Research on the Impact of Industrial Policies on the High Quality Development of Regional Economy

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ABSTRACT
This article takes 30 provinces in China from 2007 to 2021 as research objects, constructs industrial policies intensity index basing on systematically collecting local laws and regulations and government rules. The researchers establish an evaluation index system containing three dimensions, economic development fundamentals, social achievements, and ecological outcomes, and use entropy weight method to measure the level of high-quality development of regional economy. Based on a panel data model, empirical analysis is conducted on the impact of industrial policy on high-quality regional economic development. This article draws the following main conclusions.(i) The industrial policy significantly promotes the high-quality development of regional economy. (ii) The cumulative number of local regulations and documents have a greater impact on promoting the high-quality development of regional economy than the local government rules and documents. (iii) Government expenditure, human capital, and marketization level also play a positive role in promoting the high-quality development of regional economy.

Keywords: *Industrial policies, High quality development of regional economy, Index system, Entropy weight method.*

1. INTRODUCTION

Since the reform and opening up in 1978, China's economy has experienced rapid growth over the past 40 years and becomes the world's second largest economy. Currently, with the change of international environment and conditions, the extensive growth model that relied on factor input, external demand driving, and scale expansion in the past is increasingly constrained. It is necessary to transform development models, optimize economic structures, and shift growth drivers towards high-quality development. The 20th National Congress report of the Communist Party of China pointed out that "China's economy is now entering a period of high-quality development, the theme of economic and social development must be to promote high-quality development".

In order to promote high-quality development of regional economy, Chinese governments have already put forward various industrial policies to support the development of regional economy, such as reductions and subsidies for enterprises. Can these industrial policies truly enhance the high-quality development of regional economy? The mainstream academic viewpoint believes that local governments at all levels in China have become development oriented governments under a specific institutional framework, and devote to stimulating regional economic growth by formulating industrial policies. Although the rapid growth of the Chinese economy is reflected in the development and growth of various industries, which are also influenced by regional industrial policies, and local governments are committed to driving economic development by formulating industrial policies. This article focuses on the following main issues. (i) Whether or not regional economic growth is directly influenced by industrial policies. (ii) The definition and the current situation of high-quality development of China's regional economy in the current stage. (iii) The degree of influence of industrial policies on promoting regional economic

development. The exploration of these issues is of great theoretical and practical significance.

This article takes 30 provinces in China (excluding Tibet, Hong Kong, Macao, and Taiwan) as research objects, uses the relevant laws and policies and economic data from 2007 to 2021 ,with a deep understanding of the development oriented government and the framework of high-quality regional economic development. Firstly, systematically collects local laws and regulations and government rules, construct industrial policy intensity index. Secondly, constructs an evaluation index system for high-quality regional economic development from multiple dimensions such as the fundamentals, social outcomes, and ecological achievements, and then calculate the level of high-quality regional economic development. Finally, a spatial panel econometric model is used to further validate the impact of local government industrial policies on the high-quality development of regional economy.

2. LITERATURE REVIEW

Economic growth has always been an important focus of the academic community. Early scholars paid more attention to the expansion of economic quantity, while there was little discussion on the growth of economic quality. Since the 20th century, with the increasingly prominent issues of resource consumption, environmental pollution, social inequality, financial crisis, and economic periodic fluctuations, the quality of economic growth has gradually attracted widespread attention from the academic community. In recent years, with the transformation of China's economic development model, discussions on industrial policies and high-quality regional economic development have gradually increased.

The research on high-quality development of regional economy mainly focuses on the following aspects. (i) In terms of the connotation of high-quality development of regional economy, Lin Zhaomu (2018) believed that the connotation of high-quality development of economy is the development that reflects the concepts of innovation, coordination, green, openness, and shared development. Zhao Jianbo et al. (2019) held an opinion that three perspectives of system balance view, economic development view, and people's livelihood orientation view should be considered to understand the connotation of high-quality development. Miao Buran and Zhou Wen (2022) believed that high-quality economic development should focus on optimizing industrial structure, emphasizing both speed and quality, and the development of the real economy and high-level openness. (ii) From the perspective of measuring the high-quality development of regional economy, Wei Min and Li Shuhao (2018) used the entropy weight TOPSIS method to measure the level of high-quality economic development facing the new era. Yang Yaowu and Zhang Ping (2021) measured the quality of China's economic development in staged by selecting representative basic economic indicators and analysed the reasons for changes in the quality of economic development.Wang Yuling (2023) used the entropy weight-grey correlation analysis method to measure the high-quality development level of Henan provence. (iii) From the perspective of the construction of the evaluation index system for high-quality regional economic development, Li Jinchang et al. (2019) closely adhered to the connotation of high-quality development and constructed an evaluation index system for high-quality economic development from a total of 27 indicators in five parts: economic vitality, innovation efficiency, green development, people's lives, and social harmony. Sun Yixuan (2021) constructed an evaluation system for the efficiency indicators of high-quality economic development in China based on the input-output Super-DEA model. Wei Yanhua et al. (2023) proposed a sequential spatio-temporal PCA evaluation method based on multi indicator panel data, this method overcame the problem of feature vector symbol selection and can also handle the temporal and spatial correlation of the data. (iv) From the path of high-quality development of regional economy, Guo Zhaoxian et al. (2020) discussed the influence of "new infrastructure" on high-quality economic development, as fixed asset investment behavior, modern infrastructure and digital platform. Zhang Yunping et al. (2021) explored the mechanism of digital economy promoting high-quality economic development by establishing a regression model and introducing the intermediary effect test.Lei Hanyun et al. (2023) argued the mechanism of the role of financial technology on high-quality economic development from a theoretical perspective and conducted an empirical test.

The impact mechanism of industrial policies on the high-quality development of regional economy is mainly achieved through the structural rationalizing and upgrading of industrial policies. (i) The structural rationalizing effect of industrial policies. Due to the asymmetry, externalities, and

incomplete information market environment in industrial development, overcapacity and excessive volatility often arose (Hausmann & Rodrik, 2003). At the same time, enterprises might not be able to rely on cross period resource allocation in the market (Stiglitz, 1993) and couldn't achieve optimal resource allocation (Rodrik, 1996). Government departments collected a lot of market information with repeated analysis relying on their own organizational capabilities, and then introduced industrial policies ,these apparently are conducive to compensating for market asymmetry, externalities, and incomplete information, correcting market friction, avoiding blind investment and excessive producting by enterprises, which can accelerate resource optimization and allocation among industries, promote the rationalizing and efficiency of industrial structure, thus promoting high-quality development of regional economy. (ii) The structural upgrading effect of industrial policies. The high-quality development of regional economy needs necessary soft and hard public infrastructure including public research and development platforms, venture capital funds, patent protection policies, and various talent support plans (Pack & Saggi, 2006), which can be achieved through the regulatory mechanisms of local governments, significantly reduced the uncertainty risks in the process of technology research and application undertaken by enterprises, improved the efficiency of industrial innovation (Peters et al., 2012), and thus accelerate the high-quality development of regional economy. Under the combined effect of rationalizing and upgrading of industrial policies, officials pursuing high-quality development of regional economy naturally have great enthusiasm to promote the introduction and implementation of industrial policies. Active and effective industrial policies can guide industrial upgrading development, and promote high-quality development of regional economy (Han Yonghui, 2017).

In summary, research on industrial policies and high-quality development of regional economy has been very extensive. It is found that there still no unified conclusion on the connotation of high-quality regional economic development. The measurement of high-quality economic development mainly focused on the spatio-temporal and regional differences of high-quality development. More of research based on new development concepts to construct the indicator evolution system, while the development path showed differentiation tendency. The research on industrial policies mainly focused on verifying the possibility and effectiveness of industrial policies on promoting economic development, but less exploration of the impact of industrial policies on high-quality regional economic development.

3. RESEARCH DESIGN

The research design section mainly includes the acquisition of sample data, variable description, and model setting.

3.1 Source of Sample Data

This article takes 30 provinces in China from 2007 to 2021 as research objects, (excluding Tibet, Hong Kong, Macao, and Taiwan) and some missing data is supplemented using linear interpolation method. Among them, the data on industrial policies are from the central government regulations database and national laws and regulations database of the People's Republic of China. The data on evaluation indicators and control variables for high-quality regional economic development are from the Provincial Statistical Yearbook, China Statistical Yearbook, China Energy Statistical Yearbook, China Industrial Statistical Yearbook, with a total of 7200 observation values obtained.

3.2 Description of Variables

This section mainly explains the acquisition of industrial policy variables, regional high-quality economic development variables, and control variables.

3.2.1 Measurement of Industrial Policy

There is a lot of theoretical analysis and qualitative evaluation of industrial policies in the academic community. How to scientifically and effectively evaluate industrial policies in quantitate is a frontier issue in the academic and policy circles, which involves a high degree of abstraction and quantification of industrial policies. Currently, research in this area is still in the exploratory stage. This article draws inspiration from the approach of Han Yonghui et al. (2017), measures regional industrial policies by selecting the cumulative number of local regulations and documents (policy_law) and local government regulations and documents (policy_norm) of each provincial unit from 2007 to 2021, based on the laws and regulations related to industrial policies

published .Using data as mentioned above, the trend is shown in in “Figure 1”.

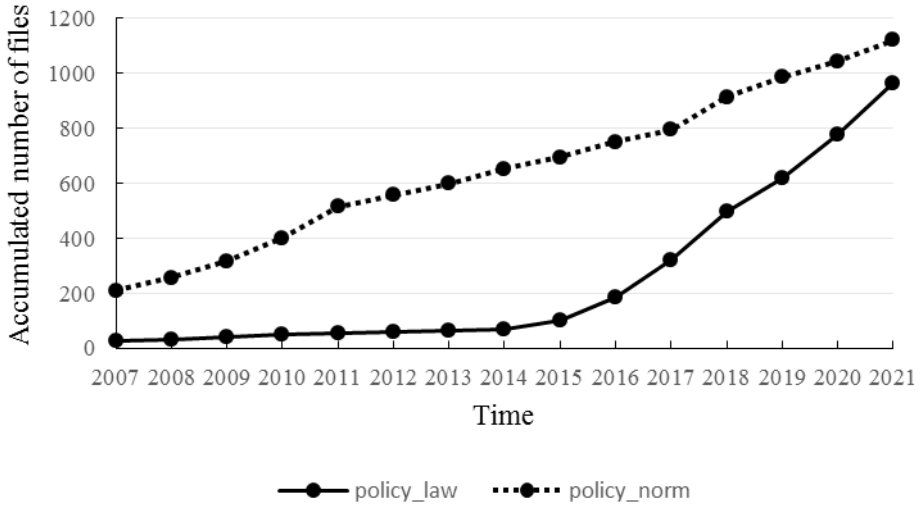

Figure 1 Accumulated number of industrial policy documents from 30 provincial-level units in China from 2007 to 2021.

3.2.2 Measurement of High-quality Development of Regional Economy

The purpose of high-quality development of regional economy is to satisfy people's needs for a better life, pursue medium to high speed and stable economic growth during the development process, gradually optimize industrial structure, significantly enhance innovation ability, and pay more attention to energy conservation, emission reduction, and ecological resource protection to achieve sustainable development. This article draws on the approach of Jiang Changliu and Jiang Chengtao (2020) to construct an evaluation index system for high-quality regional economic development from multiple dimensions such as the fundamentals, social outcomes, and ecological achievements and then calculate the level of high-quality regional economic development at the upgrading level. The settings of relevant variables are shown in “Table 1”.

Table 1. Evaluation index system for high quality development of regional economy

Target layer	Primary indicators	Secondary indicators	Indicator Impact
High quality development level of regional economy	Fundamentals	Economic development intensity: regional real per capita GDP	positive
		Stability of Economic Development: Moving Average Type Standard Deviation Coefficient of Economic Growth Rate	negative
		Rationalization of Economic Development: The Thiel Index	negative
		Economic development extroversion: proportion of net exports to GDP	positive
	Social outcomes	Education level: Number of college students per 10000 people	positive
		Medical level: number of doctors per 10000 people	positive
	Ecological achievements	Gas pollution: unit gas pollution emission output	negative
		Solid pollution: unit solid pollution emission output	negative
		Liquid pollution: unit liquid pollution emission output	negative

To measure the high-quality development level of regional economy, the initial data should be standardized to eliminate the interference caused by different dimensions and orders of magnitude on the results. The formula is:

$$u_{ij}^{t} = \frac{u_{ij} - \min u_{ij}}{\min u_{ij} - \min u_{ij}} \quad (1)$$

Among them, u_{ij}^{t} represents standardized data, u_{ij} represents initial data, i represents different provincial units, j represents different indicators, $\max u_{ij}$, $\min u_{ij}$ represents the maximum and minimum values of indicators in different years or regions. The researchers use entropy weight method to assign weights to standardized indicators, and specific steps are as follows.

The first is to shift u_{ij}^{t} by A units in order to eliminate the impact of logarithmization on the calculation of indicators, that is $v^{ij} = u_{ij} + \mathrm{A}$, the closer A is to $\min u_{ij}$, the better of the effect (here A=10^{-4}). Normalize the shifted data using the formula:

$$p_{ij} = \frac{v_{ij}}{\sum_{i=1}^{m} v_{ij}} \quad (2)$$

Then standardized matrix can be gotten: $P_{ij} = (p_{ij})_{m\times n}$.

The second is to calculate entropy e_j and redundancy d_j of indicator u_j using the formula:

$$e_j = -K\sum_{i=1}^{m} p_{ij} \ln p_{ij} \quad (3)$$

$K = \frac{1}{\ln m}$, $d_j = 1 - e_j$.

The third is to calculate weight w_j of indicator u_j using the formula:

$$w_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \quad (4)$$

Then the researchers use step-by-step weighted summation to measure the value of high-quality regional economic development level using the formula:

$$u_i = \sum_{j=1}^{n} w_j u_{ij}^{t}, \quad \sum_{j=1}^{n} w_j = 1 \quad (5)$$

Among them, u_i represents the high-quality economic development level of each province, u_{ij}^{t} represents standardized indicators, and w_j represents the weight of each indicator.

3.2.3 Selection of Control Variables

To prevent estimation errors caused by missing variables, in addition to the impact of the main explanatory variable on the dependent variable, other variables that may affect the high-quality development of the regional economy should also be included in the econometric model, mainly including regional economic level, government expenditure, human capital, foreign trade level, and marketization level. Among them, the regional economic level is measured by the per capita GDP of the region; The adoption of government expenditure is an important factor in the high-quality development of regional economy, this article selects the measurement of local government financial expenditure in each province. Human capital is the core factor that affects total factor productivity, this article measures the average education years of the population aged 6 and above in the region. The level of foreign trade is measured by the total import and export volume of the region. The level of marketization is measured based on the marketization index calculation method proposed by Wang Xiaolu et al. (2019). When substituting into the model calculation, the measurement indicators of human capital and foreign trade level are taken as logarithms.

3.3 Model Settings

To verify the impact of industrial policies on the high-quality development of regional economy, this article constructs an empirical model of the following form:

$$develop_{it} = \beta_0 + \beta_1\, policy_{it} + \Theta X_{it} + a_i + z_t + \varepsilon_{it} \quad (6)$$

Among them, i represents different provincial units, t represents time,develop represents the level of high-quality economic development in the region, policy represents the variables of industrial policy, which are divided into local regulations and document accumulation (policy_law) and local government regulations and document accumulation (policy_norm). X represents other

control variables that may affect the high-quality economic development of the region, β_0 is a constant coefficient, β_1 represents the impact of industrial policies on the high-quality development of regional economy, if β_1 is greater than zero in statistics, it indicates that industrial policies have promoted high-quality development of the regional economy in great significance.

4. EMPIRICAL ANALYSIS

In the empirical analysis section, the impact of industrial policy on the high-quality development of regional economy is analyzed by substituting industrial policy variables, regional economic high-quality development variables, control variables, etc. into the empirical model.

4.1 Industrial Policy and High Quality Development of Regional Economy

By incorporating various indicators into the empirical model (6), the test results can be obtained as shown in "Table 2". From column 1, it can be seen that the regression coefficient of policy_ law is 0.1038, and significant at 1% level of statistic, indicating that for every increase in the cumulative number of local laws, regulations and documents in each provincial-level unit, an average of one will significantly promote the high-quality development of the regional economy by 0.1038 units. From column 2, it can be seen that the regression coefficient of policy_norm is 0.0089, and also significant at the at 1% level of statistic, indicating that for every increase in the cumulative number of local government rules and documents in each provincial-level unit, an average of one will significantly promote the high-quality development level of the regional economy by 0.0089 units.

Table 2. Impact of industrial policies on high quality development of regional economy

	(1)	(2)	(3)
	develop	develop	develop
policy_law	0.1038***		0.0507**
policy_norm		0.0089***	0.0068***
β_0	-3.6353***	-4.4352***	-3.2631***
economic	0.0143***	0.0061*	0.0077**
government	0.0069**	0.0071***	0.0054***
human	1.9045***	2.3102***	1.7358***
foreign	0.0015*	-0.0026	0.0153
market	0.3760*	0.6082**	0.2934**
Virtual variables of regions	exist	exist	exist
Virtual variable of time	exist	exist	exist
R^2	0.893	0.851	0.893
N	3150	3150	3150

a Note: *,** and *** respectively represent significant variables at the 10%, 5%, and 1% significance levels.

In conclusion, the researchers find both the cumulative number of local laws, regulations and documents, as well as the cumulative number of local government rules and documents, have significantly positive regression coefficients. The implementation of industrial policies by local governments has indeed promoted high-quality development of the regional economy, and the cumulative number of local laws, regulations and documents has a greater impact on the high-quality development of the regional economy. The researchers suppose the reason for the difference is that the rules and policies related to regional industrial development issued by local governments do not have legal effect, but only have administrative effect. In addition, the insufficient implementation has greatly weakened the promoting effect of policies on enterprise production, resident consumption, etc. Nevertheless, as the main form and carrier for local governments to implement industrial policies, administrative rules are still an indispensable component in promoting high-quality development of regional economy.

In the control variables, the government expenditure coefficient is significantly positive,

indicating the important role of local governments in promoting high-quality regional economic development. The human capital coefficient is significantly positive, indicating that in the process of regional economic development, efforts should be made to introduce outstanding talents, establish talent management mechanisms, and promote the transformation of human resources into productivity. The market coefficient is significantly positive, indicating that the higher the level of marketization in a region, the better it can provide high-quality services to various economic entities, thereby promoting high-quality development of the regional economy.

4.2 Joint Inspection of Local Regulations and Government Regulations

As shown in “Table 2”, the third column provides a joint test of the impact of local laws and regulations and government rules on the high-quality development of regional economy, examining the robustness of the results in the first and second columns. The result shows that the regression coefficients of policy_ law and policy_norm are significant at the 5% and 1% levels, indicating the validation of the conclusion that industrial policies promote high-quality development of regional economy. From the perspective of coefficient size, the regression coefficient of policy_law is greater than that of policy_ norm, which indicates that the cumulative number of local laws, regulations and documents has a stronger driving effect on the high-quality development of regional economy than that of government rules and documents. Therefore, the results of model (6) are robust in econometric analysis.

5. CONCLUSION

Industrial policies are the intervention of government departments in the formation and development of industries to compensate for market defects and effectively allocate resources. At the current stage, exploring its policy effects on high-quality development of regional economy has theoretical and practical significance. This article takes 30 provinces in China (excluding Tibet, Hong Kong, Macao, and Taiwan) as research objects, uses the relevant laws and policies and economic data from 2007 to 2021, choosing the data related to industries in the regulations database of the Central People's Government of the People's Republic of China and the national laws and regulations database. Then, the researchers construct an evaluation index system for high-quality regional economic development from multiple dimensions such as the fundamentals, social outcomes, and ecological achievements, and then calculate the level of high-quality regional economic development. At last, the researchers use a panel regression model to verify the effectiveness of industrial policies in promoting high-quality regional economic development. It can be found that industrial policies significantly promote the high-quality development of regional economy, and the cumulative effect of local laws, regulations and documents on the high-quality development of regional economy is higher than that of local government rules and documents. Government expenditure, human capital, and marketization level also play a positive role in promoting the high-quality development of regional economy.

Important policy implications of this article are as follows. (i) Local industrial policies can effectively improve the high-quality development of regional economy. Local governments should continuously improve the industrial policy system, provide policy support and information guidance to key industries while following market laws, thus promoting the efficient allocation of regional resource elements. (ii) Local governments should consider the development level and stage of its own industry when formulating industrial policies, fully recognize the heterogeneity of industrial policies in different regions, and formulate appropriate directions and strategies for the development of local industries according to local conditions and times. (iii) The level of marketization and industrial policies are complementary in promoting high-quality development of regional economy. Therefore, in the process of regional industrial development, it is necessary to admit the fundamental role of the market in resource allocation, at the same time, exert the regulating effect of industrial policies and maximize them.

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