

MIDDLE INCOME TRAP, CONVERGENCE ANALYSIS AND LONG-TERM ECONOMIC GROWTH OF CHINA

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ABSTRACT

The rapid growth and development of China's economy have drawn increasing attention from academics and business circles since it became the world's second-largest economy in 2010. However, even though the country is an economic power in the world, the GDP per capita is still low comparing with other large economies. The paper aims to focus on the economic growth of China, together with other nations that are also large economies and some are its neighbouring countries to conduct a convergence analysis on the long-term economic growth of these five countries. The conclusions not only help to enrich the theoretical model of growth, but also can reveal the factors of long-term economic growth of several major economic powers in the world, so as to provide empirical reference for the economic growth of other countries. Concisely, the selected countries of the planned paper are the United States, China, Japan, India, and South Korea, with a span of time from 1956 to 2019.

Key words: Middle income trap, Convergence, Economic growth, China

1. Introduction

Fast-growing economies tend to inevitably face slower growth. From the historical review of China's economic development, it is not difficult to find that China has only stepped into the track of modern economic construction after the implementation of reform and opening-up, the implementation of export-oriented strategy to promote rapid economic growth. In the 32 years from 1980 to 2011, China's economy grew at an average rate of more than 10 percent, and its per capita GDP in 2010 was more than \$4,000, the transition from the low-income stage to the middle and high-income ranks has been achieved.

However, China's economic growth began to decline in 2011, falling below 8% for the first time in 2012 and has not rebounded since, with GDP growth falling below 7% for the first time in 2015, economic growth slowed to 2.4 percent in 2020 (National Bureau of Statistics of China, 2021). The continuous decline of economic growth has aroused the concern of scholars about China's sustained economic growth, and has also stimulated the thinking of China's economic growth model. The development of labour-intensive industries has enabled China's economy to make the first leap from low-income to middle and high-income, but at the same time the problems that have accumulated in the course of development, such as excessive export dependence, insufficient domestic demand, low energy efficiency of industrial structure, will restrain economic development. The economic growth rate continued to slow down the situation, economic growth stall or stagnation this common phenomenon also makes the future development of China's economy full of debate.

Throughout the history of economic development in the world, since the post-war period, in countries and regions with a permanent population of more than one million, there are not many economies that have successfully taken off from low-income and crossed the middle-income stage to reach the high-income stage, only a handful of economies include Singapore, Japan, South Korea, Hong Kong and Taiwan and Saudi Arabia. In two other parts of the world, the picture is very different. The economies of Latin and south-east Asia, for example, have been stuck in the middle-income stage for a long time, making it difficult to leapfrog from middle-income to high-income countries. Argentina, Chile and Brazil entered the middle-income bracket in 1962, 1971 and 1972 respectively, and are still stuck in the middle-income range, not in the high-income category; Malaysia's GDP per capita passed \$1,000 in 1977, but the economy has been growing slowly, and hasn't crossed \$10,000 in nearly 40 years (World Bank, 2013). In 2006, the World Bank first introduced the concept of "Middle Income Trap" in its analysis of the economic development of Latin American countries, mainly referring to developing countries such as Argentina, Brazil and Mexico, after a period of high-speed growth, but fell into the economic growth stagnation, polarization of the national rich and poor, environmental degradation, rising unemployment, social conflicts in the short-term accumulation of the strange circle (Linda and Helmut, 2019).

Development economics has long been concerned with the central issue of how to get out of the poverty trap and achieve economic take-off, but how to realize the modern economic growth and the special development predicament that the economy faces in the specific development stage has not been paid special attention to. The middle-income stage of the economy is prone to economic growth is not sustainable difficulties, most of the growth rate to decline, or even into long-term stagnation, so that economic development into trouble. The topic of middle-income trap is a hot topic in emerging economies, especially in the wake of the experiences of some

countries in Latin and south-east Asia. For China, a vast, geographically diverse and populous emerging economy, any potential obstacles to economic development should be treated with caution and prevented. In the understanding of international experience and national disparities, it is inevitable to have this thinking, why some countries and regions can cross the middle-income category into high-income, but some countries and regions are locked into the middle income, and are still stuck.

The paper aims to reveal the factors of long-term economic growth of several major economic powers in the world, so as to provide empirical reference for the economic growth of other countries by taking the economic growth of China, together with other nations that are also large economies and some are its neighbouring countries as examples to conduct a convergence analysis of the role of technological innovation on the long-term economic growth of the United States, China, Japan, India, and South Korea, with a span of time from 1956 to 2019. The data set is from Penn World Tables version 10.0 (PWT 10.0).

The hypotheses proposed for the analysis are as follows: Each produces only one product, which can only be used for consumption or investment. The supply of products is based on a first-order homogeneous Cobb-Douglas production function; Returns to scale remain constant, while the different factors of production can substitute for each other; Technological progress exists, and the rate of technological progress varies across countries, rather than free flow of technology; The labour force in all countries is fully employed; The savings rate and population growth rate of each country are exogenous.

2. Literature review

A number of scholars have explored the concept of Middle-Income Trap from different perspectives. Kovacic (2007) and Vares et al. (2011) point out that the change in the middle-income stage of globalization is whether such countries have high-tech international competitiveness when they lose their low-cost international competitiveness, that is, the dual plight of low-end prices and high-end technology, late-mover advantage and opening up advantage of industrial development is no longer a driving force for sustained economic growth. Ohno (2009) offers a formal definition of Middle-Income Trap in terms of industrial upgrading, which defines four stages of economic growth: First, the use of low-cost advantages to undertake international value chain division of labour transfer to vigorously develop the manufacturing stage; Second, the stage of industrial agglomeration, through the introduction of foreign advanced technology to support the domestic industry and then establish a domestic pillar industry; Third, the absorption stage of technology, in the introduction of advanced technology after the local digestion, absorption, re-innovation, the final production of products can compete with it; Fourth, the independent innovation stage, in the

global leading position in products, such as the United States, Japan, the European Union belongs to this column. Not all countries can make a smooth transition along these four stages, and when the transition from phase two to phase three is anaemic, there is a risk of Middle-Income Trap, an obstacle graphically known as a glass ceiling. Eichengreen et al (2011) defines a slowdown as having to satisfy three conditions: First, GDP per capita growth of more than 3.5% in the previous period; Second, GDP per capita must reach more than \$10,000; Third, the per capita GDP growth rate in the current period compared with the previous decline of more than 2%. When all three conditions are met at the same time, it can be inferred that the economy will fall into a growth trap. Aiyar et al (2013) attempts to identify the growth trap in the convergence model of economic growth and infer whether the economy is falling into Middle Income Trap.

As for the causes of Middle-Income Trap, Huasmann and Klinger (2007) argue that a country determines the structure of its export products according to its factor endowment, and the spatial structure of products influences the upgrading of a country's product structure. When the industrial structure is unreasonable and there is little room for industrial upgrading, it is easy to fall into the Middle-Income Trap when the economy reaches a certain stage of development. Agénora and Canuto (2017) identified declining productivity as the main cause of Middle-Income Trap. The increase in per capita income resulting from the shift of the labour force from the agricultural to the industrial sectors was a one-time event that gradually disappeared once it entered the middle-income countries. As the demographic dividend evaporated, so did the productivity gains from industrial restructuring and technological catch-up, and the economy began to decline into a Middle-Income Trap phase. From the perspective of public investment, Dinlersoza and Fu (2022) found a strong positive correlation between public investment and economic growth.

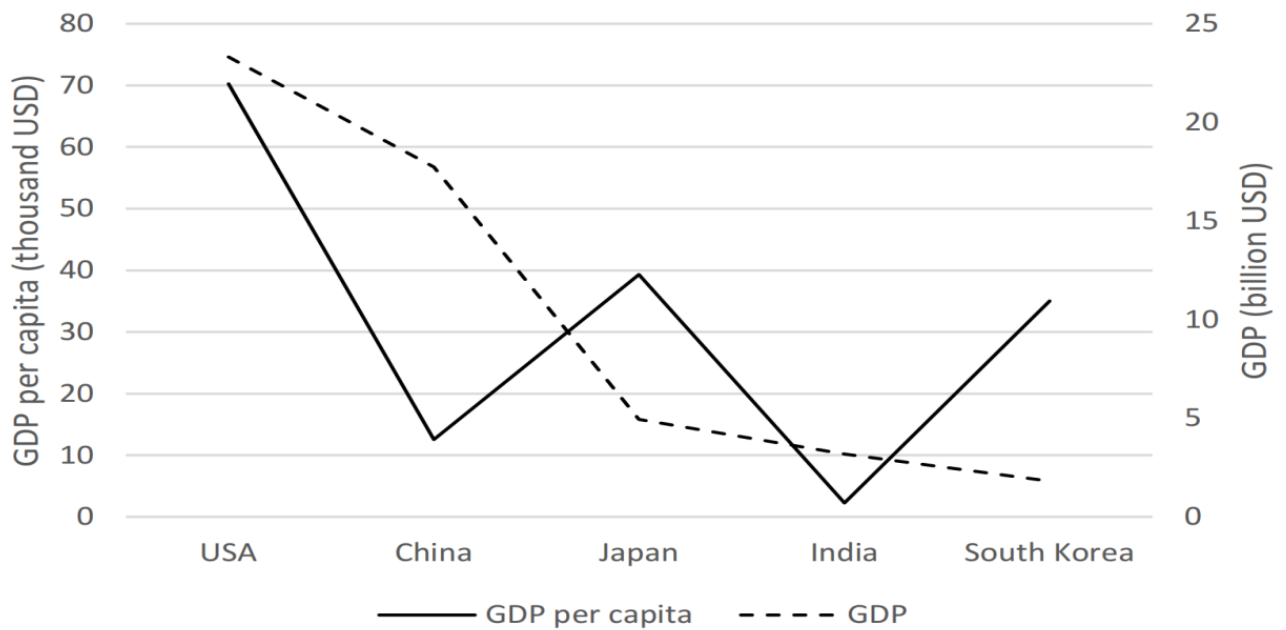
Besides, more and more scholars have put forward their research strategies for Middle Income Trap. Naughton (2007) argue that the hierarchy of institutions is important in matching institutions. To cope with the problems in economic development, high-quality institutions need to be constantly developed and improved, especially at the middle-income stage, long-term industrial restructuring, high-quality human resources this needs to be the goal of the system. Ohno (2009) suggests that Middle Income Trap should be done both microscopically and macroscopically, micro-adjustment of the allocation of resources, macro-formulation of effective economic policies to ensure the transformation of economic growth mode. Schwab (2010) institutional reforms have not had the desired effect due to inadequate e-infrastructure conditions. South Korea, on the other hand, has increased its annual GDP by about 1.4 to 1.8 percent through infrastructure improvements, which have reduced logistics costs, increased regional and international trade and boosted economic growth. A recent study by Andreoniab

and Tregenna (2020) also points out that when middle-income countries are faced with a dilemma, the former industrial development mode relying on the advantages of opening up and the advantages of backwardness is no longer suitable, the key to the Middle-Income Trap of middle-income countries is a shift in their approach to knowledge-based innovation.

3. Convergence analysis

China, Japan, India, and South Korea are among Asia's leading economic powers and contributors to global economic growth. The United States is recognized as the world's largest economy, and in this paper is used as a reference for convergence analysis of these four Asian countries. According to the latest World Bank Open Data, the 2021 GDP of the US, China, Japan, India and South Korea was \$23,315.08 billion, \$17,734.06 billion, \$4,940.88 billion, \$3,176.30 billion and \$1,810.96 billion, respectively, accounting for 24.16%, 18.38%, 5.12%, 3.29% and 1.88% of the total global GDP, respectively. Meanwhile, in terms of GDP per capita, the US, China, Japan, India and South Korea were 2021 at \$70,248.63, \$12,556.33, \$39,312.66, \$2,256.59 and \$34,997.78 respectively (see Figure 1).

Figure 1 GDP and GDP per capita of countries studied in 2021



Source: World Bank Open Data.

As can be seen from Figure 1 above, although all of these countries are 2021 the world's largest economies, there are still large differences between countries in terms of economic aggregate

and per capita GDP. India is currently a low-income country, China is a middle-income country, while South Korea, Japan and the United States are high-income countries, according to the World Bank's classification based on their per capita income.

However, 65 years ago, in 1956, the economies of these five countries were far smaller than they are today. Under the spending method, real GDP in numerical order is \$3,124,077 in the United States, \$765,116.4 in China, \$436,191.2 in India, \$379,277.4 in Japan, and \$26,252.82 in South Korea (PWT10.0, 2021). The difference in economic growth rates has led to dramatic changes in the economic situation of these countries. The Middle-Income Trap economies of Japan and South Korea took off, while the China remained stuck in the trap and India began and still under the Middle-Income Trap. Between 1956 and 2019, annual GDP growth averaged 5.61% in South Korea, roughly 3.6% in China and Japan, 2.89% in India, and about 2% in the United States (see Table 1 below).

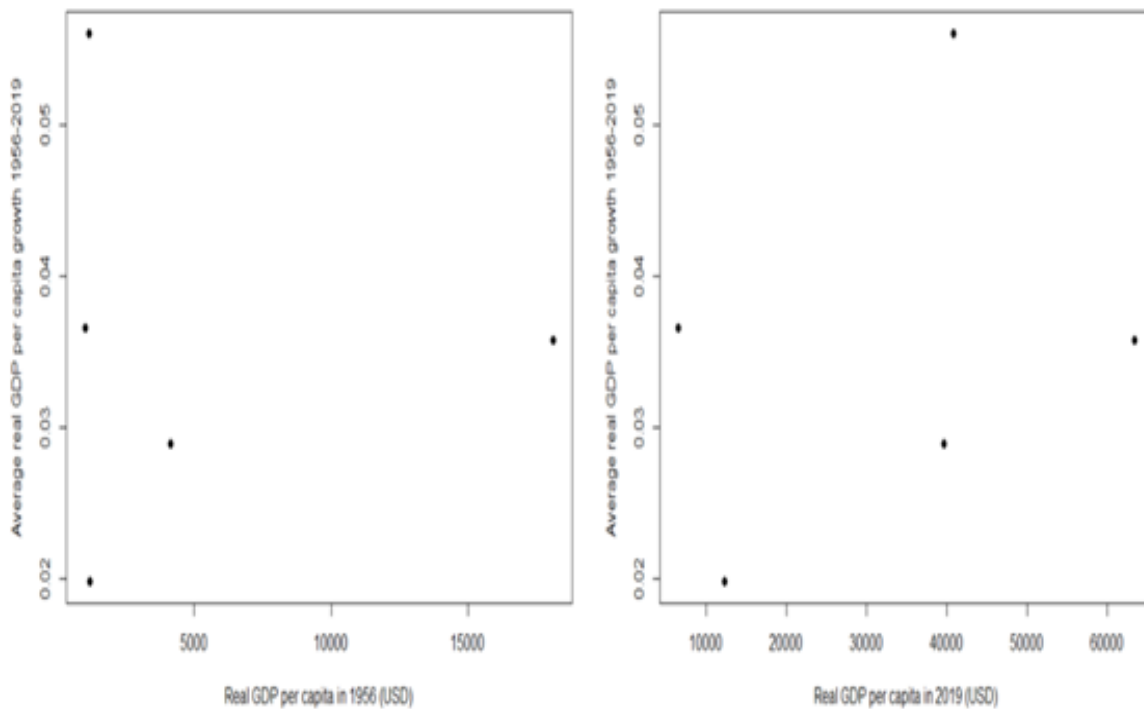
Table 1 GDP, GDP per capita and GDP growth rate in 1956 and 2019

	1956		2019		GDP growth rate (%)
	GDP (million USD)	GDP per capita (thousand USD)	GDP (million USD)	GDP per capita (thousand USD)	
USA	3.12	18.10	20.86	63.38	1.99
China	0.77	1.23	17.68	12.33	3.67
Japan	0.38	4.16	5.02	39.60	3.58
India	0.44	1.06	8.94	6.54	2.89
Korea	0.03	1.19	2.09	40.77	5.61

Source: Own construction based on Penn World Tables version 10.0.

Table 1 reflects the GDP, GDP per capita and growth rates of the five selected countries in 1956 and 2019. In 63 years, the United States has never been in a Middle-Income Trap, Japan and South Korea have been in a Middle-Income Trap, but beyond that, the Chinese are still in it, India went from being a low-income country in 1956 to a middle-income country. The speed of GDP growth per head plays a big role in whether a country can leapfrog the Middle-Income Trap. Japan and South Korea, for example, leapfrogged the Middle-Income Trap thanks to higher growth rates, and in turn, with the increase of growth rate, these relatively backward countries catch up with the ones with better economic development. For example, countries with faster growth rate tend to have higher levels of per capita GDP relative to USA, which is shown in Figure 2.

Figure 2 Real GDP per capita of US, China, Japan, India and South Korea in 1956 and 2019

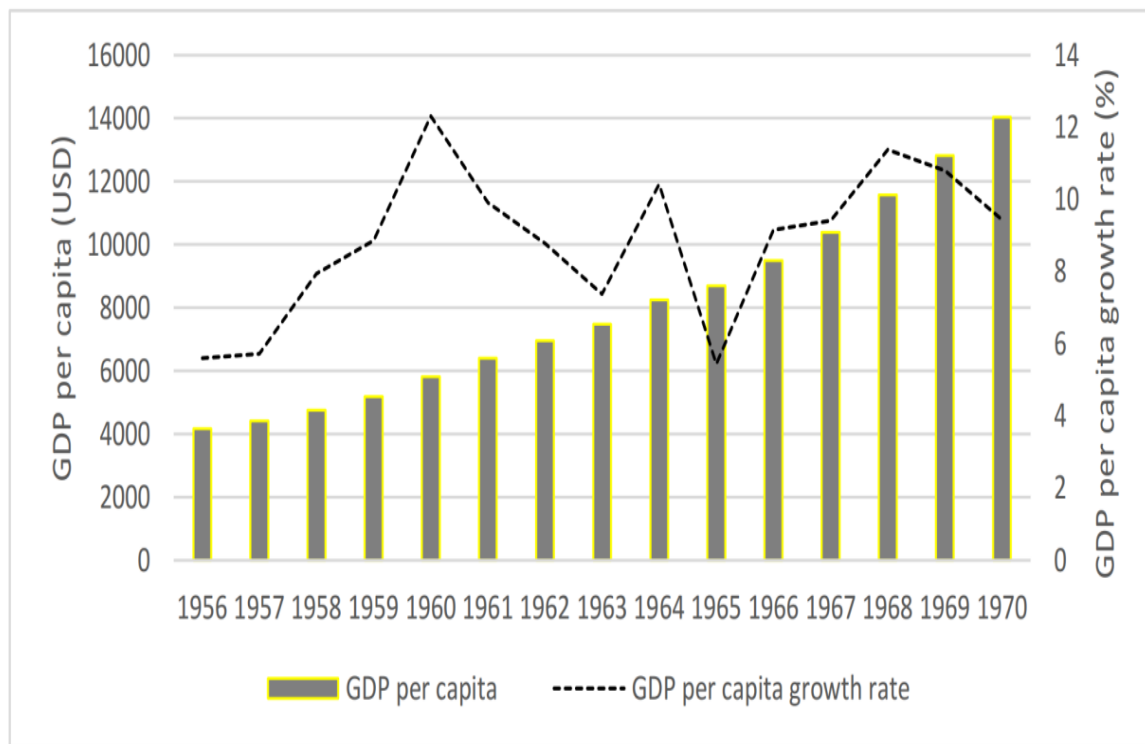


Source: Own construction based on Penn World Tables version 10.0.

A combination of data and research shows that the country moved into the middle-income bracket in the late 1956 and successfully crossed the "Middle Income Trap line" in the 1970s, the Base was weak as a post-war loser, but it took only a decade or so to make the leap from middle-income country to post-war Japan. The reasons for its rapid economic development

are worth investigating. Based on this, the data of Japan's GDP per capita and the rate of technological progress from 1950 to 1970 were collected and analysed.

Figure 3 Analysis of GDP per capita in Japan 1956-1970

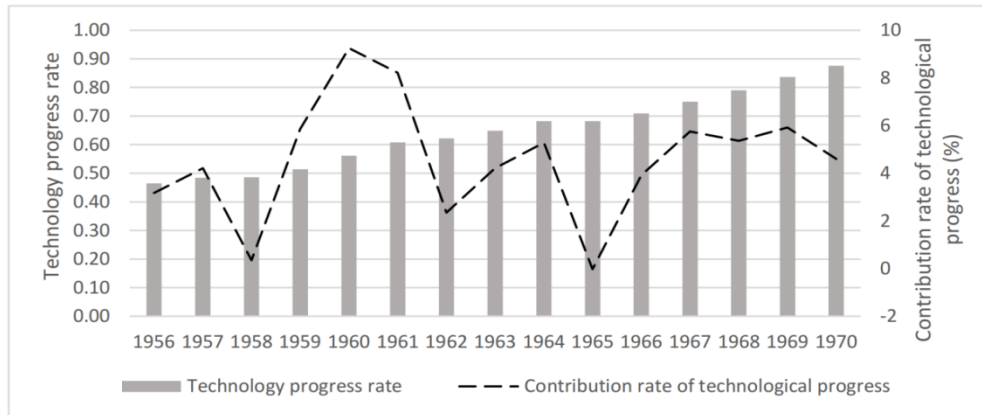


Source: Own construction based on Penn World Tables version 10.0.

As can be seen from Figure 3, from 1950 to 1970, Japan's per capita GDP level continued to rise, per capita GDP growth showed a tortuous upward trend, at the peak of nearly 10% high level. The higher growth rate of GDP per capita leads to the faster growth of the economy. And in 1969, the country successfully crossed the middle-income trap.

In the process of crossing the Middle-Income Trap, the rate of technological progress shows arising trend in Japan. From the contribution rate of technological progress, showing a tortuous rise in the law, when the highest up to 45%. According to the comparison, it can be found that the growth rate of GDP per capita and the contribution rate of technological progress show the same trend of change. Around 1985, Japan's R&D spending rose to the second-highest in the world, after that of the United States. The rising level of scientific and technological progress has enabled Japan to successfully enter the ranks of high-income countries (See Figure 4).

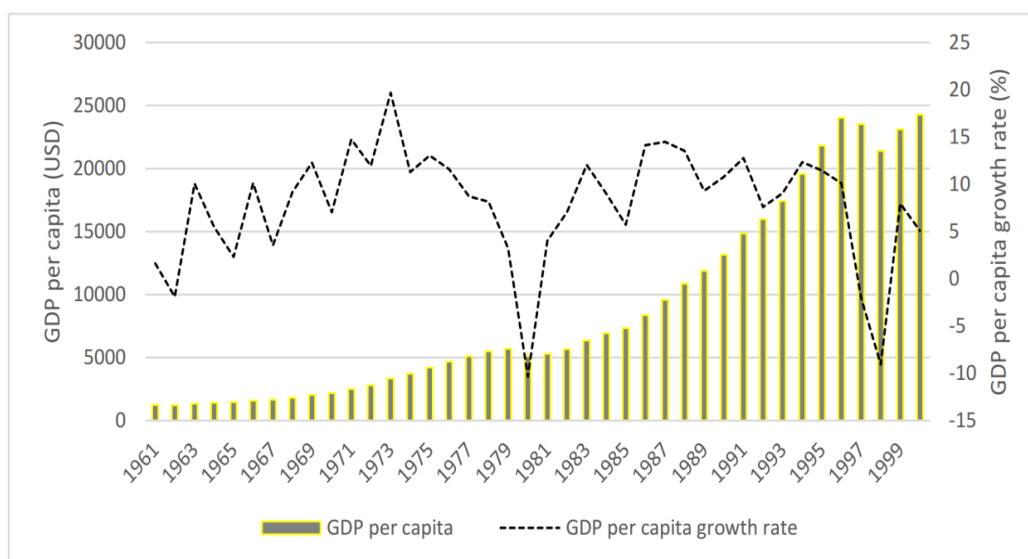
Figure 4 Analysis of the level of technological progress in Japan 1956-1970



Source: Own construction based on Penn World Tables version 10.0.

In the case of South Korea's Middle-Income Trap, the country has seen rapid economic growth through aggressive reform measures since 1960. Han River's "Miracle" is that GDP per capita has been rising at an astonishing rate. Meanwhile, in 1982, the country Middle Income Trap into a "Middle Income Trap", crossing the border in just 14 years and entering the ranks of high-income countries, being a success story for Asia and the world. This part of South Korea in 1961-2000 is to intercept the per capita GDP data and technical progress rate data for correlation analysis.

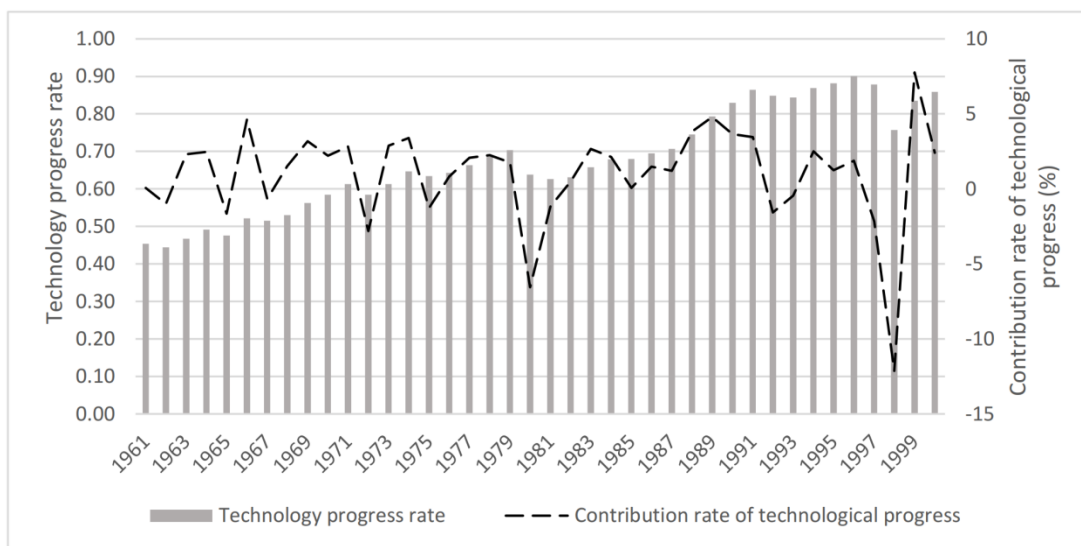
Figure 5 Analysis of GDP per capita in South Korea 1956-2000



As can be seen from figure 5, South Korea's GDP per capita surpassed \$3,995 in 1982 and \$12,847.77 in 1996, and it took only 14 years for the country to successfully enter the ranks of high-income countries. From 1982 to 1996, the per capita GDP rose all the way, and the per capita GDP growth rate showed a tortuous upward trend. In most years, the per capita GDP remained about 8%, high GDP growth rate having brought high per capita GDP growth.

From the level of technological progress in Figure 6, the contribution rate of scientific and technological progress in 1980 was 372.61%, the data is more extreme. In order not to affect the general trend of the data, eliminate extreme values. Although the contribution rate of technological progress decreased during this period, the average value remained above 20%, and the rate of technological progress increased year by year during this 14-year period. The rate of scientific and technological progress increased from 0.56 in 1982 to 0.78 in 1996. The step-by-step growth of the level of technological progress has driven the rapid growth of the Korean economy. Figures from the Korean Industrial Development Institute show that private companies have increased their R&D spending as a percentage of GDP in the Middle- Income Trap process, from less than 0.5 per cent before the 1880s to 2.5 per cent at the start of the 20th century, this has increased more than fivefold. The proportion of capital goods purchased from abroad for domestic technological learning has also increased significantly, and a large number of overseas patented technologies have been purchased. The scientific and technological progress level has developed rapidly during the inspection period, which is shown in Figure 6.

Figure 6 The level of technological progress in South Korea 1956-2000



Source: Own construction based on Penn World Tables version 10.0.

As for the USA, one of the main reasons why the country has been able to develop from a developing country after independence is to learn and import advanced technology from Western Europe and the United Kingdom and, on the basis of the introduction, to make appropriate improvements in accordance with its own national conditions, to promote the development of the domestic economy. The USA also selects technologies suitable for its own development according to its own resources and natural conditions, on the other hand, on the basis of the introduction of appropriate improvement and innovation in accordance with their own national conditions to better adapt to their own economic development.

4. Conclusion

The per capita GDP level of each country represents the economic development level of each country. When a country's per capita GDP is in the middle-income stage, it is necessary to maintain a high GDP growth rate in this period in order to achieve the leap to high-income countries. And the level of technological progress has an important impact on economic growth, to cross the "Middle Income Trap" has a certain role. Therefore, it is of great significance for the middle-income countries to improve the level of technological progress. Based on their experience of successes and failures in Middle Income Trap countries, most successful leapfrogging countries are more focused on upgrading their own levels of technological progress.

After the opening of the reform in 1978, China's economy has developed rapidly, and now it has entered the ranks of middle-income countries, but it is not so easy to enter the ranks of high-income countries. At the low-income stage, countries rely mainly on full imitation to promote their economic growth, but at the middle-income stage, full imitation has no significant effect on economic growth. When an enterprise introduces an advanced technology, it first grasps the productive capacity of the technology, knows how to produce it, and then applies the technology to the production and manufacturing process of the product, with the passage of time, will master the technology design methods and principles, on this basis, the enterprise should have the natural advantages of the product quality and performance of some modifications, finally, the product with independent intellectual property rights is developed. Technological innovation is the only way out for economic leap. Only products with independent intellectual property can be invincible in international competition and promote economic development.

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