrium of the industrial structure. However, at the current stage of development in China, the impact of financial resources on industrial equalization is still very small. Equalization is the ultimate goal and the highest level of industrial structure adjustment. At present, China is still in the stage of continuously promoting industrial rationalization and optimization. Therefore, financial development has no significant impact on the equalization of industrial structure.

Disclosure statement

The author declares no conflict of interest.

References

[1] Levine R, 2005, Finance and Growth: Theory and Evidence, Handbook of Economic Growth, 865–934.

[2] Shaw E, 1991, Financial Deepening in Economic Development, Shanghai Sanlian Bookstore, Shanghai.

[3] King RG, Levine R, 1993, Finance, Entrepreneurship and Growth. Journal of Monetary Economics, 32(3): 513–542.

[4] Wurgler J, 2000, Financial Markets and the Allocation of Capital. Journal of Financial Economics, 58(1–2): 187–214.

[5] Fisman R, Love I., 2007, Financial Dependence and Growth Revisited. Journal of the European Economic Association, 5(2–3): 470–479.

[6] Gu H, 2010, Research on the Mechanism Construction of Financial Support for Industrial Structure Optimization and Adjustment. Shanghai Finance, 05: 18–22.

[7] Qian S, Zhou Y, 2011, Financial Development, Technological Progress and Industrial Upgrading. Statistical Research, 01: 68–74.

[8] Zhou F, Fu J, Zhong S, 2013, Stock Market Development, Bank Credit Scale and Industrial Structure Upgrading – Evidence from China's Provincial Panel Data. Investment Research, 04: 100–110.

[9] He D, Yao Z, 2008, Effects of China's Industrial Structure Adjustment, Optimization and Upgrading Goals and Policy Measures. China Industrial Economy, 05: 46–56.

[10] Luo R, Men M, He J, 2014, Research on the Effect of Financial Development in Promoting the Adjustment of China's Industrial Structure – Based on China's 30 Provincial Panel Data. Economic Issues Exploration, 08: 84–91.

[11] Qi L, Chen X, 2015, Empirical Study on the Mechanism of the Impact of China's Economic Financialization on the Optimization of Industrial Structure. Contemporary Economic Management, 05: 75–80.

[12] Gan C, Zheng R, Yu D, 2011, The Impact of China's Industrial Structure Change on Economic Growth and Fluctuation. Economic Research, 05: 4–16 + 31.

[13] Xu D, 2011, Determination and Measurement of Industrial Structure Balance: Theoretical Interpretation and Verification. Industrial Economy Research, 03: 56–63.