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The Effect of Technological Innovation on the Economic Development in China and Japan

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Abstract: Technological innovations have significantly affected rural, urban, and international economic development. Technology has improved agricultural productivity, reduced production costs, and increased access to markets in rural areas. In urban areas, technology has led to new industries and enhanced productivity while enabling more excellent connectivity and access to information. At the international level, technology has facilitated global trade and the exchange of information, leading to increased economic interdependence. However, there are also concerns that technological innovations may exacerbate existing inequalities, particularly in rural areas and developing countries. Therefore, it is crucial to consider technological innovations' potential benefits and drawbacks to ensure inclusive and sustainable economic development.

Keywords: technological innovation, effects, rural and urban in China, Japan, economic development

1. Introduction

Scientific and technological innovation is a significant part of the human world because scientific and technological innovation can not only promote China's economic growth and improve the international economy. The rural and urban perspectives will be the main perspectives of China's economic growth. Scientific and technological innovation will change rural and urban economies. Still, some small factors, such as geographical location and government policies, will also interfere with the influence of scientific and technological innovation on the economy. Internationally, the relationship between Japan's technological innovation and economic development will play a significant role.

Similarly, some other factors will also affect the effect of technological innovation in promoting economic growth, such as Japan's national conditions and population size. Many data will fully demonstrate the importance of scientific and technological innovation for domestic and foreign economic growth and social development. Scientific and technological innovation is an essential part of a country. Scientific and technological innovation can significantly improve a country's influence and international status because of economic growth and the birth of some high technology. The central research aspect of this paper is economic growth. In particular, the speed of China's economic development in the past two decades is worth analyzing and studying.

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2. Technological Innovation vs. Rural and Agricultural Development

First, scientific and technological innovation has promoted the economic growth of China's agriculture and rural areas. Agriculture is essential for China, a "big agricultural country." In agriculture, the earliest "scientific and technological innovation" dates to the first century B.C. water-powered trip-powered plants are mainly used to mash, peel, and polish grain, a process that people do not need to complete manually. And in the 1st century B.C., China began using tip-wagons -- for irrigating fields on higher ground, driven by waterwheels or oxen. These two technologies represent the early use of "science and technology" in agriculture in China. Relational historical documents indicate that these two "technologies" significantly increased grain yields and accelerated farming efficiency. This situation is the microcosm of the current social and technological innovation for economic development. "Scientific and technological innovation" means water-powered facilities, and "economic development" means increased grain production. For agriculture in modern society, people need more scientific and technological innovation to promote the development of the agricultural economy.

According to a 2019 survey [1], more than two-thirds of China's arable land is medium and low-yielding. China has great potential to raise its grain yield per unit area by implementing the strategy of grain storage on the ground and grain storage on technology, intensifying the transformation of low - and medium-yield farmland, accelerating the construction of high-standard farmland, and accelerating the development of facility agriculture. And according to China's National Bureau of Statistics, government support for agricultural production has increased, and rural incomes have continued to rise. In 2021, rural residents' per capita disposable income increased by 9.7 percent in real terms [2]. In 2020, the value-added value of China's agriculture and related industries reached 16.69 billion yuan, an increase of 2,098 billion yuan over 2018, or an average annual growth of 6.9 percent. It accounted for 16.5% of China's gross domestic product (GDP), up 0.6 percentage points from 2018 [3]. China has made great efforts to strengthen basic agricultural research and has made breakthroughs in many scientific and technological methods in gene regulation and molecular breeding of agricultural organisms, mechanisms of resistance to stress in agriculture and forestry plants and animals, efficient utilization of farmland resources, ecological restoration of agriculture and forestry, pest control, biosafety, and agricultural product safety. In addition, China has promoted a series of research in cutting-edge technologies, such as agricultural biotechnology, information technology, new material technology, advanced manufacturing technology, and precision farming technology, and made great efforts to break the bottleneck of agricultural technology, such as improved seed cultivation, cost-saving and consumption-reducing, water-saving irrigation, farm machinery and equipment, new fertilizer, and medicine, disease prevention and control, processing, storage and transportation, circular agriculture, Marine agriculture, Some practical technical achievements have been obtained. In addition, the government has also implemented various policies to support the development of the rural economy. These policies include the promotion of e-commerce, the construction of modern transportation infrastructure, and the development of rural tourism. These efforts have helped improve farmers' livelihoods, increase their income, and boost the overall economic development of rural areas. The result of extensive data analysis has also been instrumental in promoting the growth of the agricultural sector. Big data analytics can be used to track and analyze the behavior of crops, animals, and even farmers, providing valuable insights into the best practices for agriculture. This data can be used to develop more effective farming strategies and to optimize supply chains, reducing waste and increasing efficiency. Robotic systems have also been introduced in agriculture, contributing to the sector's growth. Mechanical systems in agriculture allow for more precise crop planting, harvesting, and monitoring. This technology can also reduce the need for manual labor, which can be difficult and dangerous in some farming environments. Using robotics

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in agriculture has helped increase efficiency, reduce costs, and improve the safety of workers in rural areas.

3. Factors Inhibiting the Development of Science and Technology

Despite the government's push, several factors could stifle technological development in some of China's agricultural and rural areas. Despite the government's push, several factors could stifle technological development in some of China's agricultural and rural areas. According to Zhang Yi's article "Spillover Effect of scientific and technological innovation on agricultural economic growth and its attenuation Boundary," "However, most of these studies are based on the assumption of mutual independence among regions, that is, the agricultural economic growth of a part only depends on the input level of agricultural science and technology, while ignoring the effect of the spillover of agricultural science and technology innovation in other regions on agricultural production in the area. Spatial spillover is one of the essential characteristics of agricultural science and technology innovation activities "[4]. This paragraph proposes that the promoting effect of scientific and technological innovation on the regional agricultural economy is limited to these regions, which exist independently. If these regions relate to the surrounding areas, the economic growth of these regions may not only be the function of scientific and technological innovation.

Moreover, the disadvantage of space spillover is that if the economy of these regions "benefits" from neighboring areas, these regions may not vigorously develop technological innovation, which will inhibit the development of technological innovation in these regions. In addition, sharing scientific and technical innovation knowledge may lead to a lack of regional innovation capacity, thus inhibiting the growth of the agricultural economy. Therefore, the economic development of a region may be not only due to scientific and technological innovation but also some tiny factors that impact the economy. However, scientific and technological innovation is the main body of the discussion. No matter how many elements are affected, scientific and technical innovation brings massive agricultural development to a region. Despite additional shortcomings, scientific and technological innovation has driven China's agricultural and rural economic growth. Government investment in research and development and implementing policies to support rural economic development has helped transform agriculture, improve farmers' livelihoods, and promote overall rural economic development.

4. Technological Development vs. Urban Area Economic Development

Furthermore, scientific and technological innovation has a significant effect on the economic growth of urban agglomerations. The central and western regions enjoyed good growth in R&D input. In 2020, the R&D expenditure in China's eastern, mid, and western areas will reach 1,651.73 billion yuan, 466.29 billion yuan, and 321.29 billion yuan, respectively, up 9.2 percent, 12 percent, and 12.4 percent over the previous year [5]. The government's promotion of scientific and technological innovation drives enterprises to further increase investment in scientific and technological innovation and improve technical capacity and the industrial and supply chain level. Scientific and technological innovation can create new products and industries and improve existing ones. That, in turn, has boosted economic growth in urban agglomeration counties, which are centers of economic activity. These counties attract highly educated workers, contributing to a robust innovation ecosystem. The concentration of knowledge and talent in these fields has facilitated cooperation and the exchange of ideas, further driving technological progress and economic growth. In the first six months of 2021, the total profits of industrial enterprises above designated size in China reached 4,218.33 billion yuan, up 66.9 percent year on year and 45.5 percent over the first six months of 2019, with a two-year average growth of 20.6 percent [6].

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5. Economic Growth vs. Space Spillover

Urban agglomeration counties are often at the forefront of economic development, and their growth can have a knock-on effect on surrounding areas. The relationship between scientific and technological innovation and economic growth is complex and multifaceted. In the context of urban agglomeration counties, this relationship can produce significant spatial effects, meaning that innovation's benefits can be concentrated in specific geographic areas. These regions are often characterized by high concentrations of economic activity, talent, and knowledge, creating an environment conducive to innovation and growth. Urban agglomeration counties are centers of economic activity and are often home to large businesses and residents. The concentration of economic activity in these areas creates a positive feedback loop, with economic growth leading to increased investment, which drives further economic development. The presence of many businesses and residents also creates a high demand for goods and services, which can further fuel economic growth. One factor influencing innovation's spatial effect on county economic growth in urban agglomerations is the degree of concentration of highly educated workers. According to Zhu Nannan's article "Study on the Spatial Effect of population Agglomeration and scientific and technological Innovation on county economic growth in Central Yunnan City Agglomeration," "Population, as the essential factor of labor force production, can be regarded as the main body of scientific and technological innovation output and application, and an important way for the interrelation, integration, and flow of innovation achievements among counties [7]. " These people often have the skills and knowledge to drive innovation and create new products and industries. The concentration of highly educated workers in urban agglomeration counties has increased cooperation and exchange of ideas, further driving technological progress and economic growth. Urban agglomeration counties also tend to have vital innovation ecosystems, including universities, research institutes, and entrepreneurial communities. These institutions are critical in supporting scientific and technological innovation and transferring knowledge and technology to the broader economy. Vital innovation ecosystems in urban agglomeration counties help attract and retain highly educated workers, strengthening the positive feedback loop that drives economic growth. Technological innovation and economic growth benefits are more comprehensive than urban agglomeration counties. Growth and development in these areas can have a ripple effect on surrounding areas as businesses and workers from these areas spread to neighboring communities. Concentrating economic activity in urban agglomerated counties also leads to increased infrastructure and transport investment, which helps improve access to goods and services for people living in surrounding areas.

Despite the many benefits of scientific and technological innovation and economic growth in urban agglomeration counties, some challenges are also associated with this relationship. For example, the concentration of economic activity in these areas can increase competition for resources such as housing, transportation, and skilled workers. This can drive up the cost of living in urban agglomeration counties, making it difficult for lower-income residents to afford to live there. Another challenge associated with the spatial effect of scientific and technological innovation on economic growth in urban agglomeration counties is the potential for income inequality. While these areas tend to generate significant wealth, this wealth is not always distributed evenly. The concentration of highly educated workers in urban agglomeration counties can create a demand for skilled labor, increasing wages for these workers. At the same time, the need for unskilled labor may decline, leading to lower wages for workers in these areas who lack the skills and education necessary to compete in the knowledge-based economy. The spatial effect of scientific and technological innovation on economic growth in urban agglomeration counties is significant and multifaceted. These areas are characterized by a high concentration of economic activity, talent, and knowledge, which creates an environment conducive to innovation and growth. However, there are also

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challenges associated with this relationship, including increased competition for resources and the potential for income inequality. Despite these challenges, the benefits of scientific and technological innovation and economic growth in urban agglomeration counties are clear and undeniable. These areas will likely play a critical role in economic development.

6. Technological Innovation vs. Japan Economic Development

Japan has experienced tremendous economic growth and development since the mid-20th century, mainly due to its emphasis on scientific and technological innovation. The country's commitment to research and development, investment in infrastructure, and government policies that foster innovation have enabled it to become a global leader in many high-tech industries. One of the key drivers of Japan's economic success has been its focus on research and development(R&D). Japan consistently ranks among the top countries in the world regarding R&D spending, and the government has implemented various policies and programs to support innovation. According to the article "Research on the Driving role of technological innovation in improving the quality of economic growth in Japan" by Mei Wei Deng, "the measurement results show that, except for Beijing Capital Prefecture and Hiroshima County, the top 10 regions with technological innovation level in 2014 also ranked the top 10 in terms of economic growth quality.

On the one hand, the higher level of technological innovation in these regions drives intensive economic growth; on the other hand, the higher level of economic growth in these regions also contributes to the investment in technological innovation, the optimization of the innovation environment, and the corresponding improvement of technological innovation capability, thus forming a virtuous cycle of economic development[8]", this paragraph fully demonstrates that scientific and technological innovation and economy complement each other. Scientific and technological innovation is essential for economic growth. Because of the importance of scientific and technological innovation, the government has devoted much energy to it. For example, the government offers tax breaks and other incentives for businesses that invest in R&D, and it has created several public-private partnerships to promote collaboration between industry and academia. In addition to supporting R&D, Japan has also invested heavily in infrastructure. The country has one of the most advanced transportation networks in the world, including a vast system of highways, railways, and airports. Transportation has enabled the efficient movement of people and goods throughout the country and has helped to support the growth of many industries, including manufacturing, logistics, and tourism. Japan has also made significant technological investments, particularly in robotics, electronics, and telecommunications. The country is home to many leading technology companies, including Sony, Toshiba, and Panasonic. It has been at the forefront of many technological advancements in robotics, artificial intelligence, and mobile communications. This has helped to drive innovation across a wide range of industries and has enabled Japanese companies to stay competitive in an increasingly globalized marketplace.

7. Economic Downturn

But according to the data, Japan's high-tech exports showed a downward trend after 2000. The highest percentage of high-tech exports in manufactured exports was 20% in 2009; Since then, it has been on a downward trend, and the proportion of high-tech exports reached its lowest point in 2019, accounting for 17%. In 2021, the proportion of high-tech exports rose to 18 percent. The lower rate of high-tech exports also means Japan's domestic economy is declining. According to the data, Japan's total central government debt rose after 20 years, reaching 216.3% in 2021, the highest since 2000[9]. This data set shows the complementary relationship between technological innovation and economic development. But weak innovation is something the Japanese government does not want.

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Japan's government has implemented several policies that have fostered innovation and entrepreneurship. For example, the government has created various funding programs to support small and medium-sized businesses and implemented several policies to encourage venture capital investment. This has helped create a thriving startup ecosystem in Japan, with many innovative new companies emerging in biotechnology, renewable energy, and software development.

Overall, the impact of scientific and technological innovation on Japan's economic development has been immense. The country's commitment to research and development, investment in infrastructure, and government policies that foster innovation have enabled it to become a global leader in many high-tech industries and have helped to create a prosperous and dynamic economy. As Japan continues to invest in these areas, it will likely remain a significant player in the global economy for many years.

8. Conclusion

Technological innovations have significantly affected rural and urban economic development in China and Japan. Technology has facilitated agricultural modernization and improved productivity in rural areas, while in urban areas, technology has supported manufacturing, infrastructure development, and innovation. Both countries have prioritized technology in their national economic strategies, leading to increased investment, research, and development. However, there are challenges, such as income inequality, job displacement, and environmental impacts. Furthermore, while both countries have seen economic growth through technology, Japan has faced the challenge of an aging population, while China has had to balance rapid development with sustainable growth. Overall, technology has been crucial in driving economic development in China and Japan. Still, monitoring and addressing potential adverse impacts is essential to ensure inclusive and sustainable growth.

References

[1] *Ministry of Agriculture and Rural Affairs of the People's Republic of China, ICP NO.05039419-2 DOI: http://www.moa.gov.cn/ztzl/gdzlbhyjs/mtbd_28775/mtbd/202202/t20220215_6388699.htm*

[2] *Ministry of Agriculture and Rural Affairs of the People's Republic of China, ICP NO.05039419-2 DOI：http://www.moa.gov.cn/ztzl/ymksn/jjrbbd/202201/t20220121_6387413.htm#:~:text=%E5%86%9C%E4%B8%9A%E5%86%9C%E6%9D%91%E9%83%A8%E6%80%BB%E5%86%9C%E8%89%BA,%E5%A2%9E%E9%80%9F2.6%E4%B8%AA%E7%99%BE%E5%88%86%E7%82%B9%E3%80%82*

[3] *Xinghua Zhang, The second of a series of reports on the achievements of economic and social development since the 18th CPC National Congress, ICP NO.05070218 DOI:http://www.gov.cn/xinwen/2022-09/15/content_5709899.htm*

[4] *Zhang Yi, Song Hongyuan. The spillover effect of scientific and technological innovation on agricultural economic growth and its attenuation boundary: An analysis based on spatial Dubin Model [J]. Rural Economy,2022,No.475(05):116-124. DOI：https://kns.cnki.net/kns8/defaultresult/index*

[5] *Qitong Zhang, Statistics Bureau interprets 2020 Statistical Bulletin of National Science and Technology Expenditure, ICP NO.05070218，DOI：http://www.gov.cn/xinwen/2021-09/22/content_5638658.htm*

[6] *National Bureau of Statistics, From January to June 2021, the profits of industrial enterprises above designated size increased by 66.9% year on year, with an average increase of 20.6% for two years, ICP NO.05034670-2*

[7] *Zhu N N. Spatial effects of population agglomeration and scientific and technological innovation on county economic growth in Central Yunnan urban Agglomeration [D]. Yunnan university of finance and economics, 2022. DOI: 10.27455 /, dc nki. Gycmc. 2022.000243 , DOI : https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C475KOm_zrgu4lQARvep2SAke-wuWrktdE-tSIT2YIbQ2Ocnx06wyLNYwe-0aZg3eE-fjW3woWd3D_ffQXPExXwI&uniplatform=NZKPT*

[8] *Deng Meiwei, Zhang Jifeng. The Driving effect of technological innovation on improving the quality of economic growth in Japan: Based on the analysis of dynamic panel data of prefectures in Japan [J]. Modern Japan's economy, 2018, 5 (5) : 69-80. The DOI: 10.16123 / j.carol carroll nki. Issn 1000-355 - x. 2018.05.007.*

DOI:https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7i0-kJR0HYBJ80QN9L51zrP2cwla6xdv2kcHYp8Rfp3kjq1xrzXCAV09E6uBA34s68&uniplatform=NZKPT

[9] The World Bank Website, DOI:https://data.worldbank.org/country/japan