

Research of Technology Innovation in Hubei Province

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Abstract—The implementation of technological innovation-driven economic development is an inevitable choice of economic transformation and upgrading in Hubei province. In this paper, we study the current status of technological innovation in Hubei Province. We find two major problems of Technology Innovation in Hubei Province: uneven regional development; innovation capability growth is relatively slower than the other parts of China. Therefore, the Hubei provincial government should adopt appropriate financial support, tax incentives, universal education and other policies to promote innovation of the places that have relatively backward technology. This can also reduce inter-regional imbalances. In addition, the Hubei province should try its best to increase input of technological innovation.

Index Terms—Hubei, technological innovation, input and output of innovation

I. INTRODUCTION

In recent years, with the economic development of China, the demographic dividend, the system dividends and the globalization dividend gradually disappear. Coupled with the increasingly high demand for environmental protection in whole society, the low level industrialization model which includes cheap labor and environment destruction has been unable to continue to support economic sustainable development. To this end, the central government timely put forward the "public entrepreneurship and innovation", "Made in China in 2025" and other economic development strategy. The future transformation and upgrading of China's economy will be more dependent on innovation-driven. As a large province of science and education in China, Hubei Province has a large number of well-known colleges and universities, leading scientific research and rich scientific and technological personnel. These are valuable resources of the implementation of technological innovation and drive of economic development. However, the advantages of resources are not equal to the development advantages. We need study deeply some problems about technological innovation in Hubei Province.

Some scholars studied technological innovation of a region. Pavlova Adeliya et al. (2015) studied the innovative effects of organizational, economic and administrative factors on the Tatarstan region in the Russian Federation [1]. Tan Shen Kian et al. (2015) studied the individual influencing factors of innovation ecosystems in education, government and industry in

Malaysia [2]. Lubica Lesáková et al. (2014) studied the main factors affecting the innovation of small and medium-sized enterprises in Slovakia [3]. Gabriela Lucia Şipoş et al. (2014) studied the impact of innovation on innovative and non-innovative firms in European countries [4]. Jeong-dong Lee et al. (2013) studied the impact of partnerships on national innovation [5].

These scholars do not specifically study the technological innovation in Hubei Province in the above studies. A few scholars specialize in technological innovation in Hubei Province. These scholars prefer to qualitative analysis and lack of data support. They don't analyze the technological innovation of Hubei Province especially when they take the province as research unit. Different from the above research, this paper will be based on a large number of statistical data and focused on the status of technological innovation in Hubei Province.

II. THE STATUS OF TECHNOLOGICAL INNOVATION IN HUBEI PROVINCE

A Talent investment.

Science and technology talent is an important resource of technological innovation system. From 2007 to 2015, R & D personnel are growing continually in Hubei Province. R & D staff in 2015 increases by 225.44% than R & D staff in 2007 in Hubei province. Average annual growth rate is 28.18%. From the national point of view, the total amount of scientific and technological human resources in Hubei province is on the middle level of China. There are 218094 R & D staffs in Hubei province in 2014. The quantity accounts for 4.08% of the national R & D staffs. R & D personnel in Hubei province rank eighth in the 31 provinces and municipalities in China. R & D personnel in Hubei province rank second in the central and western regions in China. R & D personnel in Hubei province are only less than that of Henan province. There are 31 academicians of Chinese Academy of Sciences in Hubei province in 2015. The quantity ranked fourth and after Beijing, Shanghai, Jiangsu. There are 40 academicians from the Chinese Academy of Engineering in Hubei province in the same year. The quantity ranked fifth in the country and after Beijing, Shanghai, Jiangsu and Shanxi. Research field of these academicians are mainly in the machinery, information, chemicals, energy, civil engineering, agriculture, industrial and other technical fields. Overall, technological innovation and human resources investment is in good condition in Hubei province.

B Capital resources investment.

Ether the total amount or the input intensity of R & D funds in Hubei Province are showing increasing trend year by year. Internal R & D expenses in Hubei Province increased by 399.33% between 2007 and 2015. The growth is much higher than GDP growth. The growth rate of R & D funds in Hubei Province reached the highest stage in 2009. The growth rate is 43.19%. In addition, R & D internal expenditure / GDP (%) in Hubei Province remained unchanged at 1.65% between 2009 and 2011. R & D internal expenditure / GDP (%) in Hubei Province are steadily improving during the other years. R & D internal expenditure / GDP (%) in Hubei Province in 2015 reached 1.9%.

C Technological innovation output.

In recent years, the output of scientific and technological activities in Hubei province has shown an increasing trend.

The number of scientific papers published and the amount of scientific and technical publications in Hubei has been increasing between 2009 and 2015. The number of scientific papers published in Hubei increased from 83533 to 93190 between 2009 and 2015. It increased by 11.56%. The number of sci-tech publications in Hubei increased from 2625 to 2827 between 2009 and 2015. It increased by 7.70%. The quality of scientific papers published in Hubei is higher than that of other provinces in China. In 2014, published scientific papers in Hubei province are cited 12267 times by SCI. It ranked sixth in China. Published scientific papers in Hubei province are cited 8194 by EI. It ranked fifth in China. Published scientific papers in Hubei province are cited 3009 by CPCI-S. It ranked fourth in China.

From the number of patent applications and the number of patents granted in Hubei Province, these two indicators are increasing year by year trend. The number of patent admissibility in Hubei Province increased from 27,206 in 2009 to 74240 in 2015. It increased by 172.88%. Meanwhile, the number of national patent admissibility increased from 976686 to 2639446. It increased by 170.25%. The number of patent admissibility in Hubei Province grew slightly faster than the national level. The number of patent approvals in Hubei Province increased year by year from 11,357 in 2009 to 38,781 in 2015. It increased by 241.47%. The number of national patent approvals increased from 581,992 to 1718,192 over the same period. It increased by 174.40%. The number of patent approvals in Hubei Province increased significantly faster than the national level.

III. PROBLEMS OF INNOVATION SYSTEM IN HUBEI TECHNOLOGY

A Regional innovation development is not balanced.

The spatial distribution of technological innovation shows a clear "point-like" feature. Wuhan gathered most of the scientific and technological achievements in Hubei Province. First of all, the number of patents in Wuhan,

Yichang and Jingzhou occupy the top three in Hubei Province. The number of patent applications in Wuhan City in 2015 reached by 45.21% of the whole province. Yichang ranked second in in Hubei Province. The number of patent applications in Yichang City in 2015 reached by 12.52% of the whole province. Jingzhou ranked third in in Hubei Province. The number of patent applications in Jingzhou City in 2015 reached by 9.45% of the whole province. The gap becomes larger between the other cities and Wuhan. The number of patents granted in Wuhan City ranked first in 2015. The number of patent granted in Wuhan City in 2015 reached by 55.90% of the whole province. Jingzhou ranked second in 2015. The number of patent granted in Jingzhou City in 2015 accounted for 9.58% of the province. Yichang ranked third in 2015. The number of patent granted in Yichang City in 2015 accounted for 6.04% of the province. Wuhan is still far ahead of the other cities.

In addition, the development of high-tech industries in Wuhan, Xiangyang and Yichang occupy the top three. In 2015, the added value of high-tech industry in Wuhan reached RMB244.665 billion, accounting for 44.67% of the added value of high-tech industry in Hubei Province. The added value of high-tech industries of Xiangyang City reached 80.745 billion yuan, accounting for 16.06% of added value of high-tech industry in Hubei Province. The proportion ranked second. The added value of high-tech industries of Yichang City reached 59.232 billion yuan, accounting for 11.78% of added value of high-tech industry in Hubei Province. The proportion ranked second. The proportion ranked third. The added value of high-tech industries in these three cities accounted for 72.51% of the added value of high-tech industries in Hubei Province. The development of high-tech industries in 14 other cities (including Shennongjia forest area) is relatively backward.

B Innovation capacity growth is slower than other regions in China.

According to the "China Regional Innovation Capability Evaluation Report", innovation capacity in Hubei Province ranked 12th of China in 2015. Ranking dropped 2 over last year. Among them, the knowledge acquisition capacity of Hubei Province ranked 11th from the 14th in previous year, mainly due to the ability to transfer technology over the previous year has been improved. For example, domestic technical expenses that bought by industrial enterprises above designated size grown from 40,612.4 Million yuan of the previous year to 76,636.6 million. It ranked sixth in whole country. Environmental capacity of knowledge creation and innovation rankings was equal to the previous year. Enterprise innovation capacity rankings have declined over the last year.

IV. RECOMMENDATIONS OF TECHNOLOGY INNOVATION POLICY IN HUBEI

A The government in Hubei province should use the appropriate financial support, tax incentives, education spread and other policies to promote the scientific research and technological innovation in relatively backward and potential region. These policies can reduce imbalance of regional technological innovation.

Technical innovation in Wuhan is currently the highest in Hubei Province. Innovation potential of other areas is not fully played. For example, the development of food industry and oil machinery industry is good Jingzhou City. There is scientific research support of Yangtze River University in Jingzhou City. The provincial government of Hubei Province will greatly promote the technological innovation of local industry in Jingzhou if the provincial government of Hubei Province provides certain tax incentives and financial support for food and oil machinery enterprises. There are rich ethnic customs, beautiful scenery and characteristic agricultural products in Enshi City. There are several key universities of Hubei Province. Enshi City has strong scientific research strength of national culture, traditional Chinese medicine resources and se-enriched foodstuff. It is suitable for the development of technological innovation on tourism, national culture, Chinese medicine, food industry.

In addition, for the relatively backward areas of the economy, the government of Hubei Province should increase the financial tilt, popularize compulsory education, strengthen vocational and technical education and improve the cultural quality of local workers and scientific quality. These areas are mostly in the mountainous areas of western Hubei. There are low labor costs there. Mountain agricultural resources are rich. It is suitable for the development of manufacturing food and national characteristics product. It will also help to attract foreign investment after the quality of workers are increased. Foreign enterprises will set up factories here. Coupled with the local government appropriate policy guidance, it is also very good to promote high-tech industrial development and technological innovation in backward areas.

B The whole society of Hubei province should expand investment in technological innovation.

Although R & D internal expenses in Hubei Province accounted for the proportion of GDP increased year by

year, the proportion still lagged behind the national average. R & D internal expenditure accounted for 1.90% of GDP in Hubei Province in 2015 while national R & D internal expenditure accounted for 2.07% of GDP at the same period. Obviously, there is still much growth room for technological innovation investment in Hubei Province. The government should increase investment in science and technology funding. In addition, the government should develop appropriate policies to encourage bank to grant loans to technology innovation enterprises. Moreover, venture capital is a very important source of funding for European and American technological innovation enterprises. European and American have mature experience in promoting local technological innovation. It is worth learning for Hubei Province.

The government in Hubei Province should not only introduce European and American venture capital funds hard but also should encourage domestic venture capital funds to invest in technological innovation projects in Hubei Province. It will improve healthy growth of technological innovation projects.

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