

Science and Technology Innovation Promote the Transformation of Regional Economic and Environmental Development Model

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Abstract: Under the policy of the Belt and Road Initiative, choosing green environmental protection and innovative technology is the only way to maintain regional economic sustainability. To this end, the paper analyzes China's economic development model and economic optimization path, analyzes the comprehensive effects of industrial structure transformation and upgrading, financial technology innovation and regional economic development; builds an economic effect model, and then upgrades industrial structure and innovative financial technology model. The effect is verified. Finally, the paper combines “One Belt, One Road” and “Green Environmental Protection Development Concept” to propose optimizing credit structure, developing science and technology finance, and green finance to promote coordinated industrial development and promote regional economic and environmental development.

1. Research background

Under the background of continuous development and improvement of the market economy, China's economic development has gradually entered the stage of economic transformation, and the economic development mode has undergone tremendous changes, and it has increasingly become the basic strategic goal of the implementation of China's scientific development concept. In the 19th National Congress, the task of transforming the green economy development mode has been clearly put forward, requiring changes to the extensive growth mode, optimizing the economic growth model, enhancing the market's ability to resist risks, and promoting the improvement of China's economic development quality.

In recent years, the role of exogenous innovation based on technology introduction, imitation and integration, and endogenous innovation based on local strength and independent research and development in regional economic development has been re-examined by academic circles at home and abroad. Some scholars emphasize the role of global resources in promoting regional development. They believe that to avoid long-term regional locking, it is most important to absorb external innovation resources [1]; because in the open economy, the cost of imitating backward countries is much lower than the cost of independent research and development. However, the emphasis on external knowledge and external connections is not recognized by all geographers. Other scholars believe that only a few regions in the global innovation network can become knowledge hubs, and most regions are still marginal regions [2]; Global Innovation Network It is only a supplement to the regional innovation system. The development of an endogenous regional innovation system is the key to transforming the economic development model. The theory and policy should focus on mobilizing regional resources and cultivating endogenous innovation capabilities. Any economic activity is generated in a certain area and is restricted by geographical laws. If the local factors of the region are neglected, the guidance of technological innovation on regional economic development will be biased, and the innovation resources need to be adapted to

the characteristics of local resource endowments. Embedded in the local social and economic environment, institutional framework, etc., can improve the efficiency of innovation. Therefore, relying on scientific and technological innovation to promote the transformation of the regional economic development model, we should consider the impact of special environmental conditions such as economic development stage, development structure, development environment and institutional environment. This is also a concern when discussing the debate between global production networks and new regionalism. Local. To this end, how to achieve regional economic development and financial innovation under economic transformation has become an urgent problem to be solved in China's economic development.

2. Correlation Analysis between Science and Technology Innovation and Regional Economic Development Model

In the study of the relationship between technological innovation and regional economy, Li Jianhua et al. found that science and technology investment can promote the development of science and technology based on factor analysis, and the development of science and technology will obviously affect the development of regional economy [3]. Liu Yuanyuan and others have verified that technological advancement drives economic growth as an important way to achieve rapid and sustainable development of the local economy [4]. Through the empirical research, Hong Mingyong found that all provinces and regions with strong scientific and technological innovation ability are basically provinces with strong economic strength, and effective science and technology financial support is a necessary condition for technological innovation [5], that is, regional economic funds can be technological innovation. Provide financial support. Regional economic growth will create more demand for products. Enterprises will increase investment in science and technology innovation funds and personnel resources. At the same time, regional economic growth is a direct impact on technological innovation. It will flow capital and talents to society as a whole. It has a positive impact, which reflects the innovation dynamics of the entire society. It can be seen from the above that there is an interaction between technological innovation and regional economy. There is a relationship as shown below.

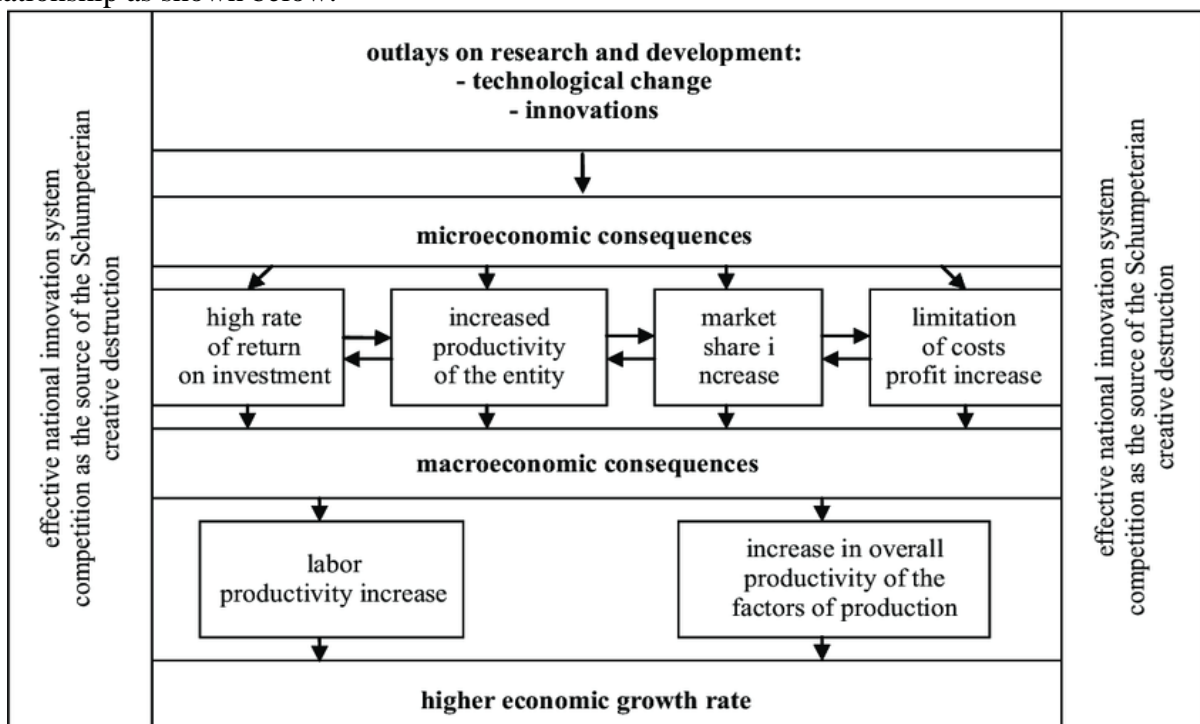


Figure 1. Relationship between technological innovation and regional economic development

3. Establishment of scientific and technological innovation and regional economic development model

3.1 Research methods

The Malmquist index was used as a measurement method to measure the relationship between regional economic development model transformation and technological innovation and total factor productivity (TFP) changes based on panel data from different periods of each sample. Among them, the Malmquist index can be decomposed into a comprehensive efficiency change index (EC) and a technical efficiency change index (TC), and the comprehensive efficiency change index includes a pure technical efficiency change index (PTEC) and a scale efficiency change index (SEC). The calculation model is:

$$TFPC = EC(CRS) \times TC(CRS) = PTEC(VRS) \times SEC(CRS, VRS) \times TC(CRS) \quad (1)$$

Where: $TFPC$ represents the economic development efficiency change index; $TC(CRS)$ represents technical efficiency; $EC(CRS)$ represents comprehensive efficiency; $PTEC(VRS)$ represents pure technical efficiency; and $SEC(CRS, VRS)$ represents scale efficiency change index.

$$TC(CRS) = \left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \times \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right]^{1/2} \quad (2)$$

$$EC(CRS) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (3)$$

$$PTEC(VRS) = \frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (4)$$

$$SEC(CRS, VRS) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (5)$$

(x^t, y^t) and (x^{t+1}, y^{t+1}) represent the input and output vectors in t and $t+1$ time, respectively. D_0^t and D_0^{t+1} are the distance functions of the actual output and the optimal output in the t and $t+1$ time, respectively. Total factor productivity reflects changes in regional economic development levels brought about by technological advances in various regions. Total factor productivity is greater than or less than 1, indicating efficiency improvement or decline, respectively.

3.2 Sample selection and indicator selection

The region is a multi-scale geographical concept that can range from economic belts to countries to small industrial areas. The regional economic development model has both national and global scales, such as the East Asian model and the Chinese model; there are also provincial scales, such as the Zhejiang model and the Guangdong model; and model cities with cities and even township scales as technological innovation and bearing regional development strategies. Important space carriers, urban-scale economic development models have always been the focus of academic research [6]. This paper takes the sustainability, demonstration and applicable conditions of economic development as the three criteria for judging the regional economic development model, and selects the typical model of the prefecture-level city (including municipality) as a research sample.

3.3 Empirical results

3.3.1 The direct effect of technological innovation and industrial structure transformation and upgrading on regional economic development

According to the classification of China's domestic economic regions by the National Bureau of Statistics in 2018, this paper divides the 30 provinces (hereinafter referred to as the full sample) into three major regions: the eastern, central and western regions. Among them, the eastern part includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan, the central part includes Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan; the west includes Sichuan, Chongqing, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Inner Mongolia, Ningxia, Xinjiang, Guangxi. The direct effects of financial technology innovation and industrial structure transformation and upgrading on regional economic development are shown in Table 1. The results show that the financial science and technology innovation indicators have obvious impact on the economic development of each region. For every 1% increase in financial product innovation and financial resource innovation, the per capita output value increases by 0.258%, and its significant level is above 1%. It can be seen that financial technology innovation has a very obvious effect on the economic development of various regions, especially in the eastern region, followed by the western region and finally the central region. This is mainly because the western region has a late-comer advantage. Therefore, the transformation and upgrading of its secondary industrial structure is more important than the central region's economic development in the region. From the perspective of the transformation and upgrading of the tertiary industry, the western region has the greatest impact, followed by the central region and finally the eastern region. For the third industry, the proportion increased by 1%, and the western, central, and eastern regions increased by 0.016%, 0.15%, and 0.009%, respectively. All in all, financial technology innovation has a significant role in promoting regional economic development, and there are regional differences in the impact of industrial restructuring and upgrading on regional economic development.

Table.1. The direct effect of China's regional industrial structure transformation and upgrading and financial technology innovation on regional economic development from 2008 to 2018

GDP	sample	Eastern	central	western
<i>TFPC</i>	0.258***	0.248***	0.449***	0.274***
	-11.356	-6.886	-6.642	-5.807
<i>TC(CRS)</i>	0.023***	0.015	0.023**	0.025**
	-2.875	-0.376	-2.346	-2034
<i>EC(CRS)</i>	0.018**	0.003	0.150**	0.016*
	-2.276	-0.435	-2.326	-1.734
<i>PTEC(VRS)</i>	0.273***	0.132***	-0.234	0.159***
	-7.634	-2.536	(-0.874)	-6.653
<i>SEC(CRS,VRS)</i>	0.547***	0.457***	0.875***	0.462***
	-6.648	-3.453	-4.456	-3.762

3.3.2 Indirect effects of technological innovation and industrial structure transformation and upgrading on regional economic development

The indirect effect of financial science and technology innovation on regional economic development is mainly reflected in the fact that financial science and technology innovation promotes regional economic development by driving industrial structure transformation and upgrading.

The results show that the driving effects of financial technology innovation in various regions on the transformation and upgrading of industrial structure are inconsistent. Among them: for every 1% increase in financial technology innovation, the secondary industry output value increased by 3.243% in all regions and 6.458% in the eastern region. The tertiary industry output value increased by 3.824% in all regions and 5.124% in the eastern region. Financial science and technology innovation have a significant role in driving the transformation and upgrading of industrial structure. Except for the

transformation and upgrading of industrial structure in the secondary industry in the central region ^[1], the driving effect of financial technology innovation in the central and western regions on the transformation and upgrading of industrial structure is not special. Obvious. From the direct effect of industrial structure transformation and upgrading on regional economic development, the indirect effect of financial technology innovation on regional economic development is about 0.053%, that is, every 1% increase in financial technology innovation will lead to a per capita output increase of 0.053%. The indirect effects of technological innovation on regional economic development are relatively small. It can be seen that it is necessary to further increase investment in financial technology innovation and comprehensively assist in the transformation and upgrading of industrial structure.

Table.2. Indirect effects of regional science and technology innovation and foreign investment on regional economic development in China from 2008 to 2018

X	Y	Driving effect	direct effect	indirect effect
<i>TFPC</i>	GDP	3.243	0.023	0.053
<i>TC(CRS)</i>		3.824	0.015	0.024
<i>EC(CRS)</i>		6.458	0	0
<i>PTEC(VRS)</i>		7.367	0	0
<i>SEC(CRS, VRS)</i>		5.124	0.025	0.053

4. Recommendations

4.1 Green economy must be put on the agenda

Under the background of ecological environmental protection, the concept of green finance has been highlighted. In China's economic growth, high-speed economic growth has not considered the cost of the environment, resulting in the current deterioration of China's environmental quality. Under the global environmental crisis, global environmental protection has become the basic responsibility of every country and every citizen. In China, green finance proves that the use of financial macro-adjustment advantages is conducive to the improvement of China's environmental quality. The so-called green finance is to consider the cost, risk and recovery related to environmental quality in the financial investment and financing activities as the normal cost of financial business. Use financial means to strengthen the protection of environmental resources, strengthen the management of environmental pollution, and guide the sustainable use and development of social resources. To carry out green finance and strengthen ecological environment protection, we must strengthen the concept of green finance of banks, establish a green financial strategy, apply green finance strategies to practice, encourage banks to develop green financial products and tools, learn from international experience, and strengthen exchanges and cooperation in the international financial system. Innovate China's green finance development model.

4.2 The role of financial guidance in the balanced development of economic regions

In view of the certain degree of imbalance in the regional economy and the role of stimulating competitive vitality and guiding resource flows, the stratified financial regional equilibrium function will certainly be a relative equilibrium rather than an absolute concept. It is the fundamental purpose of carrying out stratified finance and continuously narrowing the gap in the regional economy that is expanding. This paper proposes a three-level development goal in the development of tiered finance. The development of the three-level development level is formulated with reference to regional linkages and regional financial development, in order to provide theoretical guidance for regional financial development and promote regional coordinated development of finance and economy.

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