

The Influence of Technological Innovation Diffusion on the Optimization of Beijing's Cultural Industrial Structure

Dong Tong^{1,*}

¹ Beijing Institute of Graphic Communication, No.206, Xingsheng Street, Daxing District, Beijing, China

Abstract. Technological innovation diffusion is an important direction of industrial structure upgrading research. In the context of intelligent technology enabling the cultural industry to improve the efficiency of the whole industrial chain, it is critical to examine its impact on the optimization and upgrading of the cultural industry structure from the perspective of technological innovation diffusion. This paper constructs an empirical model based on the impact of the per capita output of regional cultural industry, the capital labor ratio of regional cultural industry, and the capital labor ratio of cultural industry segmentation on the optimization of cultural industrial structure.

1 Introduction

Culture and technological innovation is the main theme of modern economic and social changes. Technological innovation plays an increasingly important role in economic, cultural and social development. Technological innovation diffusion is an important factor in promoting the optimization of the whole industrial chain structure of the cultural industry. With the development of technology, China's cultural industry has been constantly innovating due to technological innovation. The 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long-term Goals for 2035 clearly put forward a separate discussion on "improving the modern cultural industrial system". Therefore, the establishment and improvement of a modern cultural industry system has become a national strategic requirement. The integration of technology and cultural industry is one of the important directions for the transformation and upgrading of cultural industry.

2 The impact of innovation diffusion on the structure of cultural industry

2.1 Technological innovation hastens the birth of a cultural power

Britain, the United States, France, Canada, South Korea and Japan are the countries with the fastest development rate of cultural industry in the modern world. As early as the last century, the British government attached great importance to the integration of science and technology and culture, encouraged the development of cultural industries through technological innovation, and became the first country in the world to propose cultural industries

(the UK called it "cultural and creative industries"). The then British Prime Minister Tony Blair established the "Creative Industries Task Force" when he took office. After decades of development, the cultural industry has become the second pillar industry in the UK, transforming the UK from a "world factory" with industrial technology as the core to a "world creative center" with cultural technology as the core. In the 1990s, the United States took the development of network technology as an opportunity to apply high and new technology to the publishing industry and cultural entertainment industry. The world-renowned Disney of the United States introduced high technology into the cultural industry chain, and introduced beautiful sound, light, and electrical technologies into theater performances, which improved the artistic expression of cultural products. The United States is recognized as a major country in the cultural industry in the world, and through technology to improve the expression and dissemination of culture, so that the cultural industry will continue to grow. The French government is the country that attaches the most importance to the scientific and technological development path of the cultural industry. The Ministry of Culture and Exchange has invested a large amount of funds to support the high-tech development of the cultural industry, providing preferential policies and sufficient funds for the integration of science and technology and culture, and building a modern industrial chain of the cultural industry. Canada encourages the society to participate widely in the development of science, technology and cultural industries, making Canada, a country with no deep cultural heritage, become a powerful country in science, technology and cultural industries. After putting forward the strategy of "building a country through culture", South Korea has actively accelerated the integration of technology and culture, followed the path of the integration of new culture and science and

* Corresponding author: td1202013@sina.cn

technology, established the digital game industry as a national strategic industry by setting up research institutions, promulgating the Law on the Promotion of Cultural Industry, relying on the rapid development of IT technology and digital technology, and effectively promoted the development of the cultural industry. As a model for the integration of culture and technology, Japan has actively promoted the innovation of digital technology and carriers by tapping into traditional culture, and has become the world's largest producer in the field of game animation, and the animation industry has also become Japan's largest pillar industry.

2.2 The development of cultural industry promotes the construction of "four centers" in Beijing

Since Beijing clarified the strategic positioning of "four centers", the cultural industry has become an industry of great concern to Beijing. The development of cultural industry has not only become the engine for the adjustment and upgrading of Beijing's industrial structure and scientific development, but also a necessary starting point for promoting the coordinated development of Beijing, Tianjin and Hebei. Through continuous development, the driving force of Beijing's cultural industry has been continuously strengthened, the cultural industry chain has been continuously expanded, the industrial scale has been continuously improved, the industrial structure has been continuously optimized, the industrial level has been leading in the country, and the status of the national cultural center has become prominent. The optimization of the structure of Beijing's cultural industry chain needs the innovation and diffusion of technology. In the planning and creative production process, news and publishing, radio, film and television, software internet in cultural media, advertising and design services in creative design and other industries gather the most high-quality content creative planning and production professionals, brand agencies and other elements in the country; In the aspect of communication, transaction and consumption, Beijing has gathered world-class and national-level cultural communication and distribution channels, and has a monopoly channel advantage in the aspect of cultural communication; In the development of derivatives, the development of cultural and creative industries' derivatives based on copyright is becoming stronger and stronger; In the production, manufacturing and sales of cultural goods equipment and artwork, the production and manufacturing of cultural terminal products, cultural goods and artwork are promoted and upgraded to the high-end links of the value chain such as research and development, design, sales and experiential services.

The essence of the digital economy is to realize the digitalization and intellectualization of resources development, scientific research and development, production and manufacturing, marketing, consumer services and other aspects of the economy through digital technologies such as 5G communication, artificial intelligence, big data, cloud computing, Internet of Things,

blockchain, etc., trigger the innovation of industries and business models, and improve the overall quality, efficiency and innovation of the economy. Therefore, the impact of digital economy on the cultural industry chain is omni-directional.

2.3 Cultural industry has become the pillar industry of Beijing's national economy

As the cultural construction center of China, Beijing has the most concentrated cultural infrastructure, cultural and creative high-end talents, cultural enterprise headquarters and all kinds of capital. The "two-wheel drive" effect of science and technology and culture is very obvious, which makes the cultural and creative industry show a good development foundation and huge development potential. After more than ten years of rapid development, the cultural and creative industry has become the regional economic pillar, the national development highland, and the economic growth of Beijing. The country has made outstanding contributions to its development and progress.

In the 1990s, Beijing took the lead in proposing the development of cultural industries in China. Since 2002, the added value of Beijing's cultural and creative industries has increased by more than 10% annually. In 2005, Beijing began to regard the cultural and creative industries as one of the important pillar industries of the capital economy, which was written in the Development Outline of the 11th Five-Year Plan for the National Economic and Social Development of Beijing, and put forward the goal of building Beijing into the "capital of creative industries" of China. After the development of the "11th Five-Year Plan" period, the cultural and creative industries have become an important pillar and new growth point of the capital economy. In the Twelfth Five-Year Plan for the National Economic and Social Development of Beijing issued in November 2011, it is proposed to "further strengthen the pillar position of cultural and creative industries", focus on improving the competitiveness of cultural and creative industries, promote the upgrading of cultural and creative industries, and optimize the environment of cultural and creative industries.

During the 14th Five-Year Plan period, Beijing's cultural and creative industries have made greater strides on the track of high-quality development. Now they will continue to focus on the construction of national cultural centers, actively improve the modern cultural industry system, cultivate emerging cultural formats, promote the high-end, integrated, intensive and international development of cultural industries, and strive to build a cultural industry development leading area with strong market competitiveness, sufficient innovation driving force and wide cultural radiation.

3 Model

For a long time, many researchers mainly discussed the impact of technological innovation on industrial structure from the macro level and industrial structure level by

introducing the C-D production function and assuming that the return to scale remains unchanged.

3.1 Basic theoretical analysis model at macro regional level

At the macro regional level, its basic theoretical analysis model is as follows

$$Y_r = A_r K_r^\alpha L_r^\beta, \quad \alpha + \beta = 1, \quad (1)$$

Where, Y, A, K and L respectively represent the output level, technological innovation capacity, capital stock and labor input of region r. α and β It represents the corresponding output elasticity coefficient of capital stock and labor input in the region.

3.2 Basic theoretical analysis model at industrial sector level

At the industrial sector level, its basic theoretical analysis model is as follows

$$Y_{ri} = A_{ri}^* K_{ri}^{\alpha^*} L_{ri}^{\beta^*}, \quad \alpha + \beta = 1, \quad (2)$$

The meaning of each symbol is the same as that in Formula (1). The subscript i and superscript * respectively represent the output elasticity coefficients of production factors of various industrial sectors and various industrial sectors in different regions. Set Y_r and Y_{ri} is expressed in terms of per capita output, from which (1) and (2) can be rewritten as

$$\frac{Y_r}{L_r} = A_r \left(\frac{K_r}{L_r}\right)^\alpha, \quad \frac{Y_{ri}}{L_{ri}} = A_{ri}^* \left(\frac{K_{ri}}{L_{ri}}\right)^{\alpha^*} \quad (3)$$

3.3 Technological innovation model

In order to characterize the impact of technological innovation (TI_r) on the development of regional industries, the existing research defines the ratio of the capital labor ratio of the industry to the capital labor ratio of the corresponding region. Its basic analysis model is

$$TI_r = \frac{\frac{K_{ri}}{L_{ri}}}{\frac{K_r}{L_r}} = \left(\frac{Y_{ri}}{L_{ri}}\right)^{\frac{1}{\alpha^*}} \left(\frac{Y_r}{L_r}\right)^{-\frac{1}{\alpha}} \frac{A_r^{\frac{1}{\alpha}}}{(A_{ri}^*)^{\frac{1}{\alpha^*}}} \quad (4)$$

Substitute formula (4) into (3) to obtain

$$\frac{Y_{ri}}{L_{ri}} = (TI_{ri})^{\alpha^*} \left(\frac{Y_r}{L_r}\right)^{\frac{\alpha^*}{\alpha}} \frac{A_{ri}^*}{(A_r)^{\frac{\alpha^*}{\alpha}}} \quad (5)$$

$$\bar{Y}_{ri} = (TI_{ri})^{\alpha^*} (\bar{Y}_r)^{\frac{\alpha^*}{\alpha}} \frac{A_{ri}^*}{(A_r)^{\frac{\alpha^*}{\alpha}}} \quad (6)$$

Where, \bar{Y}_{ri} represents the per capita output of industry sector i in region r.

3.4 Econometric analysis model

According to the econometric model of "technological innovation diffusion drives regional industrial structure evolution" proposed by Zhong Zhangqi and He Lingyun (2020), the panel data analysis model applicable to this paper is

$$\ln(\bar{IS}_{ri}) = \beta_1 + \beta_2 \ln(TID_r) + \beta_3 \ln(\bar{IS}_r) + \mu_t + \eta_r + \varepsilon_{rt} \quad (7)$$

Where, \bar{IS}_{ri} represents the per capita output of the cultural industry segment i in a district of Beijing.

TID_r refers to the impact of technological innovation on the development of cultural industry in a certain area of Beijing, which is measured by the ratio of the capital labor ratio of the cultural industry in that area to the capital labor ratio of the corresponding area.

\bar{IS}_r refers to the per capita output of cultural industry in a district of Beijing.

$\beta_1, \beta_2, \beta_3$ is the regression coefficient.

$\mu_t, \eta_r, \varepsilon_{rt}$ represents time effect, individual effect and random error term respectively.

t is the number of periods.

By analyzing the relationship between per capita output and the efficiency of technological innovation diffusion, this paper discusses the impact of innovation diffusion of Beijing's cultural industry on the optimization of the whole industrial chain structure.

4 conclusion

Based on the above research, this paper believes that the impact of technological innovation diffusion on the optimization of cultural industry structure mainly comes from the micro and macro levels. The per capita output of a region's cultural industry, the capital labor ratio of the region's cultural industry, and the capital labor ratio of the cultural industry sub-sectors are the main variables that technological innovation diffusion affects the optimization of the region's cultural industry structure. By constructing the model, we can analyze the impact of technological innovation diffusion on the optimization of cultural industry structure.

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