



# Reading Transforming China's Industrial Innovation in a New Era

Yue Zhou\*

Department of Economics Renmin University of China 2021 Economics (Economics with Chinese characteristics) class

\*Corresponding author Email: 3496450744@qq.com

**Abstract.** Based on the column of *Transforming China's Industrial Innovation in a New Era*, combined with Yifu Lin's research on industrial policy, China's industrial innovation system is undergoing profound changes under the pressure of geopolitics. The four articles in the column of *Transforming China's Industrial Innovation in a New Era* shows that national industrial innovation needs a variety of elements and adapts to different industrial conditions. The diversified innovation mode means that China has great resilience in the competition between China and the US. With the support of appropriate government policies, China's economic development depends on the success of innovative enterprises. If there is no strong internal R & D and innovation capability, basically no Chinese company can grow into a global influential competitor only by participating in the global industrial chain. If China wants to achieve sustainable industrial development, the independent innovation ability of enterprises and the support from the national level are indispensable.

**Keywords:** New era; Chinese industry; innovation; transformation

## 1 Introduction

In the turbulent geopolitics and changing national policies, China's industrial innovation system is undergoing profound changes. Whether Chinese industrial enterprises can successfully cope with these changes through investment in innovation will have a profound impact on the future of China and the world. Kaidong Feng, associate professor of Peking University, Yin Li, associate researcher of Fudan University, and William Lazonik, Professor of the University of Massachusetts in the United States recently planned a special column entitled Transforming China's Industrial Innovation in a New Era in the China Review to discuss the current situation and future of China's industrial innovation with scholars from China, the United States and Germany. Based on the research on industries of telecommunication equipment, semiconductor, bio-pharmaceutical, high-speed railway and low-speed electric vehicle, the four articles of the special column discuss the appearance of China's industrial innovation from the aspects of innovation source, innovation direction and innovation mode. Based on the theory and case analysis of this topic, combined with Yifu Lin 's re-

search on industrial policy, this paper makes some reflections on China's industrial innovation and transformation in the new era.

## **2 Background analysis**

### **2.1 International background**

In the 18th century, Britain took the lead in carrying out the industrial revolution, leading Europe and America to enter the boom of industrial development and industrial innovation. Since China broke away from the shackles of semi colonial and semi feudal society in the 20th century, its industrial development started late. Developed countries have made a lot of research on most industries and gained a lot of experience and achievements, which enables China to "stand on the shoulders of giants". It also enables China to imitate the industries of developed countries, learn from existing management, technology experience as well as failure lessons, and save development and R & D costs. However, at the same time, the strict international regulatory system for the industry and the protection of intellectual property rights have also hindered the learning and imitation of later developed countries to a certain extent. Moreover, according to the theory of the disadvantage of backwardness, if post-development countries only imitate technology and management of the fore-development countries rather than systems, it is easy for them to strengthen national opportunism and leave hidden dangers for the long-term development. Besides, China's rapid development and rapid economic growth have aroused the vigilance and hostility of the imperialist powers. Their governments believe that the rise of China's high-tech industry stems from the "compulsory transfer" of foreign technology and the Chinese government's policy is to use the dividends of China's economic growth to coerce foreign companies to transfer advanced technology to Chinese enterprises. Therefore, since 2017, the US government has changed its trade policy and launched a trade war to cut off the access of leading enterprises in the Chinese industry to the advanced technologies developed by the United States and curb the development prospects of China's high-tech industry.

### **2.2 Domestic background**

Under the geopolitical pressure, the industrial policy and strategic direction of the Chinese government's industrial development have changed. As Mr. Yifu Lin said, in terms of industrial policy, attention should be paid to the selection of industries with comparative advantages determined by the national factor endowment structure. By improving the infrastructure and institutional arrangements, the industries should be transformed from potential advantages to real comparative advantages due to the bottleneck restrictions of infrastructure and institutional arrangements. Under the current situation, China should focus on independent innovation. In May, 2020, president Xi announced that China will adopt a "double cycle" development strategy to reduce the external dependence of China's economy. Under the guidance of this strategy, in the next decade, China's economy will take the "domestic circulation" of industrial devel-

opment as the main body, supplemented by the "external circulation" of international trade. At the same time, since the end of 2020, the Chinese government has organized large-scale regulatory activities to change the innovation environment. It has taken a series of actions, including anti-monopoly investigations, huge fines for violations and the establishment of new privacy laws and regulations, to restrain large Internet platform companies such as Alibaba, Tencent, Didi and Meituan, and prevent them from abusing their technology and market position. In 2021, the Chinese government will vigorously promote "self-reliance and self-improvement in science and technology" policy and support technological innovation in the real economy. Its key target industries cover many fields, from semiconductors to bio-pharmaceuticals and aerospace engineering. The Chinese government has sent a clear signal that Chinese science and technology companies should actively participate in industrial innovation, instead of just abusing technological means to pursue profits. The above policies have made great contributions to the innovation, transformation and development of China's industrial industry. If they can continue to be implemented, they may profoundly change the development pattern of China's industrial economy and have a profound impact on the future of China and the world.

### 3 Article review

The four articles in the column Transforming China's Industrial Innovation in a New Era take the industries currently striving to transform China's innovation ability as examples. The cases in the article cover different types of industries, including traditional manufacturing industry and industries at the forefront of technological innovation, manufacturing industry based on mass production and innovation industry based on science, industries led by large companies and industries driven by small and medium-sized enterprises. Their measures to face industrial innovation and transformation have both common features and their own characteristics. The article China's Innovative Enterprises at the Frontiers: Lessons from Indigenous Innovation in Telecommute-Equipment and Semiconductor Industries focuses on the indigenous innovation in the high-tech industry that both China and the United States believe crucial to the future technological development, that is, how the leading Chinese enterprises realize the process of improving the acquired foreign technologies and creating complex technologies locally. By comparing the experience of HUAWEI in the field of telecommunication equipment and SMIC in the field of semiconductor manufacturing, this article concludes that only with the support of innovation investment strategy and continuous organizational learning can innovative enterprises overcome the challenge of independent innovation. At the same time, the article also points out that excessive reliance on government supported technology policies may damage the process of independent innovation. Because it keeps the industry under the pressure of constantly importing new equipment and upgrading blueprints, it destroys the accumulation process of technology learning required by local innovation, and leads to discontinuity of technology accumulation and limited progress of industrial innovation.[1]The article Innovation in the Science-Based Sector: China's Emerging Bio-

pharmaceutical Innovation Boom studied the bio-pharmaceutical industry in China. China's bio-pharmaceutical industry is characterized by complex new medicine innovation based on cutting-edge scientific research. Based on the theory that "technological leapfrogging is more likely to occur in industries with more frequent technological changes", it has implemented the strategy of overtaking at a curve. Its development mode has challenged the traditional East Asian technological catch-up strategy mode. The article believes that China has cultivated the interaction between universities and industries through a large amount of investment in academic fields. Most importantly, China has carried out substantial institutional reform of the medicine regulatory system, which has made great progress in the bio-pharmaceutical industry. These strategies finally enabled China to make achievements in the innovation of biomedical industry which East Asian neighbors failed to achieve.[2]

The article *The Multiple Role of State-Owned Enterprises in China's Innovation System: A Case Study of High-Speed Railways* focuses on the technological innovation of high-speed rail industry implemented by state-owned enterprises in the relatively closed innovation system, and deeply discusses the history of technological innovation of Chinese state-owned enterprises by studying the three state-owned enterprises that have participated in the development of high-speed rail technology since the 1950s.[3]The article believes that those state-owned enterprises with the most innovative ability are not the result of selective industrial policies, but because they can carry out strong market competition through improving resource allocation, employee incentive and capital investment in the process of innovation. The last article *Agile Business Development, Chinese Style: An Exploration of the Low-Speed Electric Vehicle Industry in Shandong Province, China* discusses the successful experience of developing low-speed electric vehicle industry in Shandong Province. Although the manufacturing of low-speed electric vehicles does not involve cutting-edge technologies, it still needs rapid cooperation and adjustment of enterprise strategies and local industrial policies to maintain the development of the industry. This process is called the "agile mode of industrial development" by the author. The success of small and medium-sized low-speed electric vehicle enterprises enables them to provide high-quality and low-cost transportation for Chinese people with limited income. Even in this industry with relatively low technology density, innovation is also an important driving force to reduce the cost of goods and services as well as improving quality, productivity, and local living standards. This also suggests that Chinese industries can use the huge Chinese market to promote the evolution of traditional manufacturing industries.[4]

## 4 Deep exploration

In general, the four articles on this topic provide multiple perspectives for observing China's industrial innovation system, and also illustrate that national industrial innovation requires multiple elements to be adapted to different industrial conditions. In Yifu Lin's new structural economics, he believes that industrial innovation should pay attention to the endowment of dynamic factors, such as natural resources, capital and

labor, and industrial structure. We should also pay attention to restructuring the relationship between state-owned enterprises and the government, research institutions and suppliers. Different industrial structures require corresponding forms of infrastructure, such as power and road networks. The state plays a key role in creating the right infrastructure and development conditions. Yifu Lin particularly pointed out that human capital is a key component of industrial factors in each country, and stressed that countries must take human capital, especially the industries they seek to upgrade, as a key component of their overall development strategy.[5] Take China as an example, in recent years, with the increase of population aging and the popularization of higher education, China's population dividend has been shrinking, while the engineer dividend has been increasing. Relatively, China's industry has gradually turned from labor-intensive to technology intensive. When their industrial investment and factor endowment are fully consistent, developing countries "can turn their backwardness into advantages by borrowing or adjusting technologies that have been mature in rich countries", and finally "achieve a technological innovation rate several times higher than that of advanced countries".

Returning to the articles in this column, we can also find that there are more than one innovation mode in China's huge industrial economy. Innovative enterprises from different industries have implemented different strategies in different development stages to overcome many challenges in the innovation process. Both the telecommunication equipment manufacturing industry and the bio-pharmaceutical industry are innovating at the technological frontier, but the sources of enterprise technological innovation are very different: HUAWEI relies on internal R & D, while the bio-pharmaceutical company relies on national investment in academic research and international knowledge flow to carry out innovation. Although semiconductor OEM enterprises take advantage of the inflow of international talents and external knowledge, it is still difficult to catch up due to the lack of internal R & D capacity and domestic supply chain. In the highly regulated high-speed rail sector, state-owned enterprises have successfully promoted innovation through balancing national tasks and market competition. In the field of low-speed electric vehicles, local governments and small or medium-sized enterprises cooperate closely, flexibly implement policies and business strategies, and creatively serve China's vast low-cost market. These markets have continuously provided a starting platform for local innovative enterprises since China's economic reform. The diversity of the above innovation modes means that China's innovation should not only produce high-tech products, but also improve productivity and promote the prosperity of many economic sectors. The diversified innovation mode means that China has great resilience in the competition between China and the US. Although the US trade policy will slow down China's innovation in some fields closely related to globalization, the vitality of the entire innovation system will be maintained in the foreseeable future.

Of course, we should also make it clear that with the support of appropriate government policies, China's economic development depends on the success of innovative enterprises. We should discard the prejudice of overemphasizing globalization and the role of the government in China's high-tech development. If there is no strong internal R & D and innovation capability, basically no Chinese company can grow

into a competitor with global influence only by participating in the global industrial chain, and it is more in the middle of the "smile curve" with the lowest added value.

If Chinese enterprises lack the strategic ambition of independent innovation, the foreign technology transfer projects supported by the government will only make these enterprises continue to rely on foreign technology. When the window of foreign technology to China is forcibly closed, those enterprises will lose their support. As Lazonik said in his "theory of innovative enterprises", the interaction of "social conditions of innovative enterprises" includes three social conditions: strategic control, organizational integration and financial commitment. Only through their interaction can enterprises produce innovative products. If a country wants to achieve industrial development, it must have the social conditions of these innovative enterprises and be supported by the appropriate governance system, employment system and investment system at the national level.

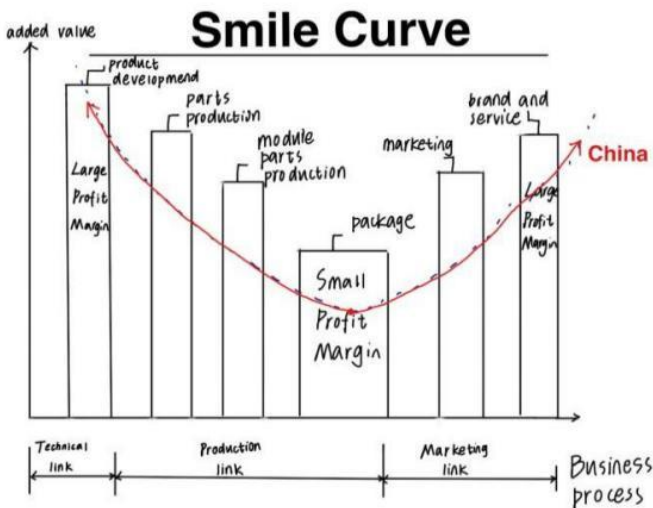


Fig. 1. Changes of China's industrial upgrading on the smiling curve [Photo credit: Original]

## 5 Conclusions

China's industrial innovation system is undergoing profound changes in the volatile international situation and the inclination of national policies. According to the four articles in the column "transformation of China's industrial innovation in the new era", we have come to the conclusion that national industrial innovation needs a variety of elements adapted to different industrial conditions. The independent innovation ability of enterprises and the support of the state are two complementary aspects for the sustainable development of national industry. In the future development of China's industry, China should not only vigorously support the sustainable development of industrial innovation, but also equitably distribute innovation income on the basis of innovative enterprises, so as to achieve "common prosperity" advocated by Present Xi.

## References

1. Yin Li and Kaidong Feng, "China's Innovative Enterprises at the Frontiers: Lessons from Indigenous Innovation in Telecommute-Equipment and Semiconductor Industries," *The China Review*, Vol. 22, No. 1 (2022), pp. 11–37.
2. Yu Zhou and Abigail Coplin, "Innovation in the Science-Based Sector: China's Emerging Bio-pharmaceutical Innovation Boom," *The China Review*, Vol. 22, No. 1 (2022), pp. 39–76.
3. Yanghua Huang, "The Multiple Role of State-Owned Enterprises in China's Innovation System: A Case Study of High-Speed Railways," *The China Review*, Vol. 22, No. 1 (2022), pp. 77–105.
4. Yu Zou, Markus Taube, Gang Liu, and Shuanping Dai, "Agile Business Development, Chinese Style: An Exploration of the Low-Speed Electric Vehicle Industry in Shandong Province, China," *The China Review*, Vol. 22, No. 1 (2022), pp. 107–133.
5. Justin Yifu Lin. Industrial Policy and my country's Economic Development: The Perspective of New Structural Economics [J]. *Fudan Journal (Social Science Edition)*, 2017,59(02):148-153.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

