

The relationship between multi-dimensional production factors and economic growth: A study on the formation factors of economic differences

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Abstract. Since the beginning of this century, China's regional economic development has shown a typical dual structure characteristics, and the uneven development of regional economy has become the main resistance to the high-quality development of China's economy. The formation of this dual structure is closely related to the unbalanced distribution of foreign investment in financial capital and high-quality labor force in human capital. Based on the panel data from 2000 to 2019, this paper conducts a regression analysis on financial capital and human capital, and obtains the proportion of their contribution to the economy, in which the proportion of foreign direct investment is the largest, followed by the proportion of labor population. At the same time, the high-quality labor force in developed regions contributes more to the economy than that in less-developed regions.

Keywords: Regional Economic Growth, Dual Structure, Economic Growth Theory.

1. Introduction

For backward developing countries, technology diffusion from developed countries is one of the sources of technological progress in developing countries. Especially in the early stage of economic development, technology introduction and technology imitation may be the most important source of technological progress for developing countries due to the backward technological level and shortage of human resources, and the most important source of technological diffusion is financial capital such as FDI. At the same time, the change of human capital structure, characterized by the evolution from primary human capital to advanced human capital, is synchronized with economic growth, which is a typical feature in the process of China's economic development. Regional unbalanced governance is an important part of the modernization of regional governance system and governance capacity, which is related to the balance and full development of the region. Narrowing the development gap, optimizing spatial governance and coordinating regional relations are the focus of regional unbalanced development governance [1]. From 1978 to 2023, China's economy continues to grow at a high speed, while the structure of financial capital and human capital also experiences great changes.

In the past, China has gradually become a major inflow of foreign capital since the 1990s, and utilizing foreign capital is an important part of China's reform and opening up policy. Since 1978, China has been one of the most successful countries in attracting international capital. By the early 1990s, China had become the second largest foreign investor in the world and the first among developing countries. As the world's second largest economy, China has always attracted the attention and investment of international multinational giants. In recent years, with the continuous growth of China's economy and the continuous opening up of its market, more and more international enterprises have begun to increase their investment and layout in the Chinese market [2]. In 2020, China's outbound direct investment flow will reach 153.71 billion US dollars, up 12.3% year on year, ranking first in the world for the first time, accounting for 20.2% of the global flow. Of this total, outbound financial direct investment reached \$19.66 billion and non-financial direct investment reached \$134.05 billion. In 2021, China's industry-wide outbound direct investment will reach 936.69 billion yuan (\$145.19 billion, up 9.20 year-on-year). The completed turnover of contracted overseas projects will be 999.62 billion yuan (154.94 billion U.S. dollars, down 0.6 percent year on year). In



2022, China's non-financial direct investment in countries along the Belt and Road will reach US \$20.3 billion, up 14.1 percent year on year, making a positive contribution to the economic development of host countries. However, in the context of the increasingly tense international situation in the future, financial capital flow and foreign direct investment will face new risks and new situations.

China's human capital has also undergone great changes, which is highlighted by the declining proportion of human capital with low education and the rising proportion of human capital with high education. The inflow of labor force provides a rich and diverse resource market, which plays a positive role in improving production efficiency [3]. The proportion of the population aged 25-64 with a junior high school education or below dropped from 81.3 percent in 2000 to 75.5 percent in 2010. The proportion of the population with high school education increased from 13.9% in 2000 to 14.8% in 2010 and 16.1% in 2014; And the proportion of the population with higher education increased from 4.8% in 2000 to 9.7% in 2010 and 12.2% in 2014. By 2014, the proportion of the population with a junior high school education or below had further decreased to 71.7 percent, while the proportion of the population with a senior high school education and a higher education had increased to 16.1 percent and 12.2 percent, respectively. As of January 23, 2018, China's population was 1.3908 billion, and according to the statistics of the National Bureau of Statistics on the number of undergraduate graduates from 1998 to 2017 and the calculation of the number of undergraduate graduates from 1978 to 1997, the current number of people with undergraduate degrees in China is about 50 million, accounting for about 3.57% of the total population.

However, through what mechanisms and channels human capital and financial capital promote economic growth and technological progress in developing countries, economists have tried to answer this question from various aspects. This paper explains the role of human capital and financial capital in economic production through the theory of economic growth. Economic growth is the comprehensive effect of many factors. Western scholars have traditionally believed that $Y_t = F(K_t, L_t, A_t, S_t)$. Where, Y_t is the total output of an economy, K_t, L_t which respectively represents the stock of production factors such as capital and labor, A_t stands for total factor productivity, and S_t stands for a series of factors such as institutions, policies and environment. To some extent, it can be regarded as a dynamic general economic growth equation, and any economic growth model can be regarded as a special case where the above general equation meets certain conditions.

In essence, the economic growth model is an equation that describes the influencing factors of real economic growth and the dynamic operation law. Considering the function of market and government comprehensively, the dynamic economic growth equation can be derived. In academic research, the market economy based on the pursuit of utility or profit maximization by micro-entities has the characteristics of rationality. In this model, the influence of the weighted combination of laissez-faire market economy and government factors on economic operation is comprehensively considered. Therefore, it is called the rational comprehensive economic growth model.

2. Literature review

Since 1979, with the continuous deepening of economic system reform, the expansion of market opening and the change of economic structure, China's national economy has achieved sustained and rapid growth, so that some scholars call it the "Chinese miracle". In fact, from the perspective of economic growth rate alone, it is not too much to call the sustained rapid growth of China's economy since the reform and opening up as the "Chinese miracle". From 1979 to 1999, China's GDP and per capita GDP grew at an average annual rate of 9.6 percent and 8.2 percent respectively. It is rare in the world that China's economy has maintained such a high average growth rate over the past 20 years. According to the *1999/2000 World Development Report* published by the World Bank, China's GDP grew at an average annual rate of 10.2% from 1980 to 1990 and 11.1% from 1990 to 1998. During these two periods, the world's average growth rate was only 3.2 percent and 2.4 percent, respectively. Of these, low and middle income countries grew by 3.5% and 3.3% respectively, and high-income

countries by 3.1% and 2.1% respectively. It can be seen that in the 1980s, China's average GDP growth rate was about 3.2 times that of the world average, and in the 1990s it was 4.6 times that of the world average. Of course, it should also be noted that China's rapid growth since the reform and opening up has been achieved through an unbalanced growth path. The formation of the spatial pattern of economic activities cannot be separated from regional resource advantages and various production factors. China's abundant natural resources, natural resource endowment conditions and historical factors have made significant differences in the economic development of different regions [4]. Although from the perspective of provincial regional units, China's per capita GDP growth has tended to converge to a certain extent since the 1980s, from the perspective of large regional areas, China's regional economic growth is unbalanced and dual structure characteristics are very obvious.

In the traditional Lewis dual structure, the cross-sectoral reallocation of unskilled labor drives industrialization and economic growth. Even after entering the innovation-driven stage, China's innovation development also has a dynamic duality structure. Through the change of the dual structure of innovation, technological innovation gives new momentum to industrialization and economic growth [5]. To facilitate the analysis of the characteristics of this dual structure, we divide China into two parts, namely the relatively developed eastern region and the relatively backward western region. The former is typically represented by Liaoning, Hebei, Beijing, Tianjin, Shandong, Shanghai, Jiangsu, Zhejiang, Fujian and Guangdong (including Hainan), while the latter is typically represented by Guangxi, Inner Mongolia, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Sichuan (including Chongqing), Guizhou, Yunnan and Tibet. The economic foundation of the central and western regions is poor, the level of productivity development is not high, and the accumulation capacity of the central and western regions is low and declining [6]. Therefore, Guangxi and Inner Mongolia are listed as the typical backward western regions mainly because these two provinces and regions are ethnic minority autonomous regions and geographically close to the southwest and northwest with a lower level of economic development and enjoy the preferential policies of the national development of the west.

Since the reform and opening up, the absolute and relative gap of per capita GDP between these two types of regions has tended to widen. Of course, the formation of this east-west dual structure since the reform and opening up is caused by many factors, such as historical and natural factors, geographical location, opening to the outside world policy and social and cultural characteristics. Through its unique geographical advantages, economic strength and open market environment, the Guangdong-Hong Kong-Macao Greater Bay Area is fast becoming an international innovation center [7]. However, there is no doubt that under the comprehensive effect of the above factors, the large inflow of foreign investment and direct investment from Hong Kong, Macao and Taiwan into the eastern coastal areas has played a very important role in the formation of the East-West dual structure and the widening of the gap between the east and the West. It is obvious that the eastern region has or is close to major seaports, convenient transportation conditions for foreign countries and regions such as Hong Kong, Macao and Taiwan, Japan and South Korea, and the country implements the opening-up policy of gradually advancing from east to west, so foreign investment flows into the eastern region first. This early entry of foreign investment will produce a cumulative causal effect with the passage of time to attract more foreign investment to enter and gather.

3. Research methods and model design

Based on the theory of economic growth, we choose Coggle-Grass production function to model. Cobb-douglas production function is a production function created by American mathematician Charles W.Cobb and economist Paul H.Douglas when they jointly discussed the relationship between input and output. Cobb-douglas production function is an economic mathematical model used to predict the production of industrial systems or large enterprises in countries and regions, and to analyze the way to develop production [8]. This model holds that the production output of a country or region in a certain period is mainly determined by production technology, capital and labor.

Theoretically speaking, the increase of human capital and financial capital can promote the overall development of regional economy. In order to test this effect in practice, Cobb Douglass production function is introduced. The general form of the function is as follows:

$$Y=AK^{\alpha}L^{\beta} \quad (1)$$

Y is the gross regional economic product, K is the financial capital, L is the human capital, α, β is the parameter, represents the output elasticity, is the share of financial capital and human capital in the total production.

In order to avoid the situation of heteroscedasticity, both sides of the equation are taken at the same time to establish an unconstrained model and a constrained regression model, so the return to scale of the function remains unchanged. $\ln(Y)=A+\beta_1\ln K+\beta_2\ln L$, At the same time, a constrained regression model $\ln(Y/L) = A+\beta\ln(K/L)$ is established, $\beta_1+\beta_2=1$. The specific model is as follows:

GDP is gross regional product, K is financial capital, FDI is foreign direct investment, L is working population, HC is human capital (number of college students)

$$GDP=f(K,FDI,L,HC) \quad (2)$$

$$GDP=AK^{\alpha}FDI^{\beta}L^{\gamma}HC^{\delta} \quad (3)$$

Since $K=SA+LN$, the regional production function can be written

$$GDP=ASA^{\alpha_1}LN^{\alpha_2}FDI^{\beta}L^{\gamma}HC^{\delta} \quad (4)$$

Where SA is deposits and LN is loans, taking logarithms of both sides, model (2) and (3) can be written as

$$\ln GDP=c+\alpha\ln K+\beta\ln FDI+\gamma\ln L+\delta\ln HC+u_i \quad (5)$$

$$\ln GDP=c+\alpha_1\ln SA+\alpha_2\ln LN+\beta\ln FDI+\gamma\ln L+\delta\ln HC+u_i \quad (6)$$

Where: c is the intercept of the equation estimation, u_i is the statistical error, and the coefficients $\alpha, \beta, \gamma, \alpha_1$ and α_2 are the estimated elasticity of K, FDI, L, HC, SA and LN growth to GDP growth pair respectively.

This model is improved on the basis of Kmenta (196) model. It is a cross-sectional and time series model which is suitable for regression analysis of cross-sectional and time series data because it takes into account the residual heteroscedasticity of cross-sectional and the autocorrelation of time series.

Unless otherwise specified, the data used here are all from *China Statistical Yearbook* (each year), *China's Regional Economy in the 17 Years of Reform and Opening Up*, *China's Complete Collection of Foreign Economic Statistics* and *China's Fixed Asset Investment Statistics compiled by National Bureau of Statistics*.

4. Empirical analysis

Due to the limitation of statistical data, here we will choose two time periods to discuss the impact of foreign investment on China's regional economic growth. First, using time series and crosssectional

data from 2000 to 2008, this paper studies the impact of foreign investment on GDP growth in North China, Northeast China, East China, Central China, South China, Southwest China and Northwest China respectively. Secondly, using 2009-2019 time series and crosssectional data, and dividing domestic capital into year-end deposits of financial institutions and year-end loans of financial institutions, the regional growth model is re-estimated. The results are shown in Table 1 and Table 2:

Table 1. Fixed effect regressions were grouped by year (pre-2008, post-2008).

	pre-2008	post-2008
Number of working population L	0.522***	0.438***
Highly qualified workforce S	0.012***	0.042***
Foreign direct investment FDI	0.013***	0.029***
Deposit Amount SA	0.531***	0.501***
Loan amount LN	0.022***	0.047***
Intercept	13.75	6.37
R²	0.98	0.98

Table 2. Fixed effect regressions grouped by region (seven regions).

	L	S	FDI	SA	LN	Intercept	R²
East China	0.507***	0.088***	0.013***	0.604***	0.092***	9.85	0.98
Northeast	-0.021***	0.021***	0.032***	0.411***	0.063***	10.82	0.98
North China	0.301***	0.035***	0.021***	0.543***	0.024***	13.003	0.99
Central China	0.203***	0.014***	-0.002***	-0.102***	0.065***	16.34	0.99
Southern China	0.403***	0.081***	-0.002***	0.593***	0.043***	9.59	0.99
Southwest	0.103***	-0.033***	0.013***	0.491***	-0.012***	11.38	0.99
Northwest	0.107***	-0.074***	0.012***	0.425***	-0.045***	9.52	0.97

The analysis results show that during 2000-2019, no matter which region, the adjusted R² of the model is above 0.96, and the F-value is significant at the level of 0.000. This shows that both models have very significant statistical significance, which can explain more than 96% of the GDP change. During 2000-2008, the more developed regions such as East China, North China and South China have a very significant impact on GDP, and the elastic coefficients are 24.977 and 53.927, 12.920 and 15.840, respectively. The results of F-test show that ln FDI is significant at the level of 0.000. During 2009-2019, the positive impact of foreign investment on GDP growth in the more developed regions was significantly weakened, and the elasticity coefficients of East China, North China, South China and Southwest regions were 4.191, 25.666, 3.544 and 12.107, respectively. It can be seen that after the financial crisis in 2008, the economic promotion effect of FDI in developed regions has significantly decreased. China currently exists the size of the financial market and the scale of FDI imbalance and the quality of FDI inflow is not high, in the central and eastern parts of the country, although the flow and scale of FDI has been very developed, but there are still more backward production capacity inflow, these backward production capacity can not bring technological progress to China [9]. In backward regions, although most of the coefficient values of ln FDI are positive, it lacks significance even at the level of 0.10. This shows that foreign investment has a non-significant positive impact on GDP growth in the western backward areas. During 2000-2008, the elasticity of FDI in Northeast China, Central China and Northwest China was -1.380 and 3.3346.142; During 2009-2019, the elasticity of FDI in the relatively backward regions was 9.286, 7.428 and 6.324, respectively. However, after 2008, the impact of FDI on the economic contribution rate of relatively backward regions increased significantly. Compared with the elasticity coefficient of deposit and loan in financial capital, the influence of FDI on economy is weak.

Labor population and human capital also have a significant impact on the economy. During 2000-2008, the labor elasticity coefficients of East China, North China, South China and Southwest

developed areas were 1.363, 5.118, 1.303 and 1.323, respectively. During 2009-2019, the labor elasticity coefficients in the four major regions changed to 2.967, 0.735, 1.952 and 2.617, respectively. The elasticity coefficients in most regions decreased, and the dependence of economic growth on the number of labor population gradually decreased. In the less developed regions, the elasticity coefficients of Northeast, Central and Northwest regions were 7.156, 2.509 and 1.631 during 2000-2008, respectively, and 3.766, 2.992 and 0.197 during 2009-2019, which also showed a downward trend.

In terms of human capital, the elasticity coefficient of developed regions increased significantly after 2008, and East China, North China, South China and Southwest regions increased from 11.206, 11.626, 11.383 and 8.031 to 20.074, 12.042, 60.147 and 12.332, respectively. It means that the contribution rate of high-quality labor force to economic growth in developed regions has increased significantly. After China's social and economic development has entered a stage of high-quality development, China's economic growth momentum has gradually changed from factor driven to innovation-driven, and human capital accumulation is a key factor to promote the output of innovation achievements and accelerate the transformation and application of achievements [10]. In fact, if the estimated elasticity coefficient of GDP to L, S, FDI, SA and LN in the above model is used, the relative contribution rate of each factor input to economic growth in the two regions can be calculated.

5. Conclusion and Discussion

China's opening to the outside world took the lead from the eastern coastal areas, which have attracted most of the foreign direct investment into China due to their favorable location, infrastructure and economic and technological foundation. The largescale inflow of foreign direct investment will promote the rapid economic development of the eastern coastal areas by increasing capital formation, expanding exports and creating jobs. In turn, the rapid economic growth of the eastern coastal areas will raise the income level of regional residents, expand the capacity of the market, and help improve external conditions, produce agglomeration economic benefits, so as to further expand the entry of foreign direct investment.

However, it can be predicted that after the 2008 financial crisis, economic globalization has received certain obstacles, and the active degree of foreign direct investment has decreased significantly, and the international economic situation will be more tense in the future. At the same time, domestic industrial production is gradually shifting from labor-intensive to high-tech manufacturing, and the proportion of high-quality labor force, that is, human capital, to the economic contribution is gradually increasing. After China's economic development has entered the new normal, the traditional dividend supporting economic growth is gradually weakening or even fading, and economic growth has shifted from factor and investment-driven to innovation-driven, and innovative development has increasingly become the core force and an important engine to promote regional economic development. In the future, the golden period of China's development and utilization of foreign direct investment has passed, and actively reserving hightech talents and helping develop high-tech manufacturing industry is a good way to continue steady economic growth.

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References

- [1] Liu Yu, Zhou Xinping, Zou Biying. The governance of China's regional unbalanced development logic and optimization [J]. *Regional economic review*,2023(6):69-75.
- [2] Yu Fenghui. How to view the future layout and development trend of international capital in China [J]. *Age of Fortune*,2023(07):25-26.

- [3] Ji BinWei, Li ShaoWen, Li LinAn, et al. An empirical study on the impact of capital factor market distortion on high-quality economic development -- Based on the moderating effect of labor quality [J]. *Industrial Technical Economics*, 2024,43(06):113-119.
- [4] Ren Yidong. The path and model of promoting balanced development of regional economy in China. *Taxation and Economics*,2022(05):94-100.
- [5] Zheng Jianghuai. The dual pattern of regional technological complementarity, scientific and technological innovation community and innovative development [J]. *Exploration and Contention*,2024(03):27-30+177.
- [6] Li Ruiji. Current regional economic development gap in China. *Journal of Hebei Institute of Technology (Social Sciences Edition)*,2003(01):40-42.
- [7] Jin Yuanshi, Liu Ziyi. A large bay area of guangdong innovation ecosystem impact on regional economic effect test [J]. *Journal of statistics and decision*,2024,40(10):129-133.
- [8] He Zuoxiu, Qing Chengrui. New labor Theory of Value and the establishment of Cobb-Douglas production function with Solow residual correction for Chinese characteristics [J]. *Quarterly Journal of Political Economy*,2023,2(01):120-134.
- [9] Song Wenhao. Study on the influence of financial development level on FDI technology spillover effect [J]. *Journal of nanyang institute of technology*, 2024 (02): 30-35.
- [10] Wang Lamei. The impact of digital economy on the high-quality development of circulation industry: Based on the regulatory effect of human capital investment [J]. *Business Economics Research*,2023(22):41-44.