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The promotion of heavy industry: An analysis of industrial transformation in three middle-income countries

Linhao Feng

Faculty of Public Administration, Shandong Technology and Business University, Shandong Yantai, 264005, China
**Corresponding author email: 3076117351@qq.com*

Abstract:

Heavy industry policy has an important impact on industrial transformation in middle-income countries. South Korea, China, and Brazil upgraded their heavy industries in the 1970s and 1980s, with varying results and thus affecting their levels of economic development.

Keywords: industrialization, heavy industry policy, middle-income country, country brand, industrial transformation.

1. Introduction

In the half century from 1950 to 2000, a number of middle-income countries successfully transformed from the basic industry model to the high value-added deep industry model by implementing a series of carefully designed government intervention measures, such as actively introducing foreign capital, implementing tax and fee reduction policies, and promoting free trade, and maintained long-term stable economic growth in the process. This transformation process involves not only profound adjustment of industrial structure, but also technological innovation, accumulation of human capital and optimization of institutional environment. Therefore, in this complex and changeable transformation process, which economic policies have the most significant impact on the industrial transformation and upgrading of middle-income countries?

In order to deeply discuss this issue, this paper selects Brazil, South Korea and China, three representative middle-income countries, as the research objects, and tries to reveal the key factors that promote industrial transformation and upgrading through comparative analysis of the influencing factors in their industrial development process. These three countries have adopted diversified policy combinations to deal with the challenges of economic transformation in different historical periods and development stages, and their experiences and lessons are of great significance for other similar countries.

After in-depth analysis and comparison, this paper concludes that the development of heavy industry has played a crucial role in the process of industrial transformation and upgrading in these three countries. Heavy industry not only provides a strong driving force for economic growth, but also drives the upgrading of the entire industrial chain through the backward and forward correlation effect, and promotes technological innovation and human capital. Therefore, for those middle-income countries that want to make greater achievements in industrial transformation and upgrading, it is a crucial strategic choice to give priority to the development of heavy industry, build a sound industrial chain, and strengthen technological innovation and personnel training.

Finally, this paper proposes a series of specific policy recommendations for those countries that are relatively weak and face more challenges in the process

of industrial transformation and upgrading. These proposals cover optimizing industrial structure, enhancing innovation capacity, improving business environment and strengthening international cooperation, aiming to help these countries better cope with the challenges of economic transformation and achieve sustained and stable economic growth and social development.

2. Literature Review

Previous studies on the impact of heavy industry policies on high value-added industries have yielded rich results. Taking South Korea as an example, the implementation of its "five-year plan" has greatly promoted the development of heavy chemical industry, especially the prosperity of shipbuilding industry, which is of great significance to the national economic development. Amsden (1989) pointed out that by formulating targeted industrial policies and providing necessary support, the South Korean government successfully promoted the rapid development of heavy industries such as shipbuilding, which in turn led to the economic takeoff of the whole country.

In Brazil's neoliberal economic reform, the privatization of state-owned enterprises and the tax reduction policy also played a positive role in the development of high value-added industries. The research of Yang (2013) and Li (2008) showed that by privatizing soes and reducing tax burden, the Brazilian government stimulated market vitality and attracted more private capital and foreign capital to enter high value-added industries, thus promoting the rapid development of these industries.

In addition, China's policy of encouraging domestic auto companies to form joint ventures with international auto giants has also achieved remarkable results. The study by Chen Hao (2022) points out that this policy not only promotes the rapid development of China's automobile industry, but also drives the economic recovery of northeast China. By introducing international advanced automobile manufacturing technology and management experience, as well as providing preferential policies such as tax exemptions, the Chinese government has successfully promoted the improvement and development of the automobile industry chain in Northeast China, which in turn has enhanced the overall economic strength of the region.

3. Case Analysis

3.1 South Korea

Shipbuilding has played a pivotal role in South Korea's economic growth. The Third and fourth Five-Year Plans, implemented between 1971 and 1981, laid a solid foundation for the shipbuilding industry to flourish. During this period, the government adopted a series of supportive measures, such as temporarily granting HHI a monopoly on steel to ensure its dominant position in raw material supply; At the same time, the government stipulated that crude oil imported into Korea must be transported by the Hyundai Group's merchant ships, a policy that not only provided a stable source of business for the Hyundai Group, but also further promoted the development of the shipbuilding industry. In addition, the government has provided overseas credit support to Hyundai Heavy Industries to help it expand into international markets and improve its competitiveness. With strong government support, HHI has risen rapidly to become a leader in South Korea's shipbuilding industry. Subsequently, large companies such as Samsung and Daewoo also ventured into the shipbuilding industry and invested in their own shipyards, further increasing the size of the shipbuilding industry in Korea.

After entering the new century, with the comprehensive recovery of the world economy and the rapid growth of Asia, the global shipbuilding industry has ushered in an unprecedented boom period. In particular, the requirements of the International Maritime Organization for the elimination of more than 25 years old ships have brought new development opportunities for the global shipbuilding industry. The Korean shipbuilding industry quickly seized this market opportunity and achieved rapid development by virtue of its advantages in technology, quality and management. In 2000, 12 Korean companies, including Samsung Electronics, Hyundai Group, and POSCO, successfully joined the ranks of the world's top 500 companies, which marked a significant improvement in the competitiveness of Korean companies in the global market. In 2005, South Korea's shipbuilding industry ranked first in the world with an annual output of 21.95 million tons, and the total export of ships reached 26.4 billion dollars, accounting for 48% of South Korea's trade surplus. This achievement not only highlights the strong strength of South Korea's shipbuilding industry, but also fully proves that the development of heavy industry has successfully transformed South Korea into an economy dominated by high value-added industries.

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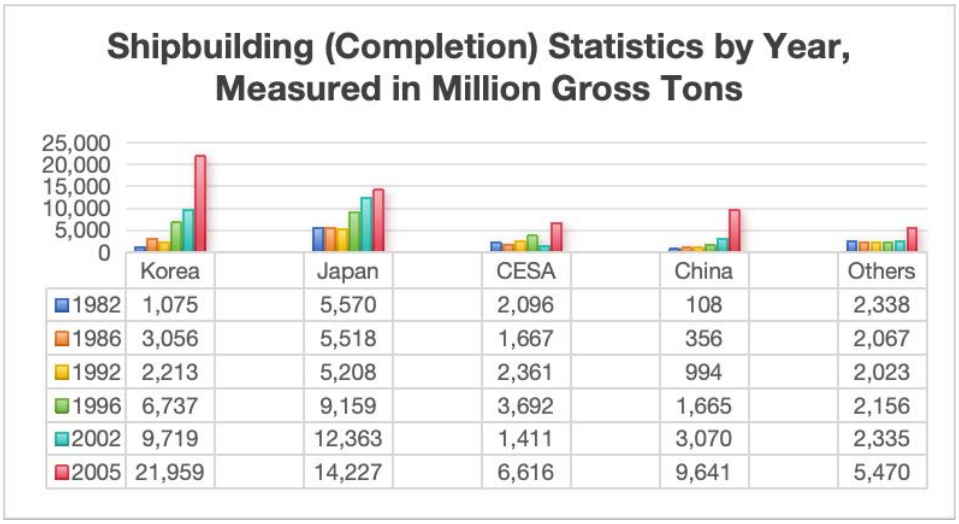

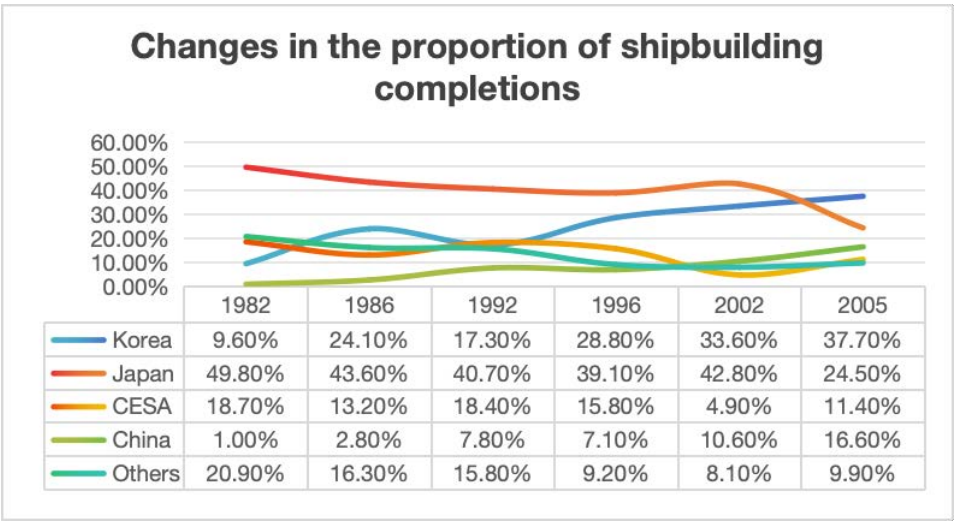

Fig 1. Development and change diagram of South Korean shipbuilding industry

3.2 China

After the reform and opening up, the Northeast region, as an old industrial base in China, has achieved particularly significant results in the transformation and upgrading of its automobile industry. In order to accelerate this process, the Chinese government actively encourages domestic automobile companies to establish joint ventures with international automobile giants. Through this approach, not only has it introduced advanced international automobile manufacturing technology and management experience (Chen Hao 2022), but it has also promoted deep integration and exchanges between the domestic and international automobile industries.

At the same time, in order to support the rapid development of the automotive industry, the government has provided a series of preferential policies including tax reductions, land incentives, and low interest loans. The implementation of these policies has provided strong financial support for the technological research and development, capacity expansion, and market competitiveness improvement of the automotive industry, greatly stimulating the innovation vitality and development momentum of automotive enterprises. In the process of joint venture cooperation, the Chinese government has always attached great importance to the degree of localization in the automotive industry. In order to reduce dependence on external markets and improve the independent and controllable capabilities of the domestic automotive industry, the government encourages joint ventures to gradually increase the localization rate of components, and gradually build a complete domestic automotive industry chain through technology transfer and localized production.

As an important gathering place for the automotive industry, the Northeast region has focused on promoting the coordinated development of upstream and downstream enterprises in the automotive industry chain. By strength-

ening the close cooperation between parts and vehicle enterprises, optimizing resource allocation, and improving production efficiency, the Northeast region has not only enhanced the overall competitiveness of the automotive industry chain, but also laid a solid foundation for the sustainable and healthy development of China's automotive industry. This series of measures not only promotes the economic revitalization of Northeast China, but also injects new vitality into the global development of China's automobile industry.

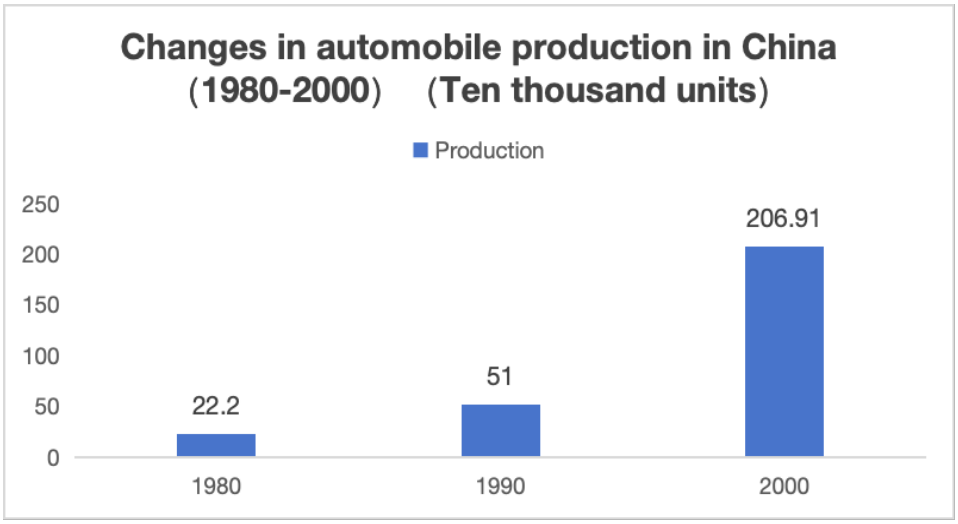

Fig 2. Chart of Changes in China's Automobile Output (1980-2000)

3.3 Brazil

The heavy industry policy in the neoliberal economic reform has a profound and complex impact on Brazil's industrial transformation and upgrading. In the late 1980s, the Brazilian government began a drastic reform and restructuring of State-owned Enterprises, which centered on actively attracting private capital to the sector by selling shares in State-owned Enterprises. The implementation of this policy has indeed improved the operation efficiency and market competitiveness of enterprises to a certain extent, enabling many heavy industrial enterprises to survive and develop in the fierce market competition. However, this inevitably weakens the state's ability to control the economy at the macro level, making the market economy dominate the direction of Brazil's industrial development to a certain extent (Yang, 2013).

In order to further promote export trade and encourage the inflow of foreign capital, the Brazilian government has taken measures to significantly reduce tariffs and relax capital controls. The implementation of this series of policies has made it easier for Brazilian heavy industry companies to access a wider range of markets and obtain cheaper supplies of raw materials, thus improving their international competitiveness to some extent. By 1995, Brazil's average tariff rate had dropped sharply from 44.6% before the reform to 13.1% (Li, 2008), which undoubtedly provided strong support for Brazil's heavy industry exports.

However, in the late stage of the reform, some problems gradually emerged in Brazil's economic development. Due to over-reliance on resource exports, the development of the manufacturing industry shows a clear downward trend. This has left Brazil with a relatively homogeneous economic structure that lacks the support of diversified industries. Brazil had only five companies on the 2000 Fortune 500 list, and these companies were concentrated in resource-intensive industries such as mining, energy, and banking, with relatively few represented in manufacturing. This weak state of manufacturing industry undoubtedly has a negative impact on the long-term sustainable development of Brazil's economy, and also highlights the severe challenges Brazil faces in the process of industrial transformation and upgrading.

3.4 Other factor analysis

In addition to heavy industry policies, there are many factors that may affect the development of high value-added industries, including the abundance of natural resources, the education level of citizens, etc. First, Brazil's iron ore reserves account for 9.8% of the world's total, ranking fifth in the world. China is rich in mineral resources. By 1990, 148 mineral resources had been identified. However, South Korea has relatively few of its own mineral and energy resources, it imports most of its industrial raw materials. Therefore, natural resources are not a direct factor affecting the development of high value-added industries.

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Second, the three countries all attach great importance to the development of education. In the 1970s, South Korea implemented the education development strategy of "popularizing secondary education, promoting higher education, and strengthening vocational and technical education" (Cao, 2018). The number of students in higher education in South Korea increased from 140,000 in 1960 to more than 1.49 million in 1990, with an average growth rate of 8.9%, meeting the demand for all kinds of high-quality talents during the economic boom (Yuan, 1996). After World War II, the penetration rate of higher education in Brazil increased significantly. Brazil went from having only five comprehensive universities to 25, 000 students, and by 1980 had 65 comprehensive universities. Since 1980, China's higher education has experienced a process of rapid development, with the number of college graduates increasing from 147,000 in 1980 to 950,000 in 2000. Therefore, the level of education of citizens is not a direct factor affecting the development of high value-added industries.

4. Conclusion

To sum up, the most obvious influence on the development of high value-added industries in the three countries is the government's heavy industry policy. In this regard, the situation is particularly prominent in Brazil, where the weak state of heavy industry further restricts the transition to higher value-added industries. In view of this problem, this paper puts forward the following policy suggestions:

First of all, when formulating industrial policies, the Brazilian government should clearly favor heavy industry and provide all-round support for heavy industry enterprises. This includes ensuring a stable supply of raw materials, exploring domestic and foreign markets, and providing financial support to help heavy industry enterprises improve their competitiveness and achieve sustainable development. At the same time, the government should deeply recognize the cornerstone position of manufacturing industry in sustainable economic development. Regardless of the stage of economic life, manufacturing is an important force driving economic growth, creating jobs and enhancing national competitiveness. Therefore, the Brazilian government should attach great importance to the development of the manufacturing industry and avoid the deformity of the industrial structure.

In the late reform period, the share of services in Brazil exceeded that of manufacturing, resulting in a heavy dependence on imports for product supply in the domestic market. This undermines the autonomy of the Brazilian economy and increases its exposure to external market volatility. Therefore, the Brazilian government should adjust the industrial policy to encourage the development of manufacturing industry and reduce the dependence on imports.

In addition, the privatization of a large number of state-owned enterprises, while improving market efficiency to some extent, has also weakened the government's control over key industries. In this case, the Brazilian government should maintain appropriate intervention and guidance for heavy industrial enterprises, and provide them with stable market environment and preferential policies such as tax subsidies.

Finally, the Brazilian government should actively build excellent national brands to enhance their visibility and competitiveness in the international market. The diversification and sustainable development of the Brazilian economy can be achieved by supporting the innovation and development of indigenous enterprises and promoting their transformation into higher value-added industries.

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