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Critically Evaluate the Nature, Rationale, and Outcomes of China's Current Use of the Strategic Emerging Industry (SEI) Selective Industrial Policy

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Abstract

This paper discusses the results of China's SIP on high-tech industries. The government nurtures and invests in the large number of professional talents needed in the AI field. In terms of this investment in talent, the policy not only aims to provide ethical and qualified people from universities and society for the industry but also aims to retain people through subsidies and the creation of a positive cultural atmosphere. Support for the AI industry comes from various financial and derivative institutions in the form of loans, guarantees, venture capital, and subsidies.

Keywords

High-technology; AI; Market; High-tech.

1. Introduction

China's high-technology industries (artificial intelligence, communications and data) have recently undergone a period of rapid growth as the government has provided various policies to support their development. For example, in a bid to become a global leader in 5G technology, the Chinese government launched the world's largest 5G network in 2019 (BBC News, 2019) and during the East Asian economic miracle (EAM), the HAPEs government implemented several selective industrial policies to help the country achieve rapid economic growth (World Bank, 1993). In recent years, China has also adopted a series of market intervention measures to promote the development of strategic and emerging high-technology industries such as subsidies, exports. In this context, this paper analyses the nature, rationale and results of China's Selective Industrial Policy (SIP) in the light of the results of the EAM. It first classifies and explains the nature of China's Artificial Intelligence (AI) industry policy instruments in relation to three policy types, and then presents the similarities and differences with EAM-era policies. Second, this paper outlines the background of reasons for developing China's high-tech industries' and the rationale for implementing the main policies . Finally, this paper discusses the results of China's SIP on high-tech industries.

2. Nature for China's Selective Industrial Policies

According to Jin, Wang and Fu, (2019), selective industrial policy is derived from "catch- up theory", which aims to support new and strategic industries in an inclined manner in compress the overall process of industrial evolution and ultimately achieve rapid industrial development and economic catch-up.

As a strategic emerging industry, the AI industry is characterised by low material resource consumption, high knowledge and technology intensity, and high growth potential (The State Council, 2010), and the development of the industry in China is inextricably linked to government policy guidance (Ma and Bai, 2021). In successive selective industrial policies, the

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Chinese state has provided three types of policy instruments for the AI industry, namely (1) supply-based, (2) environment-based and (3) demand-based (Ma and Bai, 2021). The supply-based policy is the direct driver of industrial development, which includes direct provision of funds and talent (Yuan et al., 2019); the environment- based policy provides indirect support for industrial development in three areas: finance, taxation, and strategy; while the demand-based policy is designed to further the development needs of the industry, mainly through two instruments: market development and regulatory provision.

3. Supply-based Policies

3.1. Capital Investment

The Chinese government directly supports the development of the AI industry through the input of funds . Naughton (2021, pp. 69-70) noted that the Government Industrial Guidance Funds (IGFs) are a recent, unique invention of the Chinese government. These IGFs raise funds from both public and private sources and make investments in line with the interests of the government. The objectives of the state's industrial strategy are furthered via these guidance funds, which are public-private investment vehicles (Luong, Arnold and Murphy, 2021). A central, provincial, or local government agency can establish a fund itself or request its creation but a government sponsor often establishes a fund, sets the fundraising target, provides a portion of that target directly from their budget, and seeks to raise the remaining funds from private investors (the State Council, 2008), whose contributions are referred to as "social capital" . Chen (2015) summarised IGFs as follows: "The government creates a platform; central State-Owned Enterprises (SOEs) act as sponsors; (state) banks put in funds; and social capital follows."

3.2. Talent Input

The government nurtures and invests in the large number of professional talents needed in the AI field. In terms of this investment in talent, the policy not only aims to provide ethical and qualified people from universities and society for the industry but also aims to retain people through subsidies and the creation of a positive cultural atmosphere (Yuan et al., 2021).

4. Environment-based Policies

4.1. Financial Support

Support for the AI industry comes from various financial and derivative institutions in the form of loans, guarantees, venture capital, and subsidies. One of the measures of financial investment is setting interest rates, with the government setting interest rates at artificially low levels (Wei, 2020), thus making it cheaper for companies in strategic emerging industries to borrow money . Direct credit is an additional means of financial support from the government, whereby the government can use state- owned banks and other financial institutions to direct credit to specific sectors or industries, including strategic emerging industries such as AI (Wei, 2020).

4.2. Tax Incentives

The Chinese government provides tax breaks for companies and individuals who play an important role in the development of the AI industry . China's tax incentives mainly take the form of reduced tax rates, income tax exemptions, tax rebates, accelerated depreciation of assets, additional deductions, exemptions and other forms of incentive (Huang, 2022a). For example, China's corporate income tax law provides that corporate income tax is levied at a reduced rate of 15% on high-tech industries that are supported by the state and meet national requirements (Huang, 2022b).

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4.3. Strategic Measures

The Chinese government legislative and promotional measures to protect and develop markets, promote the development of SEIs by improving relevant legislation (to protect producers and consumers within the industry) and by promoting healthy competition and enhancing cooperation.

5. Demand-based Policies

5.1. Market Expansion

The Chinese government supports the establishment of overseas branches of corporates, exchanges and cooperation, mergers and acquisitions, joint ventures and equity participation to expand channels for China's AI industry. For example, the "Thirteenth Five-Year Plan" for the development of intelligent manufacturing in Jiangsu Province aims to strengthen exchanges and cooperation with foreign intelligent manufacturing research institutions and encourage Chinese enterprises to cooperate with advanced foreign intelligent manufacturing enterprises and R&D institutions (Jiangsu Provincial People's Government, 2017).

5.2. Regulatory Provision

The Chinese government promotes the development of SEIs by reducing trade controls, while at the same time severely restricting the export of high technology. In addition, government policies are open to the private sector, supporting the development of the private sector and strengthening cooperation between the private sector and state-owned enterprises.

There are certain similarities between the policies of the East Asian Miracle and those of China. The first is protecting a young industry. To be more specific, in May 1955, the Ministry of International Trade and Industry in Japan released the "National Car Development Plan", which actively supported the small car industry through financial assistance and legal protection and established a national car industry (Zeng, 1990), which is similar with the support of SEI in China. The second similarity is market expansion. During the East Asian economic miracle, different countries promoted exports in different ways. Singapore, for example, invested in exporters by attracting foreign capital, while Hong Kong created free-trade regimes that connected their local prices to international prices and in Japan, tax incentives on inputs used to produce exported goods were used to promote exports (Chang, 2006). The third similarity is regulatory provision. Normally, the "cartel" model evokes images of wrongdoing and unjust practices (Milhaupt and Miller, 1997), but during the EAM the Japanese government used cartels for promoting healthy competition by decreasing "wasteful competition" that eats away at profits and threatens long-term capabilities for innovation and investment (Chang, 2006).

At the same time, there are also several differences between Chinese SIP and EAM. First, although there were policies on education for both, education policy during the EAM period was universal basic education, while in China it was to train high-tech talent. During the EAM period, education was more of a fundamental part of the recovery of the country's, Chang (2006) suggested that basic education and health care are not included in the industrial policy. But the technology in the AI industry is complex and not something that can be mastered with primary education . So, in China's industrial policy, professional education such as natural language processing and computer vision is one of the aspects of the SIP. Second, while the EAM included financial and tax support for industries in general, the SIP also includes support for specific companies, identifying key support companies (large SOEs), and encouraging them to grow in scale, and enabling internal professional collaboration through a series of horizontal and vertical mergers and acquisitions, favouring these key support companies in the allocation of various resources (Huang, 2022).

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As a result, China's selective industrial policy is similar to and different from the policies used by countries during the East Asian economic miracle, and the main reasons for this are the change in China's unique national circumstances and changing overall environment. The next part of this paper introduces the rationale behind these SIP.

6. Background

China's Selective Industrial Policy on Artificial Intelligence, communications and data is bold as no country has previously invested so much in an area where it is not strong . During the EAM, countries such as Japan focused on industries that were already relatively well-developed, such as the automotive and chemical industries. This not only accelerated the development of their own industries by drawing on the technological and managerial experience of other countries (Chang, 2006) but also controlled the risk of investment. However, China has not opted for such a strategy . In terms of the external environment, China believes that those high-tech industries have greater potential for future returns and will be the main drivers of economic growth; in terms of the internal environment, China wants to become a leader in these high-tech industries and reduce its dependence on foreign countries and the key technology restrictions it receives. In addition, China's own domestic market and comprehensive national power gives it the ability to develop these high-tech industries. To be more specific, the impact of three industries - Artificial Intelligence, communications, and data - on other industries is broad and deep, impacting manufacturing, healthcare, finance, transportation and many other industries across the country. In the healthcare industry, for example, AI can be used to analyse large amounts of medical data and help to identify patterns and trends that may not be visible to human analysts, which can help to improve the accuracy of diagnoses and treatment recommendations, leading to better patient outcomes. Thus, the promotion of these three industries is a multi-faceted strategy. Moreover, all three of these industries involve a core technology – semiconductors, the importance of which in all three industries has been emphasised by Naughton (2021, pp. 84-85). There are three main types of semiconductors in modern communications - the processor, communications chips, and server chips, which provide power to nodes in communications networks while in common memory chips, semiconductors serve as storage media for data. Artificial Intelligence needs processors (effective low-power chips) to function.

However, the export of semiconductors to China has been restricted by foreign countries in recent years. The 2019 CSIS report, "China's Pursuits for Semiconductor Independence", suggested that although China has made significant investments in research and technology and even if these efforts are paying off in the case of semiconductors, China is still a net importer of this technology, with only 16% of semiconductors used in China created domestically, and only 50% of these produced by Chinese companies. Thus, it is clear that China remains dependent on the West for this key technology (James Andrew, 2019). In addition to the trade war between the US and China over what the US sees as China's technology theft, the US has been imposing restrictions on China in terms of semiconductor technology by announcing sweeping "export controls" that make it virtually impossible for companies to sell chips (Tewari, 2023) as it fears that China's development is threatening its international dominance.

However, China's huge domestic market and capital investment provide strong support for the semiconductor industry. According to data from the World Semiconductor Trade Statistics (WSTS), China is the largest market for semiconductors, with a demand for over $300 billion worth of chips in 2020. Thus, selective industrial policies are necessary to develop the semiconductor industry in China with the aim of developing the Artificial Intelligence,

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communications, and data industries. The next section of this paper discusses the rationale for China's selective industrial policies.

7. Rationale for China's Selective Industrial Policies

In terms of the rationale for China's Selective Industrial Policies, the first relates to capital investment. China has suffered from a lack of capital investment and narrow financing channels in the development of its strategic emerging industries. For example, according to the World Bank (2021), China's Gross Fixed Capital Formation (GFCF), which is a measure of the amount of capital invested in the economy, as a percentage of GDP has been relatively low compared to other countries. A low GFCF-to-GDP ratio can indicate a lack of investment in the economy. The total annual investment in research and development in China and its share of GDP is relatively low, amounting to US$66.5 billion or 1. 47% in 2008, compared to US$398.2 billion or 2. 79% in the United States and US$168.1 billion or 3. 44% in Japan. (Liu, 2011). In this context, the advent of IGFs has improved this situation, with IGFs able to complement and amplify existing industrial policy measures, providing strong, all-encompassing assistance for emerging and high- tech enterprises in China. They also provide patient capital (Ongoing investment until the end of the research), a crucial resource for emerging technology (Luong, Arnold and Murphy, 2021). Results from the EAM show the value of institutions that support long- term company management. In particular, government support for currently unprofitable industries with future potential is crucial, and the existence of banks with a long-term focus (e.g., development banks, long-term credit banks) can be crucial in determining whether or not long-term projects will succeed.

However, IGFs also suffer from a range of vulnerabilities. For example, Huang (2019) stated that it is unclear whether there is much central oversight over investments made by local government-guided funds, which are carried out with little transparency, raising concerns that there may be corruption and a lack of responsibility for possible resource misallocation. In addition, IGFs fall short in their attempts to attract genuinely private capital, and, in other situations, may even drive private capital from the market (Luong, Arnold and Murphy, 2021). Naughton (2021, p. 126) concluded that the main problems of IGFs are the dominance of state financing in these funds, implicit state guarantees, soft corruption, and the emergence of investment bubbles. With the aim of ensuring that IGFs are not only effective in the short-term but also to minimise any possible negative effect, the National People's Congress Standing Committee (NPCSC) unveiled its first five-year plan for managing state assets under the direction of the State Council, with the State Council addressing government-guided funds in its full report. As a result, IGFs as a means of government investment are better able to support high-tech enterprises, but problems also exist such as the failure to attract social capital and corruption, so the Chinese government needs to prove whether their regulatory approach is effective.

The second rationale for China's Selective Industrial Policies relates to financial policy and tax, with high-tech industries often requiring significant capital investment to support research and development, build infrastructure, and commercialise new technologies. Thus, financial policy can provide the capital and financing needed to support the growth of these industries. In China, the banks and other financial institutions that provide the capital for these companies are overwhelmingly state-owned (Feng Lu and Yao, 2009), which enables the government to use financial institutions to provide direct credit and set lower interest rates to finance the development of high-tech enterprises. As a result of this financial support, innovation is encouraged and the competitiveness of China's high- tech businesses is increased.

With the aim of encouraging investment and supporting the development of small and medium-sized enterprises (SMEs), the Chinese government also provides tax incentives for these

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industries. Tax incentives can reduce the cost of R&D investment, with the higher the pre-tax expenditure of the enterprise, the higher their tax cost relief, which means the lowering of the cost for the enterprise of making R&D investments and the higher their returns on this investment (Li, 2021), which encourages enterprises' to invest in R&D. Moreover, lowering taxes can be particularly beneficial for SMEs in strategic new industries, who may have limited access to financing and may be more sensitive to changes in tax rates. Consequently, tax policy not only increases business investment but also accelerates the development of SMEs.

The third rationale relates to strategic measure. In China, developing and protecting markets is an important part of China's Selective Industrial Policy. Protecting and developing the domestic market can help support domestic companies and promote the growth of Chinese businesses. While China's Selective Industrial Policy primarily focuses on supporting SOEs, it also aims to support the development of private enterprises in China. In addition, China's SIP may encourage SOEs to cooperate with private enterprises and to adopt market-oriented principles in their operations. China's SIP also supports not only SOEs but also private enterprises since the private sector possesses a large portion of the knowledge necessary to run smart networks and use AI technology (Naughton, 2021, p. 93). However, although there was some degree of cooperation between the government and the private sector during the EAM, the Korean government was a little more assertive in its approach, forcing the private sector into industries they developed through subsidising new industries and restricting existing ones (Chang, 2006).

The development of domestic enterprises can also assist in solving the problem of domestic supply in a safe manner. On the one hand, the domestic demand for high-tech industries comes from many sources, one of which is the Chinese government. Indeed, China has a number of defense needs in the areas of AI, telecommunications, and data. In terms of AI, China's defense needs include the development of AI-powered military technologies such as autonomous weapons systems, surveillance systems, and logistics and management systems (Zhang, 2021). In telecommunications, fast and secure command and control, as well as much improved Intelligence, Surveillance, and Reconnaissance (ISR), are promised by the Fifth Generation (5G) network (Kadam, 2022). In addition to defense, combining these industrial technologies has a significant role to play in helping governments to improve people's livelihoods , one typical example of this is "smart cities" . Smart cities aim to achieve sustainable urban development by building environments and an ecological model that is conducive to business development and human habitation. Smart cities are an urban form supported by information technology, which is used to integrate and optimise various resources (Gu, 2022). On the other hand, promoting the development of domestic enterprises can effectively prevent the leakage of confidential data and public information and protect national security (Liu and Li, 2014). One of the reasons why China previously felt it did not want to be overly dependent on foreign chips was China believes that Western semiconductors have "backdoors" (James Andrew, 2019) or intentional vulnerabilities that can be used for espionage or military purposes.

In addition to the above, protecting market players also helps to drive innovation and demand. High-tech industries can involve consumer privacy and patent protection for companies. Although AI and big data have facilitated people's lives, the premise is that a large amount of personal information is collected and leaked information can be used by unscrupulous people to commit fraudulent activities (Wang, 2019). Consequently, the development of the domestic market in China needs to help develop both state-owned and private enterprises, with the development of domestic enterprises not only meeting the needs of the domestic market, but also providing a degree of national security. Finally, protecting the domestic market can also increase demand and drive innovation.

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8. Outcomes

Under the guidance of China's SIP, these high-tech industries have all achieved a degree of success in terms of their competitive and innovation capacity. In the semiconductor industry, for example, China has seen a significant change in market size and production , with global dating stating that China will soon surpass all other countries in chip production through a combination of its expanding market and homegrown manufacturing capabilities (Williams, 2022). According to Xiao (2022), between 2012-2021, China's semiconductor materials market size was generally fluctuating in terms of growth, with mainland China the second largest market, at a size of 11.93 billion U.S. dollars, an increase of 21.9%; and China's Integrated Circuit (IC) production has increased year on year in this period, with production hitting a new high in 2021, reaching 359.43 billion pieces, up 37.5% year on year. It is clear to see from this growth in market size and production that China is becoming increasingly competitive in the global semiconductor industry while, on the other hand, China's innovation capacity in this area has also increased tremendously. Specifically, in telecommunications, Huawei has a leading position in graphene-based transistor research and photonic computing (Xiao 2022); in AI, Megvii has advanced facial recognition technology and customers in more than 15 "countries and regions" outside of China (Simonite, 2019); and in semiconductors, YMTC has been investing heavily in the development of new memory technologies, such as NAND and DRAM (Sharma, 2022). As a result, China's SIP has made an important contribution to the innovation capacity and competitiveness of these high-tech companies. However, China's SIP also has certain drawbacks. For example, China's SIP doesn't always work, with domestic chip manufacturing in the semiconductor industry the most obvious example. To be more specific, despite the various capital and human tax support provided by the Chinese government to its semiconductor industry, China's chip self- sufficiency rate has not increased significantly, increasing by only 0.8% in 2021 compared to 2015 (iResearch, 2022), and the country still relies on imports of high-end chips. In addition, one of the main problems of China's SIP is that it has resulted in overinvestment in certain areas of AI, such as facial recognition technology, leading to oversaturation of the market and a lack of profitability for some companies , as there is more competition than there is demand for their products and services (Blackpeak, 2019). Thus, although China's SIP has indeed brought a series of innovations and developments to China's high-tech industries, improving its competitiveness and China's comprehensive national power, there are still several problems of low returns on investment and over-investment in the process of its implementation.

It has also been more successful for the results of the EAM, apart from the disruptions caused by political factors. But the HPAEs largely achieved strong growth by doing the fundamentals correctly: creating a stable economic environment, investing in human capital and so on (World Bank, 1993). Only on the basis of these foundations can a government choose to develop an industry. At the same time, unlike China's extensive domestic market, HAPEs have a limited domestic market and a greater need for export policies, with export targets providing a measure of the success of market interventions (Page, 1994).

9. Conclusion

In this paper the nature, rationale and results of the EAM and China's recent SIP have been discussed. This paper has found that some of these industrial policies are similar, but there are also several differences between them, mainly due to the fact that the industries currently being developed and the national context in China are not the same as those of the EAM. In terms of rationale, the Chinese SIP represents an innovative attempt at industrial policy, which entails great risks of failure, but such risks are often accompanied by high benefits, and China has indeed managed to catch up with high- technology countries in recent years, while at the same

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time being uniquely innovative, securing its position in the communications industry and strengthening the country's competitiveness. However, China's SIP also bring with them a series of problems. Waste of resources and market imbalance due to over-investment, while the semiconductor industry has not seen significant results. To achieve innovation to enhance competitiveness, government intervention can only play a catalytic role; the direction of innovation should be determined by the market, otherwise technology will become a tool of national political struggle just like HUAWEI (Zhu, 2019) and corporate innovation can also be hindered by the external environment.

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