ADAPTATION OF HIGH-INCOME ECONOMIES

A Study of Policies and Transformation

APO

CIER

The Asian Productivity Organization (APO) is an intergovernmental organization that promotes productivity as a key enabler for socioeconomic development and organizational and enterprise growth. It promotes productivity improvement tools, techniques, and methodologies; supports the National Productivity Organizations of its members; conducts research on productivity trends; and disseminates productivity information, analyses, and data. The APO was established in 1961 and comprises 21 members.

APO Members
Bangladesh, Cambodia, ROC, Fiji, Hong Kong, India, Indonesia, Islamic Republic of Iran, Japan, ROK, Lao PDR, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Turkiye, and Vietnam.

ADAPTATION OF HIGH-INCOME ECONOMIES

A STUDY OF POLICIES AND TRANSFORMATION

JUNE 2023 | ASIAN PRODUCTIVITY ORGANIZATION

ADAPTATION OF HIGH-INCOME ECONOMIES
A STUDY OF POLICIES AND TRANSFORMATION

First edition published in Japan
by the Asian Productivity Organization
1-24-1 Hongo, Bunkyo-ku
Tokyo 113-0033, Japan
www.apo-tokyo.org

Designed by Word By Design Creacomm

CONTENTS

FOREWORD

The high-income members of the APO have triggered vast amounts of research on their development models. The inspiring achievements of these economies are attributable to a radical transformation of productive structures, major shifts in the sectoral absorption of labor, and significant improvements in technological sophistication. However, recently, the productivity and economic performance of these top Asian economies has stagnated, as observed in the downward trend in their economic growth rates. Shifts toward more productive structures will be vital to break the prolonged stagnation.

To support the APO high-income countries of Japan, the Republic of China, the Republic of Korea, and Singapore in identifying key factors for sustaining their economic levels and growth, the APO conducted a policy study in partnership with the Chung-hua Institution of Economic Research, ROC. The study analyzed the historical changes in industrial structure, effectiveness of government policies, and success factors that helped these high-income economies avoid the middle-income trap. Additionally, the pace and patterns of recent stagnating growth as well as key elements to building a more productive economic structure through industrial upgrading, talent cultivation, and expanding the production base were examined. Recommendations for fostering resilience and adaptiveness in these high-income economies are given in the research publication.

The APO appreciates the contributions of and cooperation with the Chung-hua Institution for Economic Research. The dedication of the research team ensured the quality of the study report. It is hoped that this publication will result in more effective policymaking in APO high-income member countries and in other middle-income members by illustrating the success factors to advancing economic growth.

Dr. Indra Pradana Singawinata
Secretary-General
Asian Productivity Organization
Tokyo

CHAPTER 1

OVERVIEW

In the 1970s and 1980s, Hong Kong, Singapore, the Republic of Korea (ROK), and the Republic of China (ROC) were labeled as the "four Asian Tigers" and became part of the Asian economic miracle. However, in the 1990s, the ROC was going through a difficult phase due to the process of globalization, democratization, and liberalization as well as the adjustment of industrial structure. Entering into the late 1990s and 2000s onwards, faced with a huge overflow of foreign investment, fierce competition from PR China, and pressure of industrial hollowing out, the ROC fell into sluggish economic growth, and got caught in the "middle income trap" [1]. The crisis gradually ebbed after the mid-2010s when the member economy underwent global deployment, established strong linkage with global branding firms as well as scale barrier built-up in the ICT industry. It then accelerated its economic growth and successfully stepped up from middle income to high income, driven by rapid growth in the semiconductor and electronic information industries, and benefiting by switching/rush orders from the USA-PR China trade war and the COVID-19 pandemic [2].

In addition to the ROC's experience, Singapore and the ROK also faced their own challenges. Japan too was not excluded. In the 1960s, Japan's economic condition entered a stage of high growth. But in the 1970s and 1980s, the Japanese industry was forced to move towards international development due to the impact of the two oil crises and "Plaza Accord". It also made the enterprises actively engage in asset acquisitions at home and abroad, causing unproductive economic bubbles. In the 1990s, Japanese economy went into a stage of low growth with the collapse of bubble economy. In the 2000s, its society faced challenges of labor shortage caused by its super-aged society. In response to these challenges, the Japanese government adopted industrial adjustment policies with different strategic thinking to respond to the changes in the domestic and foreign economic environments in different periods, and gradually increase Japan's per capita GDP. These three countries - Singapore, the ROK, and Japan - turned the situation around by making changes to the economic structure and introducing successful factors for economic upgrading.

On a positive side, the four Asian Tigers (ROC, Hong Kong, ROK, and Singapore) demonstrated that, although difficult, climbing the income ladder was possible. One salient feature of the "economic miracle" journey these economies experienced was to follow development paths that were at odds with the majority of their income peers from a few decades ago. These high-income economies are members of the Asian Productivity Organization (APO) and their development models have triggered vast numbers of research from various perspectives. Overall, scholars are in agreement that the inspiring achievements of these economies are attributed to radical transformation of productive structures, major shifts in the sectoral absorption of labor, and significant improvements in technological sophistication. Drawing from these lessons, the economies that failed to achieve similar transformation in their productive structure might remain trapped in the middle-income category.

This study aims to explore the history of economic development, the changes in industrial structure, the influence of government policies, and the key factors that helped the ROC, Japan, the ROK, and Singapore (hereafter termed as four Asian economies) to break out of the middle-income trap. It also aims to:

- Analyze the pace and patterns of productivity growth in the APO high-income economies
- Identify the causes of and methods to overcome stagnating growth
- Examine the driving factors in building a more productive economic structure to sustain growth and avoid the high-income trap
- Provide policy recommendations to promote innovative economic activities as new sources of growth

More elaborately, the analysis comprises the following:

(i) Macroeconomic analysis

- Analyze the growth and development of four Asian economies and major industries from 1970–2021. Observations will be on economic indicators, including economic growth rate, per capita income, industrial structure change, and labor productivity. In addition, the project will also categorize several varying growth stages that illustrate the environment and relevant policies
- Use economic indicators to explore the stagnation factors of economic growth between 2000–15. Further, the effectiveness of the governments' major policies will be analyzed, including the new southbound policy, six core industries, forward-looking infrastructure, industrial reshoring, etc.
- Evaluate the economic impacts of the USA-PR China trade war and COVID-19 on the four Asian economies
  - Reasons for the boom in some specific industries as the result of the trade war and global pandemic
  - Changes in economic growth rate and industrial competitiveness
  - Economic influences of the reshoring firms
  - Some negative impacts, including polarized industry and society as well as real estate and stock market bubbles

(ii) Microeconomic analysis

- The development and competitive changes in integrated circuit (IC), electronic industry, semiconductor industry, etc.
- The service industry's competitiveness and stagnant income level

(iii) Driving forces and key successful factors of the four Asian economies' industrial upgrading

The governments' role for creating favorable investment environments through policy tools [3] are looked into, specifically:

- Industry support
- Specific programs
- Talents cultivation

This study is conducted based on review of bodies of literature, secondary data analysis (such as indicators on changes in industrial structure, labor productivity, etc.), and expert interviews.

CHAPTER 2

LITERATURE REVIEW

STRIDING ACROSS MIDDLE-INCOME TRAP

For developing countries, it is easier to transition from low-income to middle-income category. However, it is more challenging to elevate from a middle-income economy to high income. The former stage is a process of capital accumulation, technology learning, and catching up. This part is relatively easy. However, once the initial process of industrialization is completed, the threshold for continuous upward development is set far higher. When the national income reaches middle level, the wages too climb to the same level, resulting in the country losing the advantage of low wages and unable to compete with low-wage countries. Therefore, they must enter new product fields to find new growth momentum, and/or upgrade and transform, leaving the market of price competition and entering the field of quality competition to find new opportunities [4].

However, if a country enters new fields and new quality competition markets, it also faces competition from high-income countries. High-income countries have superior technology, strong enterprises, good brand image, and various barriers to entry, including intellectual property rights, industrial standards, consumer protection, environmental standards, etc. Hence, middle-income countries find themselves in an awkward situation that they can no longer fit into neither a high nor a low position.

Pursuant to that, Krugman once wrote that the four Asian Tigers (the Republic of China (ROC), the Republic of Korea (ROK), Singapore, and Hong Kong) are paper tigers. He believes that these newly industrialized countries must improve labor productivity by means other than capital accumulation in order to overcome income growth obstacles [5].

Krugman believes that the total output of a country depends on the efficiency of production and the amount of production factors, such as capital, population, and land. Land is a finite resource thus the amount is fixed. It is difficult to get rid of the fate of diminishing returns unless the production efficiency changes. That is, the input of the same factors can yield more output. In other words, this refers to the oft-mentioned “industrial upgrading” and “industrial transformation”.

According to Acer's co-founder Stan Shih, he invented the smiling curve idea that focuses on the rate of return on the development of two ends - brand and technology - and the intellectual property right (IPR) is relatively high. IPR must take a tremendous chunk in the R&D expenditure. In mainstream projects, such as automobiles and cell phone, there are several factors that must be taken into consideration. For instance, a company needs to avoid the patent map already occupied by advanced industrialized countries, its brand must invest in huge resources, and it has to get the support of the local market, which is challenging.

However, carrying out industrial upgrading and transformation implies more R&D, high-level manpower, and establishing a brand image, but the investment in R&D and high-level talents require huge funds and long-term efforts to be successful. The promotion of international brands requires the backing of an enormous local market and the full support of the government in order to be able to create a certain brand image. These factors are aptly demonstrated in the ROK brands, such as Samsung, LG, and

Hyundai and Japan's Sony, Sharp, Fujitsu, and NEC. The ROC's HTC mobile phones were once brilliant, but they were overshadowed by other competitive local brands with global presence and lacked support from the local market. The ROC could only compete in some nonmainstream areas, such as Giant Bicycles. Although the ROC has Acer and Asus, known brands in desktop computers and notebook computers, they offer low gross profit margins, in which European and American firms are reluctant to invest.

Today, the ROC's semiconductor industry has become the vanguard in the development of its hi-tech sector. The industry has an output value ranking fourth worldwide, exceeded only by the USA, Japan and the ROK. In 1998 the industry's output value amounted to TWD281.1 billion.

In 2021, the semiconductor industry recorded over 30% of total manufacturing industry output value [6]. The development of the semiconductor industry has given the ROC's information technology (IT) and electronics sector a whole new look; developing from IT and electronics industry's mid and downstream sectors to upstream raw materials sector. The division of labor within the industry has become more comprehensive and the overall competitiveness has improved with the government's industrial policy playing a vital role in the whole process. As described earlier, government intervention has used the provision of technology, manpower, and funding assistance to eliminate the risks that manufacturers would otherwise face in the early stages of semiconductor industry development. It was this assistance that has created the ROC's semiconductor industry as it is today. This view is supported by a number of works published both in the ROC and abroad. Matthews views the key factors influencing the successful development of the semiconductor sector in the ROC as being the government's industrial policy and systematic assistance that stimulated the manufacturers to invest capital, technology, and manpower. As a result, it produced a 'resource leverage effect', which has enabled the ROC to develop this new industry smoothly [7].

The Nomura Research Institute (1995) viewed the government's industry support policy, active entrepreneurship, the presence of resourceful manpower, and high level of labor mobility (for example, in the involvement of personnel recruited from Silicon Valley and the movement of talent from the Industrial Technology Research Institute (ITRI) into the private sector) as being the key factors that enabled the ROC's semi- conductor industry to grow rapidly within a short space of time [8]. The rapid development of the ROC's semiconductor industry is also attributable to the R&D work carried out by the Electronics Research and Service Organization (ERSO). This stimulated private sector investment and the development of technology.

TRANSFORMATION OF THE FOUR ASIAN TIGERS

Although the ROK had suffered from the Asian financial crisis in 1997, the government was determined to reform. Through the exchange of consortium business operations, it focused on its core competitiveness and successfully completed the transformation. Compared with the ROC, the ROK's speed of transformation was fast and smooth. The main reason is that its industrialization relies mainly on large enterprises and the government concentrates resources on cultivating large enterprises. It is better in branding and creating an international image, compared with the ROC. The ROC, focusing on small and medium enterprises (SME), did not perform as well as the ROK in upgrading, transformation, or branding, and faced fierce competition from developing countries.

Korean enterprises are large in scale and, at the same time, come from a high degree of vertical integration within conglomerates that facilitate economies of scale in R&D and marketing. Vertical integration is conducive to mastering key components and materials, which are important elements for branding firms to achieve product differentiation. For this reason, Samsung, Hyundai, and LG in the ROK are able to build high-value global brands and become the locomotives that drive industrial transformation. As a result, the ROK broke the USD30,000 per capita income barrier in 2018.

In contrast, the ROC maintains a high degree of specialization and a low degree of vertical integration. The ROC's industries, especially the electronic information, adopt a development model of reverse integration. The original equipment manufacturers (OEMs) in the downstream of the electronic information industry appear first before they develop toward midstream components. Only when the market is at a certain size, the upstream semiconductor industry is developed [2].

While Taiwanese firms put in much effort to enhance their technology R&D, they have no brand presence. But they maintain good relationship and cooperation with international firms. Although the unit gross profit margin is not high, with economies of scale on production in Southeast Asia and mainland China (PR China), tens of millions of computers and cellphones can be produced, in comparison to the 100,000 or 200,000 computers that used to be produced as OEM in the Taiwanese market. Therefore, the overall profit is not low. With sufficient profits, Taiwanese firms can continue to upgrade and transform, from components to mobile phone OEMs, to the development of communication networks, servers, information security products, etc. In other words, from quantitative changes, it transformed to qualitative.

In addition, with the production scale of PR China and Southeast Asia, the ROC and international firms can match in scale, and become their indispensable partners and entry barriers for latecomers.

As for the government, a market friendly policy is introduced, where the government steps in and helps local firms with retraining, but without violating the market principles. The government adopts policy measures to overcome market failures, such as making effective use of a range of policy tools that included public-funded research institutes, science parks, incubators, tax breaks, and large-scale technology development projects. At the same time, it continues to respect the operation of the market mechanism. The ROC emerged as a leading player in the global ICT industry during this period. However, both the innovation system and the policy tools that the government relied on for a long period of time are in need of adjustment for the following factors:

- Rise of PR China and the emerging economies of Southeast Asia
- Advent of globalized competition
- Increased transfer of resources between countries
- Growing emphasis on business enterprises in building a global presence
- Growth of the service sector

In deciding the policy tools the government should employ, the ROC is moving away from the manufacturing-oriented system of the past toward giving equal emphasis to the manufacturing and service sectors while simultaneously working to strengthen industry-university collaborations, promote new methods of human resources cultivation, and reduce the scope of applicability of tax breaks. It is anticipated that these changes will help to speed up the ROC's transformation into a knowledge economy.

Singapore is the most important entrepot base for Southeast Asian countries, and its industrial transformation is based on commodity trade. Through the introduction and strengthening of financial services, it has also developed into an overseas USD trading center and plays an important role in financial instruments, capital markets, and futures trading. In addition, Singapore continues to maintain a small number of manufacturing industries, which are also dominated by multinational companies, but are advancing toward high-tech industries, including semiconductors, biopharmaceuticals, and petrochemicals. The country also attracts multinational companies to settle in through tax treatments and bringing about the strength of growth [4].

FACILITATING INDUSTRIAL TRANSFORMATION

If not for the rise of PR China, especially following its open door policy for foreign direct investment (FDI) after 1990, Taiwanese businessmen would have continued their early investment layout in Southeast Asia, starting from Malaysia and Thailand, gradually spreading to Indonesia, the Philippines, Vietnam, and other countries under the government's "southbound policy". After 1990, PR China began its open door policy for foreign direct investment (FDI). Without any competition from PR China, the speed of the ROC's industrial relocation would have been gradual, following the law of "flying geese", starting from labor-intensive industries, such as garments, shoemaking, furniture, hardware, etc., and slowly developing to TVs, computers, monitors, desktop computers, etc. in the electronics sector. It would have also diversified in different countries in Southeast Asia and not concentrated in one place. The rise of PR China kept the "southbound policy", proposed by Lee Teng-hui in 1993, from being implemented.

Among various industries, PR China's ascension has the greatest impact on the ROC's information and electronics industry. It accelerated the speed of industrial change in the nation, quickly hollowing out old industries. However, judging from the results, the most successful industrial transformation and upgrading in the ROC is the information and electronics industry. Competition from Chinese companies, both fair and unfair, made Taiwanese companies suffer, but it also eliminated competitors from other countries. If an enterprise can find a business strategy that complements the Chinese model, it can take off under the whirlwind of PR China. The Chinese competition allowed the ROC to grow.

Without the rise of PR China, the ROC's most dazzling semiconductor industry would not be as vibrant as it is today. First of all, the semiconductor design industry with the mainland as its main market, such as MediaTek, Novatek, Realtek, etc., will lose the engine of growth. Secondly, although the main customers of Taiwan Semiconductor Manufacturing Company (TSMC) and United Microelectronics Corporation (UMC) in wafer manufacturing are manufacturers in the USA, Europe, and Japan, and Chinese customers account for less than 20%, half of the products are sent directly to factories in the mainland after the manufacturing is completed. PR China, as the world's factory, has an inherent competitive advantage in the ROC's manufacturing base due to its geographical proximity. Whether it is semiconductor design or wafer manufacturing, it also faces the pressure of imitation and competition from other Chinese companies. The ROC's semiconductor industry can stand firm without being hollowed out or overwhelmed by imitations due to its technological leadership.

In general, if there is no rise of PR China, the ROC's industrial development from after 1999 could have been relatively stable. However, the speed of industrial relocation would have been slower, the continuity of industries would be better, and more traditional industries would have remained in the ROC. The industrial structure is relatively scattered, and it would not be concentrated in the electronic information industry as it is today. Without PR China's imitation and competition, the ROC's emerging industries, such as panel, solar energy, and LED may develop smoothly, with better profits, larger industrial scale, and more capital formation each year. Under such circumstances, the ROC's resources into the semiconductor industry must also be less than what is seen, so the scale and technical capabilities of the semiconductor industry could also be lower than today's levels. In other words, the industry is more diverse, and there are many competitors, but there is not necessarily a "sacred mountain for protecting the country".

Public opinion states that with the opening of PR China, it has allowed Taiwanese companies find their second life, settling into a comfort zone, and forgetting to make progress, thus delaying the transformation of the industry. The fact is that even with a huge number of firms invested in PR China that resulted in hollowing out of old industries, they did accelerate industrial transformation. These are micro-perspectives. Industrial transformation is a general concept, rather than an individual problem. It does not matter if the companies that go to PR China never look back and forget to strive for upgrading, but more importantly, it should be identified if the ROC's overall resources are used efficiently. If

individual enterprises do not rotate, the industry will not transform. In the past 30 years, the faces of Taiwanese companies have not changed much, they have faced ups and downs. Several large-scale enterprises that have risen have been able to take advantage of Chinese resources, proving that the general trend is irreversible. Due to geographical and cultural proximity, the ROC faces both the greatest challenge and the biggest opportunity. The dual combination is a reasonable outcome for the ROC's industry to undergo dramatic changes.

CHAPTER 3

ECONOMIC DEVELOPMENT AND SUCCESS FACTORS OF THE FOUR APO HIGH-INCOME ECONOMIES

This chapter introduces the development journey of the Republic of China (ROC), Singapore, the Republic of Korea (ROK), and Japan. It encompasses each economy's development policy history that precedes its economic successes and lessons for other countries.

ROC'S DEVELOPMENT EXPERIENCE

Introduction

In the late 1960s and early 1970s, the ROC was one of the few economies that abandoned the import substitution strategy of infant industries and turned to an export-oriented economy. Through the sharp depreciation of the currency (from USD1 to TWD15 to USD1 to TWD40) as well as the export-oriented strategy of light industrial products, the economic growth has been smooth since. However, the ROC faced two oil crises in 1973 and 1979, and its export strategy of labor-intensive industries had been hit hard, including the industry that was facing the pressure of transformation. The establishment of the Science Park in 1980 and the Industrial Technology Research Institute (ITRI) (established in 1973 and expanded in 1979) enabled the government to assist the development and transformation of traditional industries into technology-intensive industries. The support and promotion of the electronic information industry and the semiconductor industry in the 1980s also laid the foundation for future industrial development.

In late 1980s, due to rapid economic development, the cost of land and labor increased, and awareness for environmental protection also rose. Enterprises began to invest abroad, first in Southeast Asia, and then after the reform and opening in PR China, they turned to the mainland to invest. In terms of investment in PR China, SMEs made the first move, followed by traditional industries, and finally the large-scale electronic information industry that came in one after the other, resulting in the hollowing-out of some industries. With the rise of the upcoming giant economy, under the triangular trade, the ROC's economic vitality gradually declined. It also suppressed the development of the overall economy and industry. Thus from the late 2000s to the early 2010s, the ROC's economic performance was stable but lackluster.

As a result of the ROC's continued investment in PR China and Southeast Asia, the scale of the ROC's electronic information and semiconductor industry expanded. It also created economies of scale as the industry maintained close relationships with major international firms. The USA-PR China trade war that broke out in 2018 and the global pandemic of COVID-19 in 2020 led to a few outcomes, such as supply chain disruptions, sharply affecting order grabbing and transfer orders, and the creation of business opportunities in telemedicine, remote working, study, and entertainment that was driven by the closure

of the city, which brought explosive growth to the ROC's semiconductors and electronic information industry. The ROC's export and investment momentum was restored and the APO member led to an impressive economic growth.

Against this backdrop, this chapter mainly discusses the ROC's economic growth at each stage from the 1970s, the development direction of major industries, and the crucial policies and their effects. In addition to economic development and industry, a discussion will be led on the reasons the ROC is able to break through the middle-income trap and the relevant government policies supporting it. Further, the impact of the ROC's COVID-19 after the USA-PR China technology war will be discussed and the ways they were dealt with as well as the summary that can be beneficial as reference for other countries' development.

Economic Development History

According to the ROC's industrial structure and GDP, the development of its industries can be roughly divided into a period of dual development model of agriculture and manufacturing. They were in coexistence in various periods: (i) during the Japanese occupation (1912–47); (ii) the labor-intensive import substitution period (1948–61); (iii) the second import substitution period (1962–80); (iv) the period of technological orientation and economic liberalization (1980–99); (v) the period of economic globalization (2000–07); and (vi) the period of post-financial crisis and the institutionalization of economic and trade across Taiwan Strait (2008–) [2].

As highlighted in Table 3.1, the ROC's economic growth rate was close to 10% on average from the 1970s to the 1990s. The labor input was at 3.5% while the growth of IT capital input was over 20% and the per worker labor productivity (LP) growth at about 7.3%. The growth rate of total factor productivity (TFP) averaged around 3.8% but the capital productivity growth fell sharply. Clearly, this period saw the extensive growth of pure labor and capital increase.

TABLE 3.1

ROC'S ECONOMIC PERFORMANCE BETWEEN 1970–2020

(%: Average Annual Growth Rate)	1970 –80	1980 –90	1990 –2000	2000 –10	2010 –19	2015 –19	2016 –17	2017 –18	2018 –19	Projection			
										2019–20	2020–21	2021–22	2020–25
GDP growth	10.5	9.2	6.8	4.1	2.9	3.0	3.2	2.6	3.1	3.1	5.4	0.8	1.6
Labor input growth	4.4	2.9	2.2	2.1	2.2	0.6	0.2	1.4	0.9	0.4	-0.3	-0.4	-0.5
Labor quality growth	1.1	0.9	1.1	1.7	1.0	0.7	0.9	0.6	0.3	0.7	0.7	0.8	0.8
Hours worked growth	3.3	2.0	1.1	0.3	1.2	0.0	-0.7	0.8	0.6	-0.4	-1.1	-1.2	-1.3
College labor input growth	7.5	6.8	6.2	5.0	3.6	2.0	2.2	2.5	1.9	1.8	1.1	1.0	0.9
Non-college labor input growth	3.8	1.6	0.1	-0.7	0.1	-1.6	-2.9	-0.4	-0.7	-2.0	-2.8	-3.0	-3.2
IT capital input growth	21.5	17.4	18.7	3.3	2.4	2.7	3.0	1.9	2.7	4.3	1.8	3.2	2.3
Non-IT capital input growth	9.8	7.7	6.9	2.9	1.7	1.7	1.8	1.5	1.8	1.5	1.2	1.4	1.2
Per worker labor productivity growth	7.3	6.9	5.5	3.2	1.9	2.3	2.5	1.9	2.6	3.9	6.2	1.8	2.7
Per hour labor productivity growth	7.3	7.3	5.7	3.7	1.8	3.0	4.0	1.8	2.5	3.5	6.4	2.0	2.9
Capital productivity growth	-10.1	-8.0	-7.5	-2.9	-1.7	-1.8	-1.8	-1.5	-1.8	1.4	4.2	-0.6	0.4
TFP growth	3.5	4.1	2.3	1.6	1.0	1.8	2.2	1.1	1.7	2.1	4.9	0.3	1.2

Source: APO Productivity Databook 2021.

In the 1990s and 2000s, the average growth rate dropped to 6.8%, entering a period of moderate growth. The growth of labor input also decreased but IT capital input continued to grow at a high rate while the TFP slowed down. From 2000 to 2010, the average growth rate was 4.1%, labor input decreased to 2.5%, and IT capital investment decreased significantly at 3.3%. During this period, overseas investment was deployed, replacing domestic investment (Table 3.1).

Between 2010–19, the growth rate dropped to 2.9%, recording from medium to low growth rate. It was also a period where the society was worried about the hollowing out of domestic industries due to overseas investment. The growth of labor input, IT capital investment, and TFP saw a sharp decline, resulting in an economic downturn. From 2020 to 2022, the ROC's growth rate averaged 3.5%. Due to the return of Taiwanese firms, IT capital investment has begun to increase again, and TFP has also begun to increase (Table 3.1).

Following the secondary data analysis, the ROC's economic development in different periods is explored further.

Export Orientation and the Second Import Substitution Period (1962–80)

From the late 1960s to the early 1970s, the ROC had also implemented short-term second import substitution in an attempt to reduce imports through import controls and high tax rates as well as developing its capital-intensive industries, such as petrochemicals, automobiles, shipbuilding, and steel. However, unlike the positive attitude of the ROK government, the ROC government's objective was to develop the upstream heavy chemical industry, but without affecting the competitiveness of the midstream and downstream export industries. In this case of multiple goals, the government was not determined enough to promote the second import substitution, which only lasted between four to five years.

In 1973, the first oil crisis struck. International oil prices increased fourfold, causing the prices of other imported products to also rise. As a way to mitigate the impact on the domestic industry, the government championed low energy consumption and low-price effects. The increase in government energy prices did not fully reflect the increase in energy import prices. However, the cost-driven inflation had also pushed up prices by more than 40%, and the government had once again resorted to tightening monetary policy to suppress inflation with high interest rate.

This period witnessed the introduction of the most important policy, the "Ten Major Construction Projects" (1973–78). In the 1970s, the ROC was facing problems - insufficient basic facilities and fragile industrial structure, coupled with the economic downturn brought on by the first oil crisis in 1973. The then President of the Executive Yuan Chiang Ching-kuo proposed "Ten Major Construction Projects" in November 1973 as to break through the oil crisis and lead the ROC's economic transformation. The 10 major constructions were the largest public investment at the time, aimed at eliminating difficulties in infrastructure and developing heavy chemical industries.

The 10 major construction projects comprised:

- Six transport infrastructure - Sun Yat-sen Freeway, North-Link Line, Railway Electrification, Taichung Port, Su'ao Port, and Taoyuan International Airport
- Three heavy chemical industry - China Steel, China Ship Building, and petrochemical industries
- One energy system - nuclear power plants

The construction of each project began in 1974 and completed by the end of 1979 with a total cost of about TWD200 billion. These projects were timely as the fiscal expansion effect produced offset the decrease in private investment and the economic recession brought by the oil crisis. The result of the projects also successfully upgraded its economy.

The global economic recession caused by the second oil crisis, coupled with competition from other countries with cheaper labor, severely challenged the ROC's labor-intensive industry exports. The government recognized the fragility of its industrial structure and the threat of being replaced by other countries with cheaper labor. It was necessary to strengthen R&D and marketing as well as develop technology-intensive output in order to maintain a competitive edge. Therefore, the ITRI was established in 1973 and the Hsinchu Science Park in the 1980s.

Period of Technological Orientation and Economic Liberalization (1980–90)

Entering the 1980s, the export-oriented policy continued to be implemented. In 1982, the export surplus had reached USD3.3 billion and increased year by year. In 1987, it was about USD20 billion. Economic growth and improvement of income per person gradually gave rise to labor welfare and environmental protection issues. Further, the trade friction between the ROC and the USA, caused by the large export surplus, had also cropped up. Under the pressure of the U.S. Trade Act Section 301 and Super Section 301, the ROC had also begun to carry out trade and economic liberalization measures.

Economic liberalization measures included the relaxation of import controls and the reduction of tariffs in the early 1970. In June 1987, the import tariffs on more than 1,700 products were significantly reduced by an average of 50%. By July 1987, foreign exchange controls were also fully liberalized. The wave of economic and trade liberalization also encompassed the privatization of public businesses and put pressure on financial institutions to open up private ownership, pushing the ROC's economy into a new era of untethering, economic liberalization, and vigorous economic development.

In terms of industrial development, the major industrial structure changes and policies behind this period can be listed as follows:

i) Industrial structure changes

Due to the sharp appreciation of the yen against the American dollar (USD) at the end of 1985, the Four Asian Tigers captured portions of the Japanese export and domestic markets, which led to their rapid economic growth and improvement in living standards. It also resulted in increasing labor costs. At the same time, with the large current account surplus, PR China and the ROK were forced to adjust their undervalued exchange rates. With the appreciation of the exchange rates of the Four Asian Tigers and rising labor costs, some labor-intensive industries lost their comparative benefits. Firms were forced to move to Southeast Asian countries or PR China to invest in production, which also led to an increase in the ROC's overseas investment portfolio.

With the appreciation of the New Taiwan dollar (TWD) and the rising cost of labor and land, the remaining industries have devoted themselves to investments, such as R&D and automation in order to maintain their competitive edge. After more than 10 years of adjustment, the structure of the manufacturing industry had shown a significant change. In terms of output value (real GDP), the proportion of high-tech and heavy chemical industries gradually increased over the past decade and the electric power and electronic machinery equipment industries grew the fastest among them while the proportion of traditional industries has gradually declined.

The output value of heavy chemical and technology-intensive industries in the total output value of manufacturing increased from 59.65% in 1986 to 75.50% in 1997. In terms of employment, the

proportion of high-tech and heavy chemical industries also gradually increased. As for the manufacturing industry's export value, heavy chemical and technology-intensive industries also increased from 54.9% in 1986 to 73.6% in 1997. In addition, observing other indicators, such as the ratio of R&D expense to turnover, the real fixed capital formation per person, and capital productivity, the 10-year trend moved upwards. From the data, it can be seen that the ROC's manufacturing industry has undergone significant transformation and upgrading, in terms of output value, employment, and export structure, moving from labor-intensive industries to technology- and capital-intensive fields.

ii) Main industrial development strategies

As highlighted earlier, since the mid-1980s, the ROC has faced internal and external pressures due to increasing labor and land costs, rising environmental awareness, and its entry into the World Trade Organization (WTO) to open up its domestic market. Under these pressures, the government took advantage of the situation and took "economic liberalization, internationalization, and promotion of industrial upgrading" as its main policy. On the one hand, tariffs were reduced, more imported products allowed, and restrictions on foreign financial service industries in the ROC were relaxed. On the other, through some tax incentives, firms were encouraged to develop from labor-intensive industries to capital and technology-intensive fields, in response to external challenges.

Meanwhile, in order to encourage the industry to accelerate technological upgrading, the government created a conducive technological environment to induce private investment to venture into high-tech fields. Hsinchu Science Park was thus established and the government also provided tax incentives through the "Statute for Upgrading Industries" to promote private investment in R&D and high-tech fields. ITRI, however, was established as an intermediary channel for technology transfer. With the support of Science and Technology R&D Programs funds, the ITRI gradually grew to make up for the lack of private R&D capabilities as well as support and expand private R&D energy. Further, supporting the development of key industries with the focus to support strategic industries has also created the robust growth of the semiconductor industry. This section, will discuss the government's vital industrial development strategies since the 1980s, in terms of its Science Parks, ITRI, and Technology Development Program, including the "Statute for Upgrading Industries" (hereinafter referred to as the Upgrading Statute).

- **Establishment of Hsinchu Science Park [9]**

  After the first oil crisis in 1973, the government realized that the ROC's industrial development was based on a fragile labor-intensive structure and would be adversely impacted in a downturn. The development of high-tech and high value-added industries has become the ROC pursuit. In order to attract foreign investment in high-tech industries and transfer of technology, the government must first provide a favorable environment. The plan was to establish a science park, functioning like Silicon Valley in California. A strategic location of the park, abundant supply of talents, and the support of technology were the mandatory conditions. This is also to include the technical support from ITRI. Hsinchu was selected as it has two universities specializing in science and technology, Tsinghua University and Jiaotong University, so there was no fear of shortage of talent. In addition to the preferential measures for the supply of talent, land, and factories, the government established the Hsinchu Science Park in 1980, and in the previous year (1979), the "Act for Establishment and Administration of Science Parks" (hereinafter referred to as the Parks Act) was passed to provide five-year tax exemptions (Article 15 of the Parks Act). Parks Act also granted exemptions from import tariffs, commodity tax, and business tax (Article 17 of the Parks Act) on importing machinery and equipment for self-use as well as raw materials, and semi-finished products.

- **Technical Support from ITRI and Technology Development Program [7]**

  In order to understand the shortcomings of insufficient number of domestic firms engaging in R&D activities and to improve the technological level of the overall industry, the Ministry of Economic Affairs established a number of research institutes to support the upgrading of private technology, of which the ITRI was the largest with the most funds and abundant talent. ITRI's main task was to engage in technology and product development related to industrial development and to spread technological achievements to private firms. ITRI also provided technical support and services for SMEs, which was a vital channel for the government to intervene in industrial R&D. Notably, the science and technology research projects that required huge fundings were mostly carried out by ITRI and its affiliated institutes.

  The Technology Development Program, implemented by the Ministry of Economic Affairs since 1968, was engaged in application research and technology development. Its main objective in ensuring the ROC's economic development is to promote industrial investment in R&D, strengthen economic strength, and improve the quality of life of its people. The main positioning of the plan was: (i) promote the development of emerging high-tech industries (key technology components); (ii) promote the upgrading of traditional industries (modernization, automation); (iii) establish industrial development infrastructure; (iv) improve resource utilization efficiency; and (v) solve common industry problems (pollution prevention, industrial safety, etc.). The way of implementation was to entrust more than 10 research institutes, such as ITRI and Institute for Information Industry, to carry out R&D and then transfer the results to private firms to enhance their technological competence in the industry. Over the past three decades, the Technology Development Program has made an indelible contribution to the ROC's industrial upgrading.

- **Tax incentives under the Upgrading Statute [10]**

  The Taiwanese dollar (TWD) has appreciated sharply since the mid 1980s while labor wages continued to rise and land acquisition became increasingly difficult. These made the ROC's labor intensive industries gradually lose their comparative edge, thereby weakening the competitiveness of their products in the global market. Therefore, it was urgent to seek new competitive advantages by accelerating industrial upgrading and increasing the added value of products. In view of this, the government passed the Upgrading Statute at the end of 1990, replacing the "Investment Incentive Act". It was officially implemented by the Executive Yuan on 1 January 1991.

  The tax incentives under the statute included: (i) the use of tax credits and incentives to encourage firms to conduct R&D, automation, and talent training (Article 6); (ii) tax credit on investment in stocks held by important technology and investment enterprises (referred to as Shareholder Credits) (Article 8); (iii) five-year tax exemption or shareholder credits for valuable technology, critical investment, and venture capital business (referred to as five-year tax exemption) (Article 8-1); (iv) important causes may retain surplus (referred to as retained surplus) within a limit not exceeding twice the capital amount (Article 15), and more.

  Upgrading Industries Statute provided tax credits and tax relief stimulus for the most directly related industrial upgrading activities, such as R&D, talent training, automation, and other "specific functions". At the same time, it also provided shareholder credits or five-year tax exemption for important technology and investment undertakings, which was basically an industrial policy tool to promote industrial upgrading through tax reduction and exemption measures.

  The statute's biggest feature was that the industry-specific incentives were greatly reduced while functional incentives were emphasized. In the past, the Investment Incentive Act

provided different levels of tax to targeted production industries, industrial and mining industries, strategic industries, etc. through five-year (or four-year) tax exemptions, accelerated depreciation, taxation limits, relaxation of retained earnings, and tariff reduction, focusing on "industry-specific" rewards. Conversely, the Upgrading Statute deducted tax relief measures for specific functions, such as R&D, talent training, automation, and other activities directly related to industrial upgrading.

The ROC faced both internal and external pressures since the 1980s. By implementing economic liberalization, industrial upgrading became an inevitable choice for the ROC's economy. Industrial upgrading and appropriate industrial policies (science parks, ITRI, planning and supporting key industries, etc.) as well as the efforts and planning of technocrats, such as Sun Yun-suan and Li Kwoh-ting, made the ROC gradually move from labor-intensive to technology- and capital-intensive sectors. It began to have the ability to withstand large fluctuations in the economy.

The industrial policy has proven to be more market-friendly by introducing technology, providing funds, encouraging exports, and did not distort the market function, which was affirmed by the World Bank (1993). However, the planning of policies (hardware) still required the matching of software to be effective. The supporting software was the implementation of the concepts of economic liberalization, political democratization, and social pluralism, which have been planned by the government and coordinated by the people since the 1980s. The implementation of the aforementioned concepts not only accelerated the development of talents, return of overseas high-tech talents, and pooling of funds, but also help strengthened the effects of industrial policies, such as the cultivation and injection of talents. They played a catalytic role in the establishment of science parks and high-tech industries, which was conducive to the upgrading of the overall industry. Due to the efforts of industrial upgrading, the ROC was able to break through the competition of labor-intensive products from Southeast Asia and PR China and maintain its export competitiveness. This allowed the ROC to avoid the Asian financial crisis in 1997.

Liberalization and internationalization also helped the ROC to sidestep the Asian financial crisis in 1997 as its efficiency has improved sufficiently to respond to emergencies. Therefore, the government should continue to implement the policies of liberalization, internationalization, and privatization, and accelerate the transformation of the government, so that the business community can further enhance their international competitiveness, build resilience, and be more responsive to economic fluctuations.

Period of Economic Globalization (2000–07)

Entering the 2000s, the wave of globalization became more prevalent with the accelerated pace of foreign investment and firms' global layouts. However, due to the political confrontation relating to both sides of the Taiwan Strait, the ROC held considerable control over mainland investment, including the "Proactive Liberalization with Effective Management" announced in 2001, followed by the "Proactive Management with Effective Liberalization" in 2006, as highlighted by Ouyang Chengxin, Dong Anqi et al.

i) Proactive Liberalization with Effective Management

At the meeting of the Economic Development Advisory Conference (EDAC) held in August 2001, a consensus was reached that "Proactive Liberalization with Effective Management" should be the main axis of the economic and trade policies with the mainland. The policy of "no haste, be patient" implemented in the past has been relaxed.

In August 2001, EDAC held a meeting, where "promoting cross-strait economic and trade exchanges and staying in ROC" was listed as one of the five topics for discussion. The Ministry of Economic Affairs, taking into account the consensus of EDAC, compiled and completed the revised draft of the "Regulations Governing the Approval of Investment or Technical Cooperation in Mainland China". Seven principles were formulated: (i) investment products or business projects in the mainland (PR China) were simplified into two categories from the existing three: prohibited and general; (ii) regularly review and relax the projects of mainland investment industries and products; (iii) adjust the upper limit and calculation basis of the cumulative amount of investment in the mainland; (iv) encourage the return of investor funds; (v) specify the examining procedures and establish an examining mechanism for cases with more than USD20 million; (vi) adding factors that should be considered for general mainland investment cases; and (vii) establish a dynamic adjustment mechanism.

ii) Proactive Management with Effective Liberalization

On New Year's Day in 2006, President Chen Shui-bian announced the policy direction of " Proactive Management with Effective Liberalization" of cross-strait economic and trade relations, and advocated that cross-strait exchanges must be based on the principle of the ROC's subjectivity and overall interests. He stressed that the role of the government must "actively" take on "management" responsibilities in order to "effectively" reduce the risks of "opening up". "Proactive Management with Effective Liberalization" has replaced the policy of "Proactive Liberalization with Effective Management" that had been implemented for many years, and became the new guiding principle of cross-strait economic and trade policies in the future.

However, with the rise of PR China's economy and its low production costs, even under heavy government control, the amount of investment in the mainland has not decreased, but increased year by year. In particular, manufacturers registered companies in Hong Kong, Singapore, the Cayman Islands, and the Virgin Islands, and invested in PR China as a third country, which was an easy way to elude government regulations and improve the flexibility of capital allocation.

The most important economic and trade policy during this period was the accession to the WTO. Although the opening of the market has had an impact on the ROC, it also took this opportunity to adjust and accelerate its industrial upgrading and transformation. At the same time, the opening of foreign markets to the ROC also created many business opportunities.

iii) Accession to WTO

At the end of 2001, WTO passed the ROC's membership application and became an official member on 1 January 2002. Joining the WTO meant that the ROC can participate in international economic affairs on an equal footing and face the international challenge of "openness and competition" head-on. In addition to enjoying the same rights as other members, participating in the creation of global trade rules, and sharing the benefits of liberalization, all members must abide by the WTO rules, commitment to membership, and fulfill responsibilities as a WTO member. Therefore, the accession to WTO was of great significance.

Joining the WTO brought benefits for domestic players to expand into the international market. The expansion promoted industrial transformation and upgrading, and had a positive effect on the long-term development of the overall industry. It however had a short-term impact on the opening of agricultural, industrial, and service markets for which the ministries and committees had already formulated specific countermeasures in advance.

Important industrial policies that were implemented during this period, including:

- Establishment of Nankang Software Park and the free trade zones
- Development of the Central Taiwan Science Park
- Implementation of the Business Merges and Acquisitions Act
- Promotion of the Two Trillion, Twin Star Industries, and the 006688 plan
- Promulgation of the "Knowledge Economy Development Program and Action Plan"
- Adoption of the "Act for the Development of Biotech and Pharmaceutical Industry"

iv) Establishment of Nankang Software Park

Nankang Software Park is the first professional software industrial park in the ROC. In 1988, in order to promote industrial upgrading and guide the development of the software industry, the Ministry of Economic Affairs began the deliberation on smart industrial parks. In 1989, the ministry conceived the expansion of Nankang Software Park into Nangang Economic and Trade Park. In 1990, the Executive Yuan approved the proposed "Nangang Economic and Trade Software Special District Development Project" and established the Nangang Economic and Trade Park Steering Group to develop it as a Operate-Transfer. In 1994, the park broke ground. In 1996, the Ministry of the Interior approved the Nangang Economic and Trade Park Development Project drawn up by the Taipei City Government. The software park officially opened in 1999.

v) Development of the Southern Taiwan Science Park

Southern Taiwan Science Park was established in the late 1990s. By the end of 2010, the number of approved companies in the Southern Taiwan Science Park had reached 167 with 45 in the optoelectronic industry and 44 in the biotechnology industry. There were 56,388 employees, an increase of 7,762 by the end of 2009. The main industrial clusters include optoelectronics, integrated circuits, precision machinery, green energy and energy-saving industries, and biotechnology and medical equipment industries. At present, there are 120 manufacturers in mass production and 13 factories are under construction in the park.

vi) Development of the Central Taiwan Science Park

The Central Taiwan Science Park is the third science industrial park after Hsinchu Science Park and Southern Taiwan Science Park. In 2002, the Executive Yuan officially approved the Overall Planning of the Central Taiwan Science Park; in 2003, the Central Taiwan Science Park Provisional Office was established; in 2007, the Central Taiwan Science Park Bureau was established, under the purview of the National Science Council of the Executive Yuan.

The scope of this science park includes Taichung, Huwei, Houli, and other bases. It is conveniently located close to National Highway No.1, National Highway No.3, Taiwan Railway, Taiwan High Speed Rail, Taichung International Airport, and Taichung Port. Further, Chi-Nan, Zhongxing, Chaoyang, and other universities have moved in to set up innovation or new-venture incubators. Therefore, the Central Taiwan Science Park is not only able to combine the original industrial characteristics of the central ROC, but also links Hsinchu Science Park and Southern Taiwan Science Park to form a high-tech corridor in western ROC.

vii) Promulgation of "Act for the Development of Biotech and Pharmaceutical Industry"

Although biotechnology is one of the eight key technologies and one of the "Two Trillion and Twin Star" industries, no new drugs have been developed in the ROC. In 2007, the government passed the "Act for the Development of Biotech and Pharmaceutical Industry", targeting domestic high-risk medical devices and new drug development. Through the loosening of the law, officials and academics can cooperate with and complement with the industry, providing more lenient treatment in tax law and fund raising.

In addition, the National Development Fund of the Executive Yuan plans to invest in biotechnology development companies and link the two biomedical parks in Hsinchu and Nangang to introduce international-level R&D and high level talents. Applicable industries mainly include: new drugs (used in humans, animals, and plants) and high-risk medical equipment industries; new drugs that have been approved by the central competent authority as being made with new composition, new therapeutic compounds, or new method of administration. All these are under the purview of the Ministry of Economic Affairs. The preferential areas include R&D of new drugs and high-risk medical equipment, personnel training, and registered shareholders that can deduct the profit-seeking enterprises' income tax. When employees acquire technology shares, income tax is levied only when the shares are transferred. When biotech and new pharmaceuticals companies undertake R&D programs entrusted by the government, the government would prepare a budget to pay their business tax. The government would also donate technical assistance units as part of technical assistance. This act was implemented until the end of 2021.

Main Factors for Breaking Through the Middle-income Barrier

1970s to 2000s

Based on the foundations laid by the ITRI, Hsinchu Science Park, and other infrastructure and export-oriented policies in the 1980s, coupled with vigorous development of the electronic information and semiconductor industries and the hinterland of the PR China market, the ROC's economy grew rapidly. The establishment of public-research institutes (such as ITRI, the Institute for Information Industry (III), etc.) enabled the ROC's SMEs with weak research capabilities to obtain cheap technology transfer, which increased their R&D capabilities and facilitated them to upgrade.

Between 2000 and 2016

Due to investment in PR China, many traditional industries were hollowed out and a few electronic information industries, such as panel and LED industries, also faced fierce competition from PR China's firms. However, most of the electronic information industry belonged to the complementary pattern of trade in intermediate goods. Thus under the umbrella of the mainland market, they could still achieve considerable growth. However, as a result of the low gross profit margin, the ROC's economic growth began to show signs of sluggishness. The average growth rate from 2002 to 2010 was 4.1% and a drop to 2.9% in 2010–19. However, making good use of the bases in PR China and Southeast Asia had achieved economies of scale. In addition, many triangular trades (transactions between domestic companies and overseas subsidiaries) still made considerable economic contributions to the ROC. In 2004, ROC's per capita income exceeded USD15,000, and reached the level of USD20,000 in 2011.

Between 2017 and 2022

Thanks to the overseas deployment in the past few years, including the New Southbound Policy of ASEAN countries, investment in PR China, and the policy of encouraging the return of Taiwanese businessmen since 2020, the ROC has become one of the economies in the world without supply chain

disruptions amid the USA-PR China trade war and the COVID-19 global pandemic. With a high growth rate of nearly 20% in exports and investment, the ROC has performed excellently: reaching a 6.57% growth rate in 2021, USD7,000 increase in per capita income, and a high growth rate of an average of 4% annually from 2019 to 2022.

In terms of per capita GDP, it exceeded USD15,000 in 2004, but the economic growth had slowed down from 2000 to 2008. The per capita GDP exceeded USD20,000 in 2011, and the economic growth was even slower from 2008 to 2016. The low growth rate from 2000 to 2018 was mainly due to the fact that overseas investment reduced the domestic growth momentum. However, overseas firms in PR China and Southeast Asia have also enabled the ROC to build up scale barriers in production, and accumulating impetus for subsequent development. In 2019, the outbreak of COVID-19 had driven online shopping, entertainment, work, and study, which also led to the explosive growth of the ROC's 3C products - computer, communications, and consumer electronics. The overall economic growth rate was about 3.91% (2.7%, 3.11%, 6.59%, and 3.28% in 2019, 2020, 2021 and 2022, respectively {estimated value}) while the overall growth rate of the information electronics industry in 2021 was 11.49%, far exceeding 7.88% in 2020.

At the same time, the ascending USA-PR China trade war also drove the effect of rush order and switching order in semiconductors with a high growth of an average of more than 20% (22%, 26.8%, and 18.3% in 2020, 2021, and 2022, respectively). In 2021, the export value of semiconductors accounted for 34.8% of the ROC's total export value, creating a trade surplus of USD74.1 billion, which also restored the vitality of the ROC's economy. GDP per capita has exceeded USD30,000 in 2021, breaking through the barrier of middle-income trap.

Impact and Responses of COVID-19 and the USA-PR China Trade War on the ROC

During the rage of COVID-19, the ROC carried out appropriate pandemic prevention, early preventive measures, and Zero-COVID strategy. The virus has duly impacted the service industry, but the manufacturing industry remained unaffected. As the private consumption was at almost zero growth, the government implemented bailouts and revitalization programs (such as Triple Stimulus Vouchers and Quintuple Stimulus Vouchers) that prevented the impact of private consumption from further spiral.

During the pandemic, the demand for remote work, study, entertainment, and education has dramatically increased the demand for the ROC's 3C products, information security products, and servers, which also pushed the export and investment of electronic information products. In addition, the return of Taiwanese firms made the ROC's international layout more complete, which enabled the APO member avoid supply chain disruptions.

Due to the USA's imposition of tariffs on PR China and the planning of the entity list (such as blacklisted Chinese firms on the entity list and American firms not allowed to export nor invest with them), it resulted in order grabbing and order transfer in the mainland. This, coupled with new technologies, such as AI, Internet of Things (IoT), 5G, and automotive electrification, steered the explosion of semiconductor demand, which is conducive to the vigorous development of the ROC's semiconductor industry exports and investment.

Devoid of supply chain disruptions and due to the USA-PR China trade war and COVID-19, the ROC had the competitive edge. When PR China was locked down, the ROC could ship supplies overseas domestically and from Southeast Asia. Once Southeast Asia faced lock down, the ROC was able to export from its shores and the mainland. The ROC, with its complete international layout and secure supply chains, was also one of the economies benefiting from the trade war.

Several factors can be summarized on the ways the ROC's economy has benefited from the new pandemic and the USA-PR China trade war:

- Right people - in terms of leadership in implementing early preventive measures, it limited the impact of the pandemic
- Right place - its locations enabled supply to Southeast Asia, PR China, India, Latin America, Eastern Europe, plus the return of Taiwanese firms provided a complete international layout without chain disruption
- Right time - new high demand driven by the COVID-19 and the USA-PR China trade war

Table 3.2 highlights the ROC's economic performance in 2020–22.

TABLE 3.2

ROC'S ECONOMIC PERFORMANCE BETWEEN 2020–22

	2020	2021	2022*
Economic growth rate	3.36	6.57	3.28
Growth rate of exports	1.22	17.14	4.52
Private investment	4.53	19.91	5.80
Inflation rate	-0.24	1.97	3.02
Unemployment rate	3.85	3.95	3.70

Source: Compiled by this project.
Note: * is the predicted value.

Suggestions and Learnings for Other Countries

The ROC's experience in economic development can be used as a reference and case study for other countries. There are several learnings:

- **Learning one** - Manufacturing countries can break through the middle-income trap through innovation and investment (Chen Tianzhi, 2022). Unlike the ROK, the ROC has no brand and no marketing channels. However, as a result of active overseas investment, global layout, and forming strategic alliances, it has become an established OEM for international companies. With advanced technology and stable orders, the ROC has begun to enjoy economies of scale and scope, and become an indispensable OEM partner for international companies, which has also created considerable barriers to entry. Although the gross profit margin is not high, it has steady profits as a result of the global layout and the expansion of the number. This is the key to stable economic growth.
- **Learning two** - The layout and policies of major industries are still necessary [11]. The ROC's investment in semiconductors in the 1980s was subsidized by public-research institutes and Technology Development Program to reduce the risk of initial investment in semiconductors and leverage effect of the economy's resources [8]. This is also an important factor for the take-off of the semiconductor industry after 2000 [12]. For the electronic information industry, although the government's policy intervention is not obvious, the ROC's capital market also contributes to the provision of the necessary funds for the electronic information industry to grow, expand, purchase/merge, upgrade and transform, and internationalize.

The biotechnology industry, supported by the government's Act for the Development of Biotech and Pharmaceutical Industry, tax incentives, subsidies, and technology investment, has also achieved certain results, although it is still not comparable to the scale and influence of semiconductors. Undoubtedly, it's still necessary to respect market mechanism in terms of the implementation of government policy tools. For example, the ROC emphasizes functional incentives (such as support or tax reduction for R&D, personnel training, pollution prevention, and other functional activities, etc.), infrastructure, public-research institutes, investment in the establishment of science parks, rather than direct involvement in the market.

- **Learning three** - Infrastructure and talent investment are fundamental. From the establishment of export processing zones in the early stages to the investment of science parks and public-research institutes in the middle and late stages, the ROC has also achieved certain effectiveness in reducing the risks of early R&D and personnel training conducted by private institutions. The ROC's heavy investment in post-secondary education has cultivated an abundant line of talents and engineers, who will assist in the planning, development, and production that will spur rapid industry growth.

- **Learning four** - Intellectual property rights, equipment value-adding, and appropriate localization are of great importance to nurturing the industry. Although the LED, TFT-LCD, and other industries in the ROC were booming in the early days, the equipment was mainly imported with insufficient R&D investment, and industrial upgrading was limited. Once foreign countries purchase more advanced equipment and recruit talents, the industry will be destroyed, which explains why the ROC fell into the quagmire of growth between 2000–15.

- **Learning five** - Make good use of international resources and carry out international division of labor. The ROC's resources were limited, so it chose to cooperate with American firms and made good use of PR China's market, creating today's electronic information and semiconductor industries in the ROC.

- **Learning six** – Ensure long-term supervision and evaluation of government projects and policies. The Council for Economic Planning and Development (now the National Development Council) regularly conducts a four-year supervision and evaluation of effectiveness on all government policies and industrial development projects as a basis for policy adjustment. This is good practice that other countries may take note of and refer to.

SINGAPORE'S DEVELOPMENT EXPERIENCE

Singapore's Economic Growth Stages and Driving Factors

Since the founding of Singapore, with its strategic geographical location, efficient administrative system, and open business environment, the city nation has become high-tech and embedded in the international market in no time. At present, financial services, tourism, and precision manufacturing are its main driving forces. This chapter will review Singapore's economic development since the 1970s, covering GDP growth trends and per capita GDP performance, exploring its different development stages, focusing on the key factors driving structural transformation and government policies, and then proposing directions for other emerging countries to learn from.

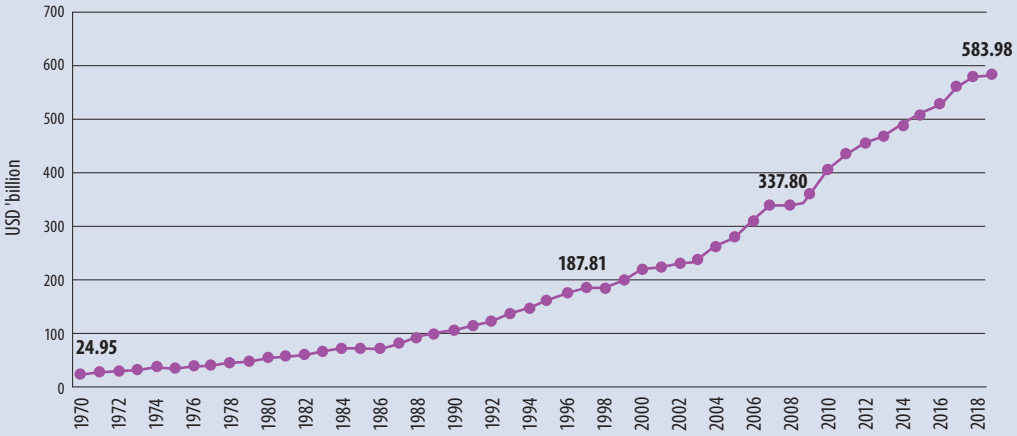
Singapore's Overall Economic Performance

The island country's economic performance is seen in Figure 3.1 that uses constant market prices (using 2017 PPPs, reference year 2019) as the calculation benchmark. Singapore's actual GDP grew steadily from the range of USD22 billion to USD50 billion in the early 1970s and early 1980s, and began to

accelerate in the late 1980s. It reached a swing high of USD187.81 billion in 2018. However, after the 1997 Asian Financial Crisis, Singapore's export-oriented economy encountered bottlenecks and stagnated temporarily. However, unlike other Southeast Asian countries that were hit hard, the Singaporean government showed its resilience. In 2000, its GDP exceeded USD200 billion and continued to grow. As of 2019, except for the stagnation in 2007–08 due to the Lehman Brothers collapse in the USA, Singapore's economy as a whole showed a step-by-step development, reaching a high of USD583.98 billion in 2019.

FIGURE 3.1

SINGAPORE'S GDP TREND (ACTUAL GDP)



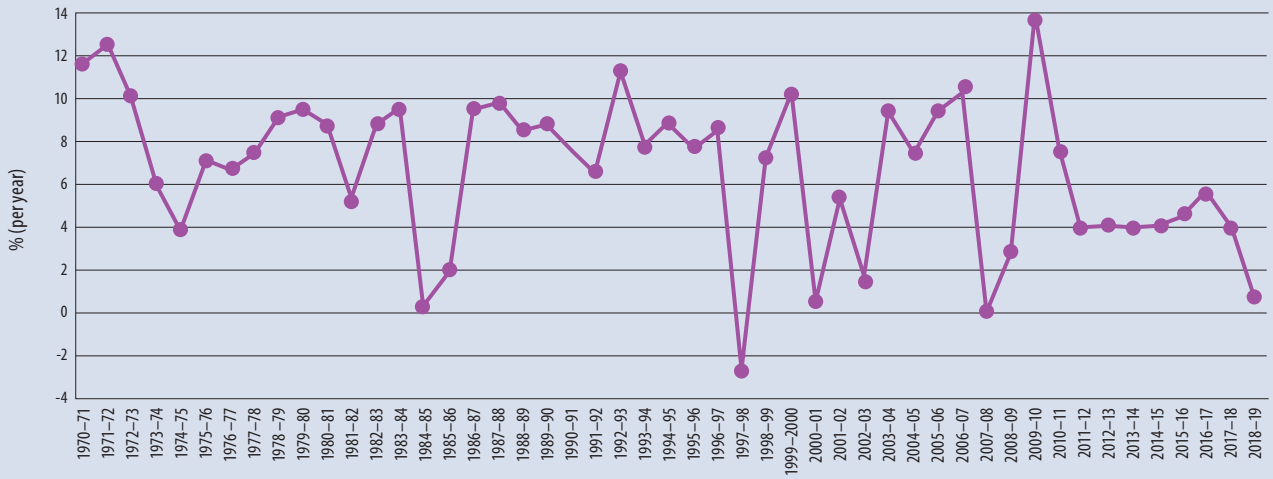
Source: APO Productivity Database 2021.
Description: GDP at market price (GDP at Constant Prices, using 2017 PPPs, reference year 2019).

The annual growth rate of the actual GDP in Singapore from 1970 to 2019 is shown in Figure 3.2. Before the Asian Financial Crisis in 1997, developing economies generally showed high growth, for example: 1971–72 (12.50% growth); 1972–73 (10.08% growth); growth rates are above 8% in most years in the 1980s; 1992–93 (11.42% growth); 1994–95 (8.85% growth); and 1996–97 (8.48% growth). In the 21st century, Singapore's social and industrial structure has gradually matured. Except for the strong rebound to 13.80% due to the low base period of the financial tsunami in 2009–10, double-digit growth has been absent. From 2018 to 2019, the growth rate was only 0.71%, which echoes the unfavorable external situation, such as the economic and trade competition between the USA and PR China, and also reflects the fact that Singapore has become a mature economy.

Based on current market prices and using annual average exchange rate, Singapore's nominal GDP grew steadily from USD2.27 billion in 1971 to over USD100 billion in 1997. It was not until 2004 that the GDP returned to the USD100 billion level after the hit of the financial crisis [13]. Since 2004, except for the subprime mortgage crisis in 2008, the Chinese stock market crash and sharp depreciation of the Renminbi in 2015, and the impact of the COVID-19 pandemic in 2019, in macro terms, its economic growth is quite solid. According to the World Bank, Singapore's GDP is to reach a new high of USD396.99 billion in 2021 (Figure 3.3).

FIGURE 3.2

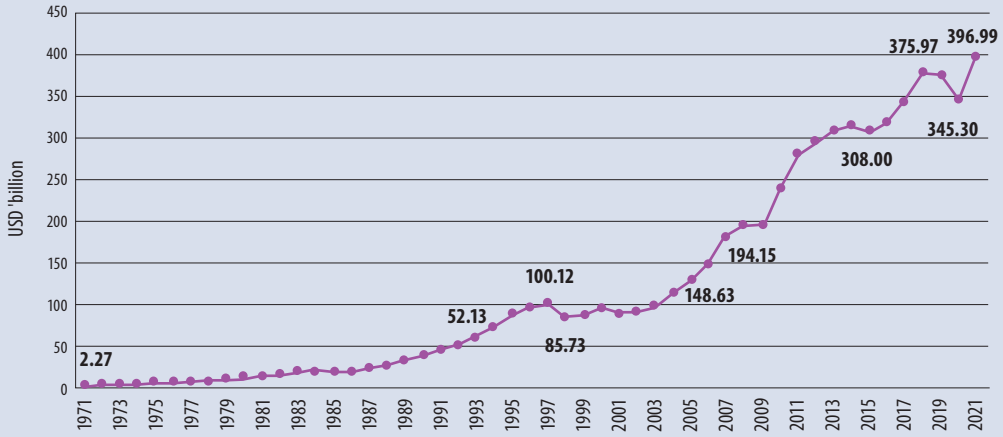
SINGAPORE'S GDP ANNUAL GROWTH RATE (ACTUAL GDP GROWTH)



Source: APO Productivity Database 2021.
Description: GDP at market price (GDP at Constant Prices, using 2017 PPPs, reference year 2019).

FIGURE 3.3

SINGAPORE'S NOMINAL GDP TREND (EXCHANGE RATE BASED)



Source: APO Productivity Database 2021 (1971-2019); World Bank National Accounts (2020-2021).
Description: GDP at market price (GDP at Current Prices in US dollars, using annual average exchange rate).

Development Stage

In the 1960s, Singapore successfully formed a labor-intensive industrial base under the impetus of two "five-year economic development plans". This chapter will integrate Qing Zhang & Jiguang Guo [14] , Jianwei Yang [15] , Yilin Wu [16], and other academic viewpoints and literature, and roughly divide the development of Singapore from 1971 to the present into five periods:

i) 1970s: High-tech industry flourished, making Singapore an emerging industrial country

In the 1970s, the rapid economic growth of Japan, the ROK, the ROC, and Hong Kong as well as the rise of labor-intensive industries in other Southeast Asian countries posed a threat to Singapore. Lee Kuan Yew (Singapore's first prime minister in 1959–90) believed that the labor-intensive industries laid the foundation in the 1960s could only be a transition. To this end, the "Ten-Year Economic Development Plan (1971–1980)" was formulated, which included raising domestic funds, attracting foreign investment, developing precision industries, focusing on improving LP, and advocating the combination of scientific research and industry that focuses on computer and computer components manufacturing, IT, software development, and other industries.

By the end of the 1970s, Singapore's per capita income was second only to Japan in Asia, and the economic structure had changed significantly. The proportion of GDP in the manufacturing and transportation industries began to increase. In the financial industry, the USD trading market in Asia was gradually developed, and the banking industry developed in a fast pace.

ii) 1980s: Becoming a modern industrial country

Singapore's economy developed rapidly in the 1970s, but it also encountered challenges, such as economic stagnation and rising protectionism in Western countries. In 1979, the Singapore government proposed a new economic development strategy, which was called the "Second Industrial Revolution". In 1981, it issued the second "Ten-Year Economic Development Plan (1981-1990)", and in the late 1980s, Singapore was successfully built into a modern industrial country with five pillar industries of machinery, trade, transportation, service, and tourism as its core.

It is worth noting that in 1985, under the pressure of weak demand in the international market and the sharp depreciation of the USD, the annual GDP growth rate that year was negative for the first time. However, the Singaporean authorities soon set up an Economic Commission, led by the Minister of Trade and Industry Lee Hsien Loong, and through highly subsidized and regulated emergency measures, the overall economy began to recover after July 1986. By the end of the 1980s, Singapore had officially transformed from labor-intensive to high-value industries. The financial and service industries had entered a new stage and its trade had changed from entrepot trade to mainly exporting domestic products.

iii) 1990–97: Period of economic internationalization and liberalization, Singapore became an international finance center

In November 1990, Goh Chok Tong took office as the second prime minister and established a set of development strategy of internationalization, liberalization, high-tech, and financial services as the core. Domestically, it mainly focused on electronic telecommunications, petrochemicals, finance, shipping, and service industries. Externally, it vigorously promoted regional economic strategies and strengthend economic and trade relations with Southeast Asia and the world's major countries.

In terms of internationalization, on the one hand, it strived for multinational companies to set up business headquarters in Singapore. On the other hand, it encouraged Singaporean enterprises to go global, strengthen economic and trade relations with countries in the Asia-Pacific region. The government also set up an "Committee on Foreign Investment" to provide tax relief, financial support, loans, and other policies as to guide and attract overseas investment.

On liberalization measures, Singapore promoted the privatization of state-owned enterprises, optimized the business environment, and expanded the role of private enterprises. On high-tech,

policy-based elimination of labor-intensive industries and technological upgrading of enterprises have been taking place while encouraging foreign investment in high-tech industries, or direct cooperation with foreign businesses. For the financial services industry, control measures have been significantly relaxed. For example, it canceled foreign exchange control and allowed foreign financial, insurance, securities, and other institutions to set up offices in Singapore.

To sum up, during this period, Singapore officially became an open economy, laying the foundation for transforming into an international finance center. Before the Asian financial crisis in 1997 both the economic growth rate and foreign trade continued to increase every year.

iv) 1997–2010: After two financial crises, Singapore's scope and process of accelerated globalization and liberalization was expanded

The Asian financial crisis broke out in 1997. Although Singapore had a medium- to long-term foreign investment structure (different from the short-term foreign investment dependence of other Southeast Asian countries at that time), it was less affected by the withdrawal of capital [17]. The decline in external demand and the devaluation of regional currency still contributed to the decline in cost competitiveness. In response to the crisis, externally, the Singapore government provided aid loans to the Southeast Asian countries which were seriously affected by the crises. Internally, it introduced relief measures, such as reducing corporate costs and taxes and accelerated the consolidation of the banking industry to make the financial system more competitive. When the economy began to recover in 1999, the government continued to adopt a phased liberalization of the banking industry, allowing foreign investors to participate in the financial system of Singapore.

In 2001, Singapore founded its Economic Review Committee. In 2003, five strategies were proposed: (i) expanding external linkages; (ii) maintaining competitiveness and flexibility; (iii) fostering entrepreneurial spirit; (iv) strengthening manufacturing and service industries; and (v) developing Singapore's manpower [18]. In addition, the rise of PR China and India made Singapore pay more attention to regional economic and trade cooperation. One outcome was the ASEAN Free Trade Area being officially launched in 2002[1].

Facing the subprime mortgage crisis in 2008, Singapore's economic growth stagnated. To this end, the Singapore government actively intervened at the end of 2008, taking measures which include: "Bridging Loan Program" to increase credit support for local enterprises, "Employment Subsidy Program" to help enterprises pay wages, "Skill Upgrading Contingency Program" to upgrade labor skills, and established the Economic Strategy Committee in June 2009. In the second half of 2009, Singapore's economy showed signs of rebounding. Leaders and senior civil servants had also taken the initiative to reduce their salaries, and the country has started to invest in large-scale infrastructure construction.

To sum up, during this period, Singapore survived two financial crises and became the "United Nations of Asia" where multinational talents and enterprises gathered [16]. In addition to the successful realization of the headquarters economic strategy, it continued to consolidate and build a multiregional center.

[1] The Fourth ASEAN Summit held in Singapore in January 1992 decided that the ASEAN Free Trade Area will be established within 15 years from 1 January 1993. By 2008, Vietnam, Laos, Myanmar, and Cambodia joined, and the ASEAN Free Trade Zone was fully completed.

v) 2010 to present: Emphasizing talents, innovation, and sustainability - creating a distinctive international city

Singapore's economy rebounded strongly in 2010. In February 2010, the Singapore Committee on Economic Strategies announced the economic development strategy report for the next 5–10 years [19], which clearly defined three development goals: high-tech talent, innovative economy, and distinctive global city. The main strategies include:

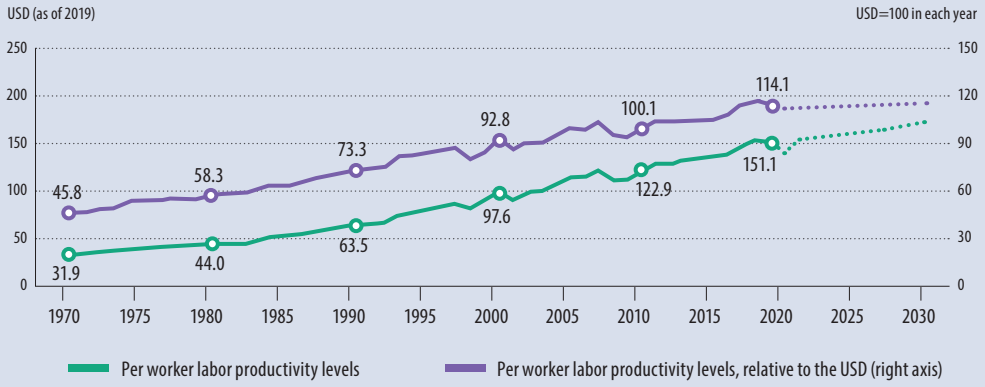
- Improve work skills - establish a "sustainable education and training system"
- Deepen corporate capabilities to make Singapore an important base for global enterprises in Asia - strengthen R&D value, increase R&D expenditure, and assist SMEs to expand overseas markets
- Develop into a distinctive global city - enrich the hardware and software infrastructure, and use land resources more efficiently

With the exception of the stagnation caused by the USA-PR China trade war in 2018 and the COVID-19 pandemic in 2019, Singapore's economy has grown step-by-step since 2010. At present, a number of industrial clusters, such as electronics, chemicals, biomedicine, media, logistics, and finance have been formed. More than 7,000 multinational companies have set up operating agencies in Singapore, of which 4,200 have set up regional headquarters in Singapore, which is the largest among Asian cities.

In terms of financial technology, Singapore became the first country in Asia and the top three countries in the world to implement a regulatory sandbox in 2016. In terms of advanced manufacturing, Singapore has invested in the infrastructure of advanced manufacturing, building a strong research ecosystem, and dedicated to becoming a global business, innovation, and talent hub for advanced manufacturing by 2030.

FIGURE 3.4

SINGAPORE'S LP TRENDS PER WORKER (COMPARED TO THE USA)



Source: APO Productivity Databook 2021.
Description: USD '000 (constant prices and 2011 PPP, reference year 2014).

To sum up, Singapore, after 2010, is already a highly mature economy pursuing high-level values, such as innovation and sustainable development. The core values of actively facing global environmental

changes, high openness, and attracting global talents will continue to be the cornerstone of its development.

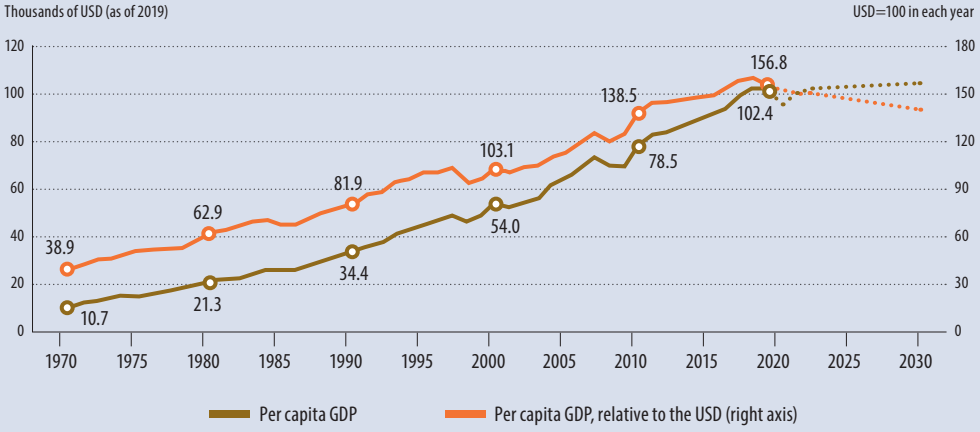
Notably, Singapore's per worker LP has continued to climb since the 1970s, reaching over USD120,000 in 2010, a level comparable to that of the USA (Figure 3.4). Overall, it can be regarded as the result of investment in Singapore's talent policy, education system, and the development of high value-added industries.

Growth and Breakthrough of Per Capita GDP

Highlighted in the APO Productivity Databook 2021, Singapore's actual per capita GDP has generally risen step-by-step since 1970, reaching USD102,000 in 2019. Further comparison with the USA shows that from the late 1990s to the early 2000s, Singapore's actual GDP per capita is at the same level with the USA, and it continued to expand. By 2010, Singapore's actual per capita GDP was USD78,000, which was 1.38 times of that of the USA in the same period. By 2019, it has exceeded the USA by 1.56 times during the same period (Figure 3.5).

FIGURE 3.5

SINGAPORE'S ACTUAL GDP PER CAPITA (COMPARED TO THE USA)



Source: APO Productivity Databook 2021.
Description: GDP at market price (GDP at Constant Prices, using 2017 PPPs, reference year 2019).

Figure 3.6 calculates with current market prices using annual average exchange rate. Singapore's nominal GDP per capita exceeded USD10,000 in 1989 and exceeded USD15,000 in 1992. In more than two decades, Singapore's nominal GDP per capita rose from USD1,071 to USD16,136 in 1992. This mainly attributes to the success of the second "Ten-Year Economic Development Plan (1981–1990)" and Goh Chok Tong's succession process encountered no unstable political and economic fluctuations.

High value-added industries help boost per capita income. In the early 1980s, the industrial and enterprise structure in Singapore was upgraded smoothly through:

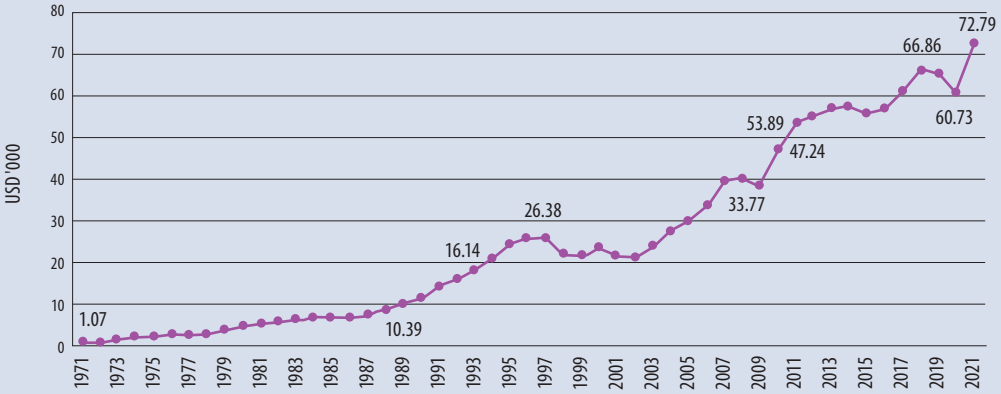
- Adjustment of salary policy to eliminate labor-intensive industries
- Encouraging foreign investment to invest in high-tech industries and provide preferential treatment

- Encouraging scientific and technological R&D, and establish the National Computer Committee to introduce foreign experts

- Improve the quality of human resources

FIGURE 3.6

SINGAPORE'S TREND OF NOMINAL GDP PER CAPITA (BASED ON EXCHANGE RATE)



Source: APO Productivity Database 2021 (1971-2019); World Bank National Accounts (2020-2021).
Description: GDP at market price (GDP at Current Prices in US dollars, using annual average exchange rate).

Facing the depression in 1985–86, the government began to promote the operation headquarters plan, whereby attracting multinational companies to set up headquarters through tax concessions [20]. In addition to manufacturing, the companies were allowed to operate other businesses, such as product design, engineering support, marketing, financial management, and fund management [21]. The Singapore government also diversified its economy. Although multinational corporations were the backbone, it tried hard to avoid over-reliance by all means. Therefore, through the leadership of the two "government-linked enterprises" of the Government of Singapore Investment Corporation and Temasek Holdings, they played a specific role in market action [22].

With the government's intervention, Singapore ended the argument that developing countries will never develop after being highly dependent on foreign investment. Right around when Goh Chok Tong took over as prime minister, it became an emerging industrial country driven by high-tech, high-value industries and financial industries.

Critical Periods of Structural Transformation, Key Success Factors, and Government Policies

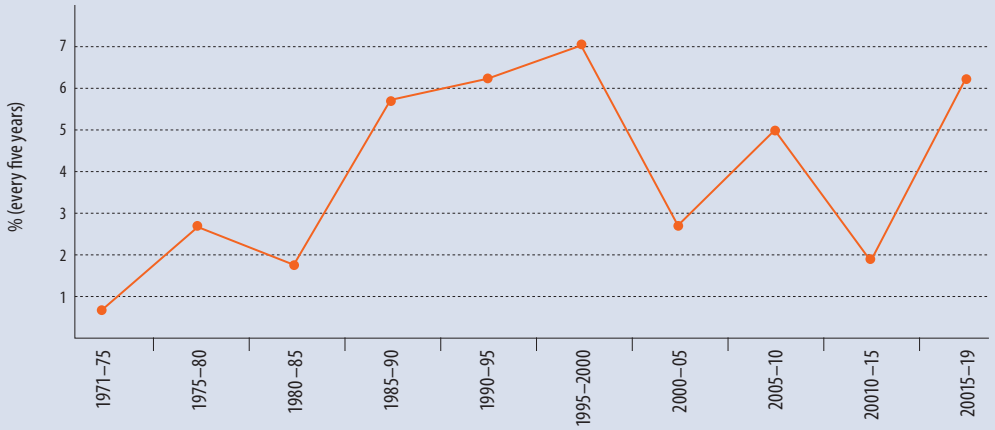
To explore the critical period of Singapore's structural transformation requires delving into the perspective of industrial transformation. One is the upgrading from an emerging industrial country to a modern industrial one, the other is the process of transforming from manufacturing to knowledge service industry. This chapter will explore literature by Xinzhi Ke [23], Jianyi Lu [24], Qing Zhang and Jiguang Guo [14], Mingfeng Wang and He Yuan [25], and others, summarizing the key factors of the two periods of Singapore's economic structural transformation.

First Critical Period: Upgrading to Become a Modern Industrial Country

Singapore became an emerging industrial country in Asia in the late 1970s and a modern industrial country dominated by capital and technology in the early 1990s. By observing the growth of LP in the manufacturing industry (Figure 3.7), it shows that the periods of 1985–90, 1990–95, and 1995–2000 were the outbreak of LP in Singapore's manufacturing industry. The growth rate reached a peak of 7.05% from 1995 to 2000. It reflects the appearance of Singapore after the success of the "Second Industrial Revolution" and upgrading to a modern industrial country.

FIGURE 3.7

SINGAPORE'S LP GROWTH EVERY FIVE YEARS IN MANUFACTURING (%)



Source: Asian Productivity Organization (APO).

Summarizing the main success factors, in addition to the Reform and Opening of mainland PR China and the external pressure caused by the entry of developing countries in Southeast Asia into the competition, the political elites headed by Lee Kuan Yew have successfully implemented the path of a development-oriented country and effectively promoted policies and measures related to the "Second Industrial Revolution", as listed below:

- Forcing companies to turn to technology and capital-intensive industries. From 1979 to 1981, the salary policy has been substantially adjusted for three consecutive years, increasing by 20%, 19%, and 16%, respectively. In addition, the "Computerized Production Plan" issued in 1984 required enterprises to put into mechanized production as soon as possible and take advantage of the situation to transfer labor-intensive industries to other countries.

- Encourage foreign businesses to establish partnerships with local enterprises, and guide foreign capital to invest in high value-added industries. For high-tech enterprises, they can enjoy the tax-free policy for 5–10 years. Specific industries were pursued, such as automation equipment components, mechanical equipment, medical equipment, chemical drugs, computer software and hardware, optical instruments, electronic equipment, hydropower products, etc. The Income Tax Law was also amended to provide double tax deductions for expenditures on R&D projects.

- Singapore differentiated from other East Asian countries and attracted foreign investment with its operational headquarters and financial environment. In 1986, the "Multinational Company

Operational Headquarters Plan" led by the then Minister of Trade & Industry Lee Hsien Loong began to attract foreign investment. In 1988, 17 financial and nonfinancial companies have been certified as operating headquarters; 50 multinational companies have applied to set up headquarters in Singapore. Only 10% corporate tax was levied on the aforementioned companies, encouraging them to invest in high-value industries.

- Strengthen technical training and improve the quality of manpower, such as organizing training courses for colleges and jointly hold training centers with multinational companies. At the same time, encourage university graduates to enter multinational companies. In addition to driving Singapore's salary level, it can also learn advanced technology and management methods through local talents.

- Develop the southern island into a petrochemical production base and distribution center, and build the first aviation industry center as well as expand the Singapore Technology Park to accommodate the technology industry.

With the implementation of the aforementioned policies, it took only a decade or so for Singapore to upgrade from a newly industrialized country to a modern industrialized country. Actual GDP grew from USD51.49 billion in 1980 to USD104.83 billion in 1990 and it ranks first in terms of economic growth rate and per capita income among the Four Asian Tigers.

Second Critical Period: Development Path of Knowledge Economy and High-End Service Industry as the Main Axis

In the 1990s, PR China and Southeast Asian countries started to gradually promote industrial upgrading, and the Singaporean government realized that only by developing knowledge economy and high-end service industry, can it survive. After Lee Hsien Loong took over as the third prime minister in 2004, he became more aware that "knowledge" is the key to Singapore's competitiveness. Since then, the Singapore government has continued to promote the development of knowledge economy. The policy measures are listed as follows:

- Adopt a loose new immigration policy, attract a large number of overseas elites with professional knowledge and assets, and grant them permanent residency or citizenship. The “National Population Policy Committee” was established in 2004 while the "National Population Secretariat" in 2006. The introduction of personalized employment certificate, with which holders can apply for permanent residence in Singapore through the "Professional, Technical and Skilled Workers Scheme (PTS)".

- Create a headquarters economy, adopt an economic circle development strategy with Singapore as the center and a seven-hour flight distance as the radius. Build regional centers - World Trade Center, Seaport Transit Center, Aviation Center, Conference Center, Education Center, Healthcare Center, International Medical Center, and Financial and Wealth Management Center. In response to the financial center and headquarters economy, it has actively signed economic and trade cooperation agreements with major economies and Asia-Pacific countries.

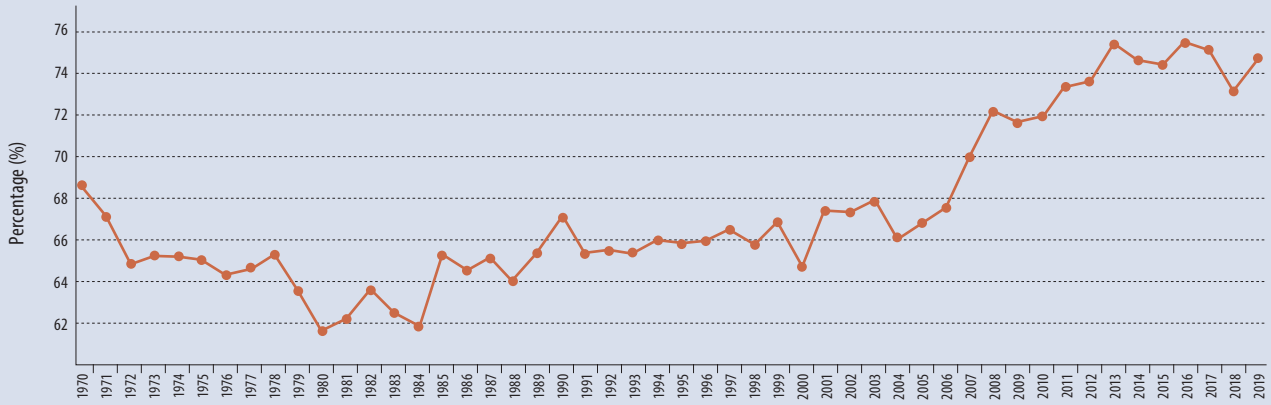
- The financial industry is a knowledge industry with high added value. Since the 1980s, the Singapore government has continuously aimed to build and consolidate an international financial center. It is mainly promoted through strategies, such as allowing free trading and circulation of foreign exchange, allowing foreign banks to set up branches, becoming an Asian dollar exchange, and actively communicating with international financial markets. For example, the introduction of online financial services in 1991, the implementation of the USD check settlement system in 1996, the phased liberalization of the banking industry in 1999, and the Singapore dollar joined the Asian currency of the Continuous Linked Settlement International Settlement Mechanism in 2003.

- Development of knowledge-intensive industries. The 1997 financial turmoil made the Singapore government realize the importance of diversification of the industrial structure and knowledge-intensive industries, such as biomedicine and information and communication were highly valued. To this end, the Singapore government first established the Biomedical Research Council (BMRC) and the Science and Engineering Research Council (SERC) to strengthen basic research in the biomedical and information and communications industries. Second, it established scientific scholarships to fund research activities. Third, in the Singapore Science Park and the National University of Singapore, the Singapore Science and Technology Research Center - One-North - was built to develop the biomedical and information communication industries. Entering the 21st century, Singapore has formulated a series of economic development strategies, such as the "Industry 21 Plan", among which the high-tech strategy is aimed particularly at the biomedical industry.

To sum up, by observing the trend of the GDP proportion of Singapore's service industry, it can be found that after 2007, the GDP share of Singapore's service industry has maintained a high proportion of more than 70% (Figure 3.8). Looking forward to the future, when Singapore's knowledge-based economy matures, the demand for intellectual property protection and arbitration will increase, which will continue to create more added value and highly professional jobs. As in April 2021, the Intellectual Property Office of Singapore released the "Singapore Intellectual Property Strategy 2030" [26], a 10-year blueprint to build Singapore into a global hub for intangible assets and intellectual property status. Singapore's knowledge economy is expanding toward legal services, institutional creation, and even international arbitration, cross-border marketing, and other fields.

FIGURE 3.8

SINGAPORE'S GDP PROPORTION OF SERVICE INDUSTRY (SERVICE GDP SHARE IN %)



Source: Asian Productivity Organization (APO).

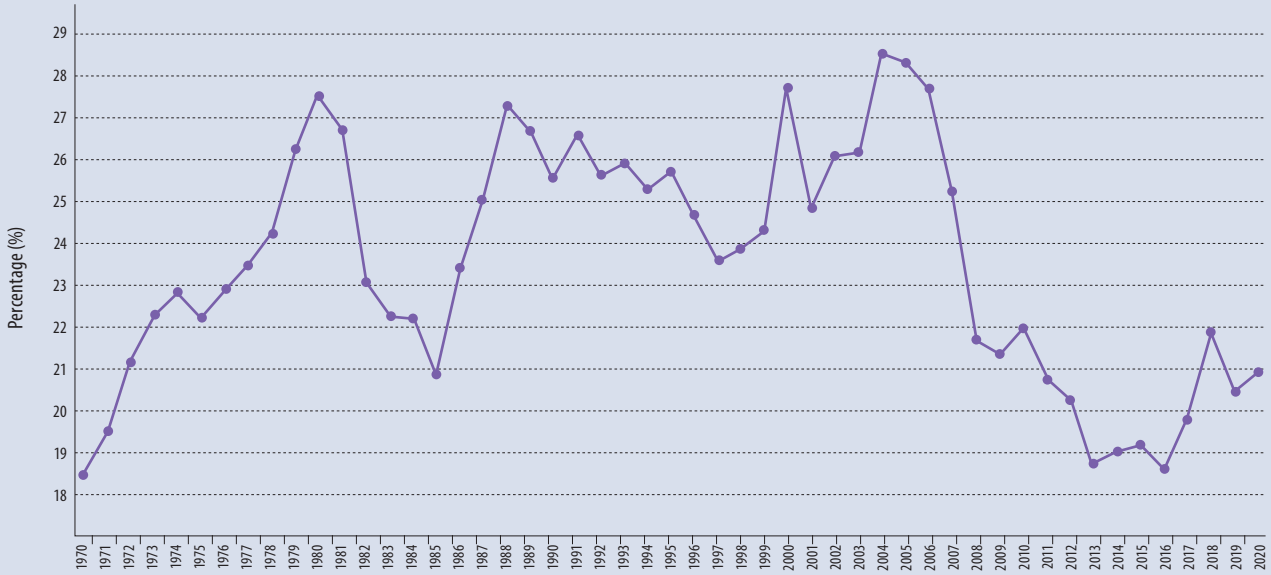
Singapore's Macroeconomic Structural Transformation

As highlighted earlier, Singapore has experienced five stages of development since the 1970s: (i) newly industrialized country; (ii) modern industrial country; (iii) becoming an international financial center; (iv) deepening foreign investment participation and regional economic and trade cooperation; and (v) building a multifaceted regional center. Since 2010, Singapore's economy has grown in a step-by-step manner, continuously striving for innovation, sustainable development, and the gathering of talent.

It is worth noting that, in any stage of development, the service industry plays a major role in Singapore's GDP. After the service industry exceeded a 70% share of Singapore's GDP in 2007, it has steadily maintained a high proportion of 72%–75% since 2011 (Figure 3.8). On the contrary, the share of Singapore's manufacturing industry rose steeply in the early 1970s, reaching a peak of 27.5% in 1980, and, after a setback in the early 1980s, contributed to the macroeconomy to some extent with the modernization of machinery under the successful second "Ten-Year Economic Development Plan (1981–1990)". However, as the economy underwent restructuring, the manufacturing industry saw a rapid decline in its GDP share after reaching 28.5% in 2004, and has only maintained about 20% share since 2010 (Figure 3.9).

FIGURE 3.9

SINGAPORE'S GDP PROPORTION IN MANUFACTURING INDUSTRY (SERVICE GDP SHARE IN %)



Source: Asian Productivity Organization (APO).

From the 1970s to the present, the key trends in the transformation of Singapore's economic structure are as follows (Figure 3.10–3.11):

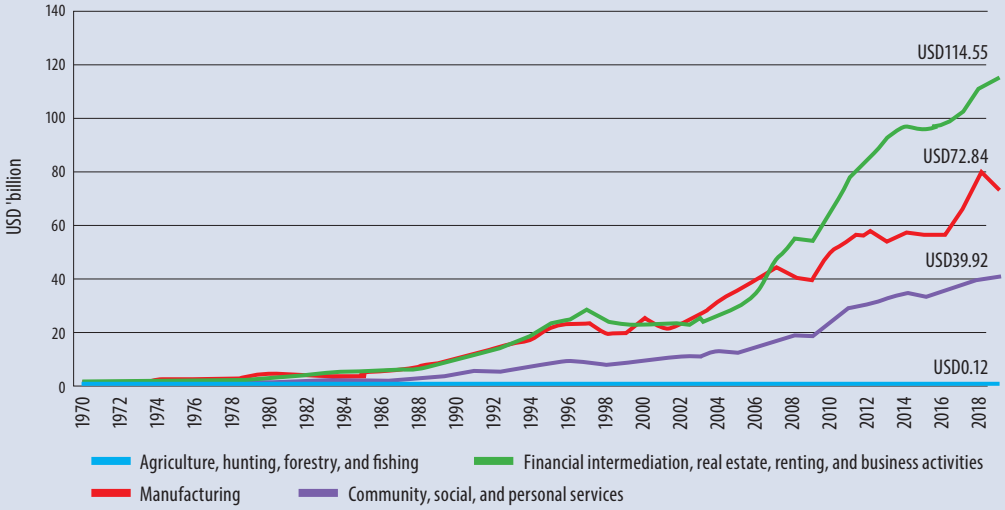
- The proportion of service industry GDP has increased over the years with over 70% in the past decade. Moreover, commercial activities, such as financial intermediation and real estate have had a greater impact on Singapore's macroeconomy than community, social, and personal services. The value gap between the two has been gradually widening - according to the APO database, the former was USD114.55 billion in 2019 while the latter was USD39.92 billion.

- The GDP from the manufacturing sector has decreased in recent years, accounting for about 20% of the past 10 years, and its influence on the macroeconomy of Singapore has remained stable with a value of USD72.84 billion in 2019. Among them, the machinery and equipment industry (electric machinery) has been the main contributor. This industry experienced rapid growth during the "second industrial revolution" of the 1980s. It was not as smooth as the financial industry and experienced several stagnations in response to the decline in international demand. However, after breaking through the USD20 billion mark in 2017, it reached USD34.94 billion in 2019, accounting for 47.9% of the total manufacturing sector in that year.

- It is expected that with the stabilization and control of the COVID-19 pandemic and border openings worldwide, Singapore's knowledge-based economic service industries, such as financial services, business services, legal and financial accounting services, and start-up support will continue to thrive. If the global economy recovers, Singapore's manufacturing industry is likely to continue to invest more in these areas, such as information and communication, digital economy, and smart manufacturing, and will integrate more deeply and extensively with the service industry. This aligns with Singapore's third five-year plan: "Research, Innovation and Enterprise 2025 plan (RIE2025).

FIGURE 3.10

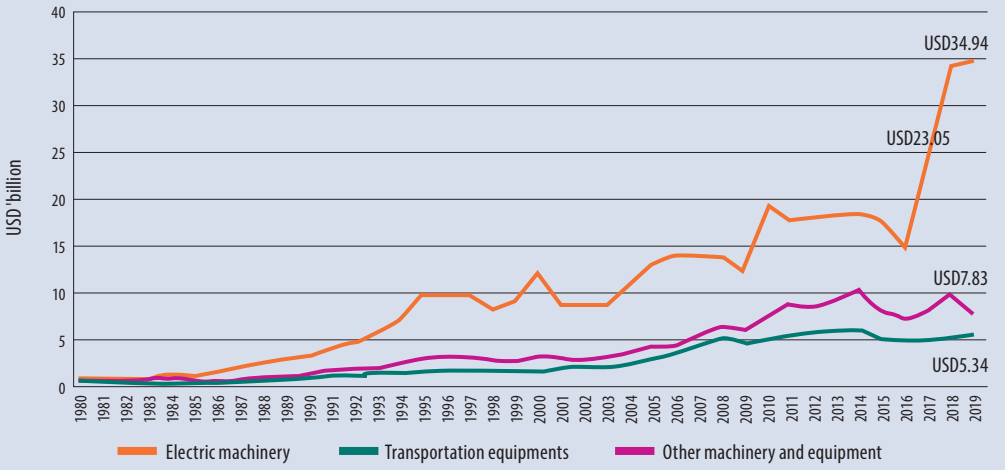
SINGAPORE'S GDP CONTRIBUTION FROM MAJOR INDUSTRIES



Source: APO.

FIGURE 3.11

SINGAPORE'S GDP CONTRIBUTION FROM MAJOR MACHINERY AND EQUIPMENT INDUSTRY



Source: APO.

Whether the Process of Structural Transformation Leads to Stagnant Economic Growth

Unlike the development path driven entirely through market competition, Singapore's structural transformation has been highly government-led, often in response to potential difficulties in development or external risks that have already emerged or expanding. The former includes, for example, the rapid economic growth of Japan, the ROK, the ROC, and Hong Kong in the 1970s, and the rise of labor-intensive industries in other Southeast Asian countries. This prompted the Lee Kuan Yew government to launch the "Ten-Year Economic Development Plan (1971–1980)" to cope with potential external competition. The latter includes, for example, the financial crises in 1997 and 2008, in which the Singapore government sought to create a multifaceted regional center and actively participate in economic and trade integration to create diversified industries and markets.

Observing the trend of Singapore's macroeconomic development, the so-called "growth stagnation" occurred only in the following periods, mainly due to external factors:

- In 1985, the expansion of the USA trade deficit (mainly with Japan) resulted in the signing of the Plaza Accord and the expected global impact of Japan's bubble economy
- The 1997 Asian financial crisis
- The global linkage effect after the 9/11 terrorist attacks in the USA in 2001, which did not significantly recover until 2004
- In 2020, due to the escalation of the USA-PR China tensions in multiple fields and the spread of the COVID-19 pandemic, Singapore's GDP annual growth rate was -4.1%, the worst performance in half a century

It is worth noting that during the global spread of the financial crisis in 2008–09, Singapore's economy managed a slight growth. Further, after the outbreak of the USA-PR China trade war in 2018, Singapore's economy still maintained normal development, showing that Singapore has considerable resilience in the adjustment period of the global supply chain and foreign trade. In 2021, with the easing of global pandemic control measures and the normalization of economic and trade, Singapore's economy has now returned to a path of sustained growth.

In conclusion, does the structural transformation process lead to economic growth stagnation? Observing Singapore, a highly open economy, the economic growth stagnation in a few periods was mainly due to external factors, rather than internal factors. In addition, the Singapore government's highly efficient leadership model in response to external risks has resulted in an overlap between periods of "external economic headwinds" and "economic policy implementation", making it difficult to directly infer a causal relationship between the structural transformation process and the few periods of economic stagnation. Furthermore, as discussed earlier in this chapter, it can be observed that Singapore's economic development plans or transformation strategies are very orderly. The promotion of Singapore's structural transformation is sometimes even done in advance, when its economic environment is very good, in preparation for potential future difficulties in development.

Overall, except for the obvious decline in 2019–20 due to the COVID-19 pandemic, Singapore's economy has almost never been severely impacted, even in face of external risks in the past half century. Looking at the growth histories of major economies, Singapore's structural transformation process can be considered as very smooth.

Impact of the USA-PR China Trade Friction and COVID-19 Outbreak in Singapore and its Responses

In March 2018, the USA-PR China trade friction intensified, which directly impacted the world economy, trade and supply chain. Singapore, which is highly dependent on export, bore the brunt of the USA-PR China trade war. Then the COVID-19 pandemic broke out globally at the end of 2019, which resulted in Southeast Asia's economy taking a big hit. In the face of two major external risks, the Singapore government still achieved a new high in economic growth in 2021, fully demonstrating its resilience in facing the double crises.

First of all, under the influence of the USA-PR China trade war, although Singapore's solid service industry made up for the weakness in the manufacturing industry, the GDP growth in 2018–19 only edged up by 0.71%. The respective decrease is seen in exports by 5.2%, imports by 3.1%, and trade surplus by 24.0%, among which, the export of electronic and electrical products decreased by 6.3% [27], which reflected the impact of the USA-PR China trade war evolving into high-tech competition. At the time, Singapore's Minister of Trade & Industry Chan Chun Sing pointed out that the USA-PR China trade war will have three modes of impact on Singapore: (i) direct tariffs: its impact on Singapore's overall economy will not be significant; (ii) indirect supply chain: Singaporean manufacturers supply intermediate materials to mainland China, which are processed and then exported to the USA. When mainland China's exports to the USA are blocked, the demand for these intermediate products will also decrease; (iii) global economic environment: global business and consumer confidence may decline, hitting global consumption and investment activities, and seriously affecting Singapore's open economy [28].

Facing the USA-PR China trade frictions, the Singapore government's basic position was to maintain the balance of its relations with the USA and PR China as much as possible [29]. As both the USA and PR China are Singapore's main economic and trade partners, it has not made any tilt or side selection in industrial layout or economic and trade policies, but instead, made some medium- and long-term strategic responses.

In terms of enhancing the competitiveness of domestic industries, Singapore's goal was to better diversify businesses, so that Singapore will never be dependent on any particular industry or single market. The Minister of Trade & Industry in that period, Chan Chun Sing, said that the Singapore government will continue to assist enterprises in transformation, focus on long-term, high-quality investment, expand into new markets and acquire new skills, and help workers develop new technologies to face new changes. Relevant strategies include continuing to strengthen basic soft and hard skill advantages, such as transportation network, stable political situation, and business friendly environment, so as to make Singapore more internationally competitive. At the same time, inject vitality into existing industries through the Industrial Transformation Map (ITM) and build new industries, such as agri-tech and precision medicine and assist Singaporean companies to seize regional and global market opportunities.

Externally, in the international context of the restart of protectionism, Singapore maintains a highly open economic and trade environment, and strives to expand the network of free trade agreements, while seeking other high-quality, more inclusive bilateral or multilateral economic and trade relations to distract from the risks of the USA-PR China trade war. For example, China-Singapore Free Trade Agreement (CSFTA), which was upgraded on 16 October 2019, was to establish an electronic origin data exchange system and EU-Singapore Free Trade Agreement (EUSFTA), which came into effect on 21 November 2019. In addition, on many occasions, the ASEAN integration and the ASEAN market have been emphasized, especially in the field of digital economic cooperation with the objective to use technology to create new opportunities.

While Singapore experienced a partial recession, the overall growth trend was still there. This was based on the fact that the developed knowledge service industry and tourism industry have suffered less

impact. However, with the global spread of COVID-19 at the end of 2019, Singapore's challenges became even more acute.

In terms of the impact of the COVID-19 pandemic, Singapore, as an open economy, bore the brunt of strict border control policies around the world. Tourism, catering, and service industries shrunk due to pandemic prevention and control, and major trading partners (the USA, the European Union, ASEAN, and Japan) have fallen into recession, making Singapore's foreign trade orders and manufacturing sluggish. In 2020, Singapore's economic growth performance was the worst in half a century, with manufacturing, services, and construction industries facing a total decline.

The Singapore government's response to the impact of the COVID-19 pandemic [30] can be divided into two. It began by focusing on bailouts in the early stage of the pandemic (the first half of 2020). From February to May 2020, four budget proposals were announced successively, with a total allocation of SGD92.9 billion (over USD65 billion), accounting for about 20% of Singapore's GDP. It focused on measures, such as alleviating unemployment and stabilizing cash flow, including subsidizing wages, reducing taxes, reducing rents, launching financing plans, etc. It also included some revitalization measures, such as providing training subsidies, rewarding the digital transformation of the catering and retail industry, and supporting start-ups, etc.

When the pandemic slowed down and stabilized (after the second half of 2020), the government emphasized on industrial transformation and development of overseas markets. In terms of strengthening the capability and competitiveness of enterprises, the Singapore government assisted enterprises by promoting industrial transformation, strengthening the company's financial health, encouraging start-ups and rewarding R&D, and talent training. Grants were also made available, among which the "Enterprise Development Grant" and "Market Readiness Assistance Grant" were promoted to help enterprises reduce overseas development costs while "Productivity Solutions Grant" looked into enhancing the competitiveness of SMEs. All of the above were the extension of the subsidy policy. In addition, the Singapore government and many countries have also jointly declared to maintain the smooth flow of trade and logistics, supplemented by the Singapore Business Federation (SBF) to expand and set up overseas bases, thereby helping enterprises to develop overseas markets and build Singapore's international brand.

In March 2022, the Singaporean authorities announced that social control measures will be further loosened, and the country will enter a phase of coexistence with the pandemic.

Directions and Shared Learnings for Other Emerging Countries

Successful Government Policy Domination - Balancing Free Markets and Government Involvement

Unlike European and American capitalist democracies, Singapore's political system allows the government to dominate development strongly. At the same time, it exhibits the efficient civil service system of the Theory of Developmental State, and policy planning which is less socially challenged. On the spectrum of state dominance and corporate needs, Singapore has managed to strike this balance successfully since the days of Lee Kuan Yew.

In terms of framework and system construction, the Singapore government leads the formulation of rules, but at the same time, creates a highly competitive and open environment so that companies have the incentive to follow the path of orderly development. Singapore did not choose the path of "small government", so it did not follow the path of some Latin American countries, as mentioned in the Dependency Theory. After breaking away from colonization, they relied heavily on advanced countries and implemented comparative interests. As a result, their industries could not be upgraded and could not get rid of the predicament of dependence.

In addition, during the days of peace, the Singapore government will be more dominant. But when the economy is in recession, representatives from employees, employers, multinational companies, government, local enterprises, and other groups will be selected within a short period of time to set up a review committee. In turn, they will listen to opinions widely, and make decisions. Therefore, Singapore's success is not only dependent on market forces, but also on the continuous intervention of the government, thereby nurturing and promoting the development of the industry [26].

For other emerging countries, when planning their development strategies, they can take a look at how Singapore balances market forces and government. If political conditions permit, they can follow the Singapore government to set the direction of policies and rules, give enterprises a high degree of profit-seeking space within the framework, which can be conducive to the sustainable development of the industry. However, this path presupposes visionary government leaders and an efficient civil service system. In the case of a military government or a government in a failed state, the Singapore model is difficult to replicate.

Phased Economic Development Strategy, Maintaining High Policy Flexibility

Singapore has transformed from labor-intensive, technology-intensive, and capital-intensive industries to an economy dominated by knowledge-based economy. From its "two five-year plans", "ten-year plan", and public initiatives of leaders, to the official axis of industrial policy, the neat phased development is clearly charted.

For other emerging countries, this kind of staged development arrangement after considering the internal and external environment and implementing the national regulations and institutional systems, will actually help to concentrate the high-intensity development of domestic enterprises and social resources. Economy will not fall into the predicament of development disorder and vicious competition in the industry. Other countries, including PR China, Vietnam, and Thailand, have also adopted similar practices. Regardless of the difference between the implementation rate of relevant economic construction plans and Singapore, the aforementioned countries have indeed achieved significant growth in the past 20 years.

It is worth noting that the development plan of the Singapore government is not stock. In response to the internal and external environment, it still maintains resilience in terms of policy. For example, in the face of the global economic crisis, or the supply chain and foreign trade adjustment period, the Singapore government will use various tools, such as tax relief, industrial subsidies, salary adjustment, loan expansion, organizational setup, government spending, foreign investment regulation, immigration regulation, and whatever measures that will work. However, for emerging countries, it is not uncommon to set the overall development stage of the country. Precise regulation and implementation of policy tools, in addition to strengthening the foundation of cross-country and cross-sequence comparative research, are also heavily dependant on the government department's experience of adapting every time it encounters external pressure or economic crisis.

Highly Open and Autonomous

Singapore is a densely populated, small island nation. Its natural resources are scarce thus creating an open port city by taking advantage of its strategic location is almost the only option. It depends mainly on attracting foreign investment, opening up the financial market, encouraging multinational companies to set up headquarters, lowering the entry threshold for talents, etc., led by the government and supplemented by external forces, to create an institutionalized and free capital market. At the same time, multinational companies are used to drive local enterprises to upgrade their technology. In addition, Singapore is one of the first Asian countries to take the initiative to face and welcome economic globalization. It had actively signed bilateral Free Trade Agreements (FTA) with Asia-Pacific countries, such as New Zealand (2001), Japan (2002), Australia (2003), the USA (2004), Brunei (2005), PR China

(2009), and signed double tax avoidance agreements and investment protection agreements with many countries.

For other emerging countries, since its hinterland, natural resources, and population may all be many times larger than Singapore's, it is not practical to fully replicate the Singapore model. However, it is still possible to follow Singapore's practice in some key cities and industrial parks. This includes granting "super-preferential tax policies" to talents in specific development targeting industries, granting corporate policy subsidies in line with development goals, investing capital in targeted industries or infrastructure, and giving tax incentives in specific cities or designated areas.

It is worth noting that during the Lee Kuan Yew period, Singapore realized that it was overly reliant on foreign capital. In the long run, there may be side effects, such as reducing the development of local SMEs, reducing the employment of local labor, and being restrained by advanced countries. Therefore, many key areas are still controlled by state-owned capital to ensure national autonomy, such as the Government of Singapore Investment Corp, the Temasek Holdings, the Singapore Airlines, the DBS Bank Limited, and others. The power of the state in the market has never been absent. But unlike other developing countries, the Singapore government has not given state-owned enterprises the power to monopolize operations. Therefore, on the one hand, it can reduce the risk of being highly dependent on private capital. Government-linked enterprises still need to face market competition, which can effectively avoid the eventual inefficiency.

Continue Investment in Digitalization and Infrastructure to Maintain a Friendly Business Environment

After more than half a century, Singapore's current infrastructure has become world-class, including the Changi Airport as an international hub, a shipping hub connecting more than 600 ports around the world, a highly stable public transportation system, stable water supply, and reliable electricity supply[2]. In addition, Singapore has also made considerable progress in digital infrastructure. Currently, it has built a top submarine cable hub connected to 23 active submarine cables that provides the world's fastest broadband and the lowest network latency. 5G network has also been available since 2020 [31]. The Singapore government is cognizant that infrastructure is hard power. In addition to involving people's daily life and social operations, it also directly affects the results of investment promotion and the business environment. They are also the key factors for medium- and long-term enterprises to invest in Singapore and foreign talents to remain in Singapore.

For other emerging countries, if they are in the developing stage, the government will generally adopt specific policy incentives, build specific industrial parks, and build infrastructure for purely production purposes. However, when the industry develops to a certain level, the dividends of infrastructure construction must spill over to nonproduction sectors, or expand to diversified industries, as to continue to drive social growth and create a positive circle. For example, railway transportation is for raw materials in the first place, as the secondary industry being upgraded to the third level, the original railway is gradually transformed into a commuter train, or the industrial park has expanded from a factory production line to a regional business district and residential area, the relevant logistical infrastructure must follow.

Although the development is very mature, the Singapore government is still active in optimizing its infrastructure. For transportation infrastructure, such as Changi Airport Terminal 5, three new subway lines, unmanned buses, and other plans are in progress. For digital infrastructure, it is still led by the "Smart Nation Singapore" (started in 2014). It includes three aspects: digital society, digital economy,

[2] Power grid users in Singapore experience an average power outage of less than one minute per year, meaning that Singapore's power supply is more stable than most cities in the world such as Tokyo, London, and New York.

and digital government. For emerging economies, some areas may be in the process of "leap development". For example, mainland PR China directly enters the stage of smart phones, skipping the period of popularization of home phones in traditional advanced countries. Therefore, when referring to Singapore's relatively complete development path and select specific successful experiences, emerging countries can effectively avoid the "wrong road" in the urban development process of advanced countries in the past, and then more accurately meet the actual needs of the industry and the public.

ROK'S ECONOMIC DEVELOPMENT

Introduction

The end of the four-year Korean War in July 1953 left the ROK devastated. The capital Seoul was in ruins, and millions of people were struggling with hunger and poverty despite the ROK government efforts to fulfil the needs of her people through the "import substitution" policy. In 1958, the Korean economy had not yet recovered to the level it was in 1940. After President Park Chung-hee came to power in 1961, he implemented the "Five-Year Economic Development Plan" several times since 1962. During his 18 years of strong governance, he established light industries and supported heavy industries, created a solid foundation of industrial development, and enhanced the ROK's steel, shipbuilding, aviation, automobile, telecommunications, nuclear energy manufacturing, and other fields to a significant position in the world. The ROK was world-renowned as the "Miracle on the Han River", which was then hailed along with the ROC, Singapore, and Hong Kong in the mid-1980s as the Four Asian Tigers [32].

Although the Korean economy has suffered from the impact of the Asian financial turmoil in 1998 and the global financial tsunami in 2008, its economy always recovered in a short period of time under the continuous innovation and transformation of the industries. In July 2021, the United Nations Conference on Trade and Development (UNCTAD) approved the upgrading of the ROK from a developing country to a developed country. This is undoubtedly a great achievement for the ROK and it has since then become the economic development learning model of many developing countries. The ROK prioritizes national interests and promotes high economic growth, and the per capita income in 2018 exceeded USD30,000, officially entering the league of high-income countries. During the process, due to economic policies favoring some industries and resources have long been concentrated in the *chaebols* (large industrial Korean conglomerates run and controlled by an individual or family), the revenue of the top 10 *chaebols* accounts for more than half of the GDP. In addition, the capabilities of large and small enterprises are quite disparate. This may result in a widening gap in per capita income, soaring urban housing prices, high youth unemployment, and causing social problems, such as increased household indebtedness. These problems are common among emerging countries around the world.

Economic Development History and Problems

Going through the chaotic war and inflation period in the 1950s, the ROK was prompted to implement the "import substitution policy" with financial and material assistance from the USA. Education and agricultural land reforms were also carried out, laying the foundation for successful economic development after the 1960s. This is based on the changes in the ROK's economic pattern after the 1960s [33]. Its development process and the arising problems from it is summarized as follows:

High Economic Growth Stage (1961–79)

The ROK's economy went through "import-substitution industries" in the 1950s, and began to develop "labor-intensive export industries" after the 1960s. Simultaneously, the "five-year economic plan" was implemented. The ROK participated in the international division of labor based on comparative

advantages while promoting the development of labor-intensive industries, strengthen its infrastructure, and push the ROK economy to enter a period of high growth. In 1973, in response to the international energy crisis, the ROK implemented the "First science and technology revolution", shifting the core of economic development to capital-intensive heavy industries by focusing on steel, shipbuilding, nonferrous metals, petrochemicals, automobile manufacturing, and electronics. In this period, the industry developed rapidly under the leadership of its government and policies. The average annual economic growth was maintained at more than 9.8% and the export growth was more than 40% per year. The per capita income increased from USD87 in 1962 to USD1,640 in 1979. With the high growth of the ROK's economy, the industrial structure also significantly improved. The proportion of its primary industry in the national economy dropped from 36.6% to 19.1%, the absolute poverty population decreased drastically from 40% to 10%, and the relative unemployment in the nonagricultural sector dwindled from 16.3% to 5.6% [34].

Economic Structure Adjustment Stage (1980–96)

While the ROK's economy was going through a period of high growth, its emphasis was on the development of export industries. Since the 1970s, the government steadfastly promoted heavy industrial policies but ignored to support the domestic demand industries, resulting in a serious imbalance in the economic structure. With the continuous expansion of the economic scale and the continuous improvement of the market mechanism, the government's economic leadingcapacity and efficiency however gradually deteriorated. In 1979, the global energy crisis broke out again, which led to the ROK's first recession since 1956 and the balance of payments deficit reached USD5.3 billion. This forced the ROK government to carry out economic policy adjustments and structural reforms to strengthen the role of market mechanisms in economic development.

In the 1980s, the ROK achieved three consecutive years of high growth and low inflation rate through market opening and industrial restructuring. In line with the favorable environment in the international market: "three lows; low oil prices, low interest rates, and low US dollar value", the economy was returning to a stable development track. In 1986, the economic growth reached 12.9%, the annual price increase was only 2.8%, and the balance of payments was in surplus for the first time, reaching USD4.6 billion. After entering the 1990s, in addition to the political transition from long-term military rule to democracy and in response to the advent of the 21st century, Kim Young-sam proposed the "Five-Year Plan for New Economic Development" in 1992 to replace the previous "Five-Year Economic Development Plan". In October 1996, the ROK became the 29th member of the OECD in Asia after Japan. However, under the government-led development model, the ROK faced some problems. For example, in the process of pursuing high-speed economic growth and in order to accelerate the adjustment of industrial structure, the government's over-reliance on fiscal and financial policies could easily lead to waste of investment and resources, which was the seed of the financial crisis that broke out in 1997.

Post-Financial Crisis Take-off Stage (After 1997)

The Asian financial crisis broke out in July 1997 and the ROK was affected. In November of the same year, the foreign exchange crisis broke out. The country fell into high foreign debt, sharp currency depreciation, business failures, and high unemployment. It was the first severe challenge that the economy has ever experienced since its high growth period. The crisis fully exposed the disadvantages of the long-term government-led export-oriented economy. In 1998, the economic growth turned negative and the recession rate was as high as 7%. With the assistance of the International Monetary Fund (IMF), the government carried out reforms in four sectors - business, finance, public utilities, and labor, overcoming the foreign exchange crisis within two years. At the same time, the country also introduced advanced foreign economic and financial systems, allowing the economy to turn the corner and return to the right track. In 1999, the economy grew by 9.5%, making the ROK the earliest recovered country in East Asia that was hit by the financial crisis.

After overcoming the economic crisis, the ROK continued to develop in a healthy and stable manner. GDP nearly doubled from USD504.6 billion in 2001 to USD969.8 billion in 2007 before the global financial crisis. Further, facing the trend of world development in the 21st century, the ROK elevated the development of high-end technology as a national policy after overcoming the Asian financial crisis. In 2003, the "Second science and technology revolution" began. Through technological innovation and industrial upgrading, industries, such as electronics, shipbuilding, automobiles, and steel were reborn. In addition, what has attracted the attention of the international community was that the ROK government begun to innovate its national image. From the focus on heavy industries in the past 50 years, it started actively using existing cultural assets to promote the development of cultural industries. At the same time, for the first time, the proportion of the budget of the cultural sector increased by more than 1%, enabling the cultural industry to flourish under the support of policies. It also became one of the pillar industries in the ROK, and even entering the global cultural stage, forming a "Hallyu" [34].

The global financial crisis that was led by the USA subprime mortgage crisis in 2008 once again made the ROK the second nation to be considered to go bankrupt, following Iceland. However, it was different with this crisis. After recovering from the Asian financial meltdown, the ROK has greatly improved its ability to nimbly manage the financial crisis. Recovery took less than a year, becoming the earliest country among the OECD members to do so. Even in 2009 and 2010, when the global economy was in crisis, the nation experienced economic growths of 0.2% and 6.3%, respectively, making the ROK's GDP return to USD1 trillion in 2014, USD1.82 trillion in 2021, and an estimated USD1.91 trillion in 2022, which was more than three times than that in 2001. Since 2020, the ROK has remained as the 10th largest economy in the world for three consecutive years.

TABLE 3.3

ROK'S ECONOMIC PERFORMANCE BETWEEN 1970–2020

(%: Average Annual Growth Rate)	1970–80	1980–90	1990–2000	2000–10	2010–19	2015–19	2016–17	2017–18	2018–19	Projection			
										2019–20	2020–21	2021–22	2020–25
GDP growth	9.1	9.8	6.8	4.7	2.8	2.8	3.1	3.0	2.3	-1.0	3.5	2.7	1.7
Labor input growth	4.1	5.7	3.1	2.2	1.1	-0.5	-0.3	-1.8	0.0	2.8	-0.5	-0.6	-0.7
Labor quality growth	0.9	3.1	2.1	2.2	1.0	0.9	0.9	1.0	0.5	-0.1	0.8	0.8	0.9
Hours worked growth	3.3	2.7	0.9	0.1	0.1	-1.4	-1.2	-2.8	-0.5	2.9	-1.3	-1.5	-1.5
College labor input growth	3.6	10.9	7.2	5.6	3.0	1.5	1.4	0.0	2.0	3.8	0.8	0.7	0.7
Non-college labor input growth	4.3	4.1	1.0	-0.9	-1.7	-3.7	-3.1	-4.8	-3.5	1.0	-3.0	-3.3	-3.4
IT capital input growth	25.0	20.8	16.9	5.9	2.4	3.2	3.6	3.7	3.0	2.8	2.0	2.2	1.4
Non-IT capital input growth	9.8	8.4	7.2	5.1	3.4	3.3	3.4	3.7	3.2	2.4	2.2	2.2	2.0
Per worker labor productivity growth	5.3	6.7	5.4	3.5	1.6	1.9	2.0	2.7	1.0	0.4	4.7	4.0	3.2
Per hour labor productivity growth	5.3	6.7	6.0	4.6	2.8	4.1	4.4	5.8	2.6	-3.9	4.8	4.1	3.2
Capital productivity growth	-10.0	-8.8	-7.7	-5.1	-3.3	-3.3	-3.4	-3.7	-3.1	-3.4	1.4	0.5	-0.2
TFP growth	1.2	2.2	1.7	1.0	0.7	1.4	1.6	2.1	0.6	-3.6	2.7	1.9	1.1

Source: APO Productivity Databook 2021.

The ROK's import and export trade performances were even more impressive. After becoming the seventh largest trading country in the world in 2010, its trade amount stayed above USD1 trillion for four consecutive years from 2011 to 2014. Although it slightly stagnated in 2015 and 2016, the trade

amount stayed above USD1 trillion after 2017, except in 2020 due to the COVID-19 pandemic. After overcoming the foreign exchange crisis caused by the Asian financial crisis in 1997, the ROK's foreign exchange reserves accumulated rapidly with vigorous development of foreign trade. After hitting the high at USD469.2 billion in October 2021, it declined marginally due to the sharply depreciated Korean won (KRW). However, it was one of the several Asian countries thatused its foreign exchange reserves to prop up their currencies under pressure from the USA Federal Reserve raising interest rates. As of August 2022, the ROK's foreign exchange reserves reached USD436.4 billion, ranking the sixth in the world with foreign exchange reserves. Moreover, its relative short-term foreign debt accounted for 32.9%, being in the middle level among G20 countries and its credit rating by international institutions has remained at a stable level. The economic performance of the ROK from 1970 to 2020 is summarized in Table 3.3.

Problems Arising from Economic Development

The ROK's economy has heavily relied on government resources and supporting *chaebol* enterprises to develop vertically and horizontally through various measures. While the innovation strategy has been largely successful, the overly biased industry policies toward *chaebol* have led to their monopolization of various industries, leaving little space for SMEs.

As shown in Table 3.3 in recent years, *chaebol* enterprises, which have been driving the sustained growth of the economy, faced unprecedented difficulties in their operations due to sudden changes in the international economic situation, such as the USA-PR China trade dispute and the spread of the COVID-19 pandemic, which sounded the alarm for the ROK's economic slowdown. Moreover, many scholars and experts have pointed out that while Korean firms have been striving for innovation and focusing on the development of new products, they seem to have neglected the improvement of the performance or reduction in prices of existing products, which has made the structure of the Korean economy highly vulnerable to external factors and increased the risk of economic development.

For example, PR China has always been an important exporting country to the ROK, and the ROK has enjoyed a large surplus in the past 28 years. However, since 2022, the global semiconductor industry has been clouded by uncertainties, coupled with the rise of the Chinese semiconductor industry's mature processes that has changed the trade situation and led to a reversal in the ROK's trade with PR China from May 2022. The Korean International Trade Association estimates that 2022's trade deficit is likely to exceed USD15 billion, which is a first since 2008. In addition, the ROK is facing the worst financial crisis since the global financial crisis of 2008 with the Korean won falling to a 13-year low against the USD. It is even breaking the KRW1,300 mark with the currency's inflation rate exceeding the predicted 3.1%. Despite the interest rate hikes by the Bank of Korea, foreign investors have sold more than KRW50 trillion (USD38.5 billion) worth of Korean stocks in the past two years, and the stock market index has fallen more than 20%, with the foreign selling trend showing no signs of easing.

Over the past 50 years, while the ROK has embraced economic growth driven by the simultaneous growth of national income, it has also faced many social problems due to the widening gap between the rich and the poor. According to the Yonhap News Agency, Korea announced the "2022 Household Financial Welfare Survey" on 7 December 2022, dividing households into five intervals based on their asset size, each representing 20% of the total number of households. As of the end of March, the average asset of households in the first interval was KRW1.65457 billion while that of households in the fifth interval was KRW25.84 million, a gap of 64.69 times and a new historical high. Although the ROK is proud of its own educational level, the OECD reported that the training provided by Korean schools often fall short of the skills required by the labor market, leading to worsening unemployment among local youth. In particular, as the ROK's economy gradually shifts from manufacturing to the service industry, it is inevitable that youth unemployment will become more serious. In addition, the rapid aging of the ROK's population means that the labor force is no longer able to meet the demand for labor.

As the Korea Economic Research Institute (KERI) pointed out in its report in December 2019, many of the ROK's economic indicators, such as production, exports, investment, and employment, still rank among the lower performers compared to countries OECD.

Breaking Out of the Middle-income Growth Trap

In 1997, the Asian financial crisis broke out and the ROK economy was not immune. However, with the assistance of the IMF, in addition to reorganizing its financial structure, the ROK turned to upgrading and transforming its economic structure, thereby breaking through the "middle-income growth trap" [35]. According to statistics, the ROK's per capita income exceeded USD3,000 in 1987 and reached USD11,468 in 1995, successfully breaking through the middle-income trap within nine years. Thereon, it has increased significantly every year with the pace of economic growth. Before the global financial crisis in 2007, the threshold of USD20,000 had been exceeded. Although the global financial crisis took effect and the per capita income dropped below USD20,000 in 2008 and 2009, it returned to above USD20,000 in 2010 and exceeded USD30,000 in 2018. In 2021, it even reached USD35,000, entering the list of advanced countries of higher income.

The key factors that made the ROK's per capita income continually grow successfully [36] can be summarized as follows:

i) Guiding economic momentum through innovative development

In the early stages of the ROK's economic development, the industrial base was weak and the level of technology was outdated. Through cheap labor, land, and other factors, coupled with the introduction of foreign capital and technology, the ROK's economy achieved high growth. However, with economic development, the contribution of factor investment to economic growth has declined significantly.

The ROK has invested in four aspects: innovation strategy, innovation drive, innovation input, and innovation environment. The objective is to:

- Adopt a progressive innovation and development route suitable for the ROK's situation and implement an innovation-driven development strategy
- Attach importance to the transformation and application of scientific and technological achievements
- Strengthen the integration of production, governance, education, and research
- Cooperate with relevant fiscal, taxation, and financial policies to promote innovation and improve resource allocation efficiency, forming a driving force for sustained economic growth

ii) Gradually promote structural adjustment of economic constitution

Influenced by eastern culture, the ROK has a high savings rate. Although it has a positive effect on increasing investment, it is not easy to promote consumption, in which case the proportion of early consumption remained around 60%. After the 1990s, with the substantial growth of per capita income while driving the upgrading of consumer demand, it accelerated the adjustment of industrial structure, thereby improving the economy. The ROK took advantage of the change in demand structure to drive the upgrading of its industrial structure. Simultaneously, it accelerated the introduction of science and technology through the upgrading of the industrial structure, forming an adjustment of the industrial structure every 10 years. Thus innovation becomes a

platform to promote industrial upgrading and subsequently, achieve economic structural transformation [37]. In addition, in the process of industrial restructuring, the ROK maintained a relatively reasonable ratio between the secondary industry and the tertiary industry, and continuously improve efficiency.

iii) Attach importance to agriculture in tandem with rural development

An important reason for the ROK to have overcome the middle-income trap and transform into a high-income country is by realizing the need for coordinated development of urban and rural areas. Since the 1960s, the ROK has been promoting the development of heavy and chemical industries while facing challenges, such as slow agricultural development, widened gap between urban and rural areas, and rural population emigration. In 1971, the ROK government promoted the implementation of the "New Village Movement". Based on the concept of social equity, in the late 1970s, it provided policy guidance on housing supply, rental loans, etc., to support rural construction and narrow the gap between the urban and rural areas.

After the 1990s, the government continued to introduce policies and took measures in line with the "New Village Movement", such as increasing the price of agricultural products and set a large number of policy subsidies to ensure farmers' income is secured. These measures worked by promoting agricultural development, reducing rural unemployment, and allowing rural areas to develop in an all-round way.

iv) Implementation of balanced social policies and effective employment and distribution

In the process of economic development, the ROK had the problem of "focusing too much on growth and ignoring distribution", which resulted in widening the urban-rural income gap and escalating social conflicts. Therefore, the government implemented a series of effective measures to improve employment and distribution balance. Among them:

- Promotion of employment policies that includes protecting the legitimate rights and interests of employees and employment fairness by improving employment policies and regulations, such as the Minimum Wage Law enforced in 1986, the Equal Employment Law in 1987, etc.

- Promoting rural population transfer and employment

- Attach importance to public education and vocational training, provide fair access to education, and improve the human capital level of lower-educated workers, so that they would not lose their jobs due to industrial transformation

In terms of distribution policy and as part of a measure, it used taxation to adjust the distribution of personal income. The comprehensive income tax system was implemented in 1975 and the family was set as the collection unit. This method took into account the difference of the natural situation between taxpayers and families. Education fees, insurance fees, and others were levied under labor income tax. Since 1983, by reducing the progressive level and lowering the highest and lowest marginal tax rates as well as substantially increasing various deductions and expanding the scope of tax-exempts, etc., the income tax burden of the middle- and low-income classes has been continuously reduced. In addition, the tax rate of the upper income class was increased, and a tax system was imposed on their immovable properties.

On other taxes, since 1981, the inheritance and gift property tax system in the retention and transaction links has been continuously improved, and to a certain extent, the results of regulating income distribution have been exerted. These measures have allowed the ROK to rapidly increase

its middle-income population, shaping a middle-class society, successfully completing the transformation of its social structure, and becoming a high-income country with sufficient social conditions.

Impact of the USA-PR China Trade Dispute and the COVID-19 Pandemic on the ROK's Economy and Its Responses

Impact of the USA-PR China Trade Dispute on the ROK's Economy and Its Response

In March 2018, a trade war broke out between the USA and PR China. In July of the same year, the two sides imposed additional 25% tariffs on each other, which directly impacted Korean industries. A research report by the Korea Institute for International Economic Policy pointed out that Korean exports to the USA and PR China decreased by between USD760 million and USD1.36 billion. In addition, USA tariffs have caused the ROK's industrial output to drop between USD1.615 billion–USD3.04 billion while PR China's tariffs have caused a drop by USD215 million in comparison. According to the research of the ROK's Woori Bank Financial Research Institute, the excessive export dependence of the ROK to PR China reached 26.8% [38], surpassing Japan's 19.5%, Germany's 7.1%, and France's 4.2%, making it the country with the worst recession among the world's major trading nations. In addition, data from the Bank of Korea showed that the escalating trade war between the USA and PR China resulted in the ROK's first ever current account deficit in the recent seven years (by then in 2019). The ROK's dividend payments to foreign investors increased to USD6.78 billion, reaching the second highest in the ROK's history and causing its current account deficit. Meanwhile, the ROK's trade surplus narrowed to USD5.67 billion in 2019 from USD9.62 billion in 2018.

On the impact to the ROK, what is more worthy of attention is the conclusion made by the Korea Institute for International Economic Policy in its research report. It highlighted that in recent years, with the increasingly fierce disputes between the USA and PR China in the field of 5G and semiconductors, the ROK's trade in the ICT sector, where the ratio of its exports to PR China is as high as 47%, was directly impacted, especially for Korean semiconductor manufacturing and subsidiary technology electronic component manufacturers investing in PR China. As the trade dispute continues to extend from tariff war to technology war, the export of semiconductor manufacturing and ancillary technology electronic components, which are the ROK's industrial strengths and account for one-fifth of the ROK's export value, fell sharply due to exports of electronic products from mainland PR China being blocked [39]. The ROK's economy and currency took a hit. Since 2019, the Korean won has depreciated by 6.6%. According to Citigroup's analysis, PR China is the largest exporter of semiconductors in Asia, accounting for more than 50% of Asia's semiconductor exports. The ROK has the highest dependence on the mainland among the Asian countries. If the USA ban on Huawei was taken into consideration, the export of the ROK's semiconductor industry and ancillary technology electronic components to PR China would be even more affected.

The ROK is also firmly caught in a dilemma. Since its long-term trade surplus with PR China has been dependent on semiconductors, the USA proposed to form a "Chip 4" alliance with the ROK, Japan, and the ROC [40].The aim is by strengthening cooperation with the three countries (regions), it can contain the Chinese mainland, which is competing in technology. This puts the ROK at a crossroads where it can neither reject the USA (technology) nor offend PR China (market). 2022 marks the 30th anniversary of the establishment of diplomatic relations between PR China and the ROK. Since 2003, PR China has surpassed the USA to become the ROK's largest export destination, to whom the ROK has maintained a trade surplus. According to data, the ROK's exports to PR China in 2000 totalled USD18.5 billion, accounting for 10.7% of the ROK's exports. In 2021, the ROK's exports to the mainland reached USD162.9 billion, a nine-time increase that accounts for 25.3% of the ROK's exports. However, since May 2022, the ROK starts to experience a trade deficit with the Chinese mainland, which is rather worrying for the ROK.

In the face of the sudden outbreak of the trade conflict, the ROK government has stated that its continuous deepening would pose a bigger and more serious impact on the ROK's economy than in the past. In order to avoid the impact of export shrinkage on the economy and provide trade financial assistance through the additional correction budget to fully support export marketing, the ROK would also be formulating follow-up measures for trading in consumption, digital and service-related industries as well as strengthening cooperation by working on programs with Indonesia, the Philippines, Malaysia, and other ASEAN countries.

Impact of COVID-19 on the ROK's Economy and Its Response

Although the ROK has ranked the 10th largest economy in the world for three consecutive years since 2020, the severe damage to the economy caused by COVID-19 lingers. According to data released by the Bank of Korea, the country's GDP growth in the second quarter of 2020 reached -4.7%, down 3.3% from the -1.4% growth in the first quarter. It is the country's worst performance since the Asian financial crisis in 1998. Further, more than 40% of the ROK's GDP is supported by export trade. As the pandemic forced countries to suspend work, close customs, and cut off flow, the ROK's export trade value in the second quarter plummeted by 16.6%, compared to the first quarter, again being the worst performance since 1963. Further, in the second quarter, manufacturing and agriculture, forestry, fishery, and animal husbandry industry dropped by more than 9%, as opposed to the first quarter. Likewise, the service industry, which was affected by the sluggish performance in the accommodation, catering, and transportation industries, also fell by 1.1%. In May 2020, the Bank of Korea revised its annual economic growth forecast to -0.2%, down 2.3 percentage points from 2.1% at the beginning of the year.

Faced with this situation, the ROK government took the pandemic as an opportunity to promote industrial transformation. In February 2020, the government held a meeting with relevant departments to request pandemic response policies for major industries to reduce the ripple effect of the global crisis. Among which, in addition to the "Special Plan for Employment Stabilization in Response to COVID-19" proposed by the Ministry of Employment and Labor to reduce the impact on employment, the Ministry of Commerce, Industry, and Energy proposed the "Support Plan for Strengthening the Management and Stability of Small and Medium-sized Enterprises" to provide support for workers' employment security. By taking advantage of the quarantine framework that was widely recognized by the international community, and with the health industry as the core and the "Korean-style pandemic prevention (K pandemic prevention)" industrial policy in place, the ROK government promoted the export of new start-ups with the aim to create an export path for the ROK's pandemic prevention industry in the post-pandemic period.

With the spread of corporate crisis and deteriorating employment, an emergency economic meeting was held on 22 April 2019, and the "Financial Stabilization Plan for People's Livelihood in Response to COVID-19" was proposed. This included:

- An urgent investment of KRW40 trillion to establish an "Industrial Stabilization Fund" for the emergency period

- The scale of the pandemic "financial relief plan" has been increased from KRW100 trillion to KRW135 trillion, the support for small enterprises and the scale of corporate bond purchases to be expanded, and support for low-credit companies increased

- KRW10.1 trillion is invested in "employment stabilization" and three other measures [41]

In addition, the relevant departments of the ROK government took stock of their main business policies and future development strategies in advance while responding to the pandemic. For example, on 20 March 2019, the Ministry of Science and ICT held the "ICT Emergency Meeting" [42] to discuss and prepare policies for the post-pandemic period. On 6 May 2019, the Ministry of Industry, Trade and Energy

proposed eight measures to deal with the economic and social changes brought about by the pandemic, including health and environment, economic activities, and trade environment.

On 27 May 2019, the Ministry of Science and ICT announced the "Comprehensive Program for Science, Mathematics, and Information Convergence Education ('20~'24)" in response to the changes brought about by the continuous development of the pandemic on people's lives and industrial development. The aim was to cultivate talents in new technology fields, such as artificial intelligence (AI) and virtual reality (VR/AR), and lay the foundation for the development of the future information and communication society.

In response to the drastic changes in the educational model and environment caused by the pandemic, the Ministry of Education promoted the "Future Innovation Leading Schools" program to include advanced educational technologies (such as AI) in new curriculum content. On the basis of the above two plans, the government's "K-defense roadmap" [43] was established in the "Emergency Economic Central Countermeasures Headquarters Meeting", and 18 standards, including clinical data and pandemic prevention R&D, etc. were proposed to build the "K pandemic prevention model". Advertised as 3T (Test-Trace-Treat), it was designed to promote the establishment of "inspection/confirmation", "epidemiological tracking", and "disease containment/treatment", including other international standards organization (such as ISO) guidelines, hoping to make the "K pandemic prevention model" a global model. Thus the "K pandemic prevention" plan not only included the establishment of the "K pandemic prevention model", but also promoted the concept of "pandemic prevention industry". According to a study by the Korea Health Industry Development Institute (KHIDI), the export value of the health sector in the first half of 2020 was USD9.6 billion, an increase of 26.7% from USD7.6 billion in the same period last year.

Overall, the ROK was evaluating the changes in supply and demand following the pandemic and believes that the pandemic has accelerated the development of the fourth industrial revolution (IR4.0) (including 5G, cloud, big data, VR/AR, drones, autonomous driving, etc.). The global disease had also expedited the use of noncontact technology to accelerate digital development, which is linked to the industrial policy of the ROK President Moon Jae-in (2017–22), who since coming into power, promoted the IR4.0 as the main axis of policy preparation for industrial development in the post-pandemic period. Obviously, the ROK regards the COVID-19 pandemic prevention as an opportunity for domestic industrial evolution. At the same time, with the pandemic prevention achievements being valued by the international community, it has accelerated the cultivation of emerging industries and promoted them to become innovative export drivers and gain a leading position in the international market after the pandemic.

Suggestions and Shared Learnings for Other Countries

ROK is a country with a presidential system that generally adopts a top-down approach to economic policy planning. Every president has his/her own national political think tank team to assist in planning policy guidelines from the beginning of the election, a commitment to be implemented for the five years when elected to power. For example: when Kim Dae-jung (1998–2003) was in power, he focused on reforming the *chaebols* and industrial structure, introducing dispatched manpower, and proposed the development of the cultural industry. Roh Moo-hyun (2003–08) advocated the integration of technology and innovation, strengthening scientific and technological management, and carrying out administrative efficiency reforms in order to “take benefits as the purpose of economic growth” while focusing on the distribution of export benefits and advocating consumption-driven growth.

Lee Myung-bak’s (2008–13) regime made the "ROK 747" commitment, which included an economic growth of 7%, per capita income reaching USD40,000, and leading the ROK to become the world's top seventh largest economies. He formulated the "577 Initiative" basic plan for science and technology and advocated green policies to shape a leading international image and a national brand. Park Geun-hee (2013–17) emphasized the integration of technology and ICT and advocated the creative economy.

Moon Jae-in (2017–22) promoted people-oriented, technology-disruptive innovation as a new opportunity for national growth and transformation as to solve industrial and social problems. Although each regime has its policy axes, their core can be roughly summarized as follows:

i) Implementation of strategic thinking of knowledge economy

During the Asian financial turmoil, large-scale Korean enterprises laid off workers to tide over the crisis. At the same time, they allowed these personnel to start their own businesses when it was not easy to make a living, as to promote the development of SMEs in the ROK. For the first time in history, their contribution to employment opportunities and economic growth surpassed that of *chaebol* companies.

However, in terms of industrial structure, there was still a lack of backbone enterprises with solid technology, resulting in reliance of Japanese industries to import key components and parts. As a result, the higher the export value of products, the larger the trade deficit was with Japan. Therefore, with the help of the global knowledge economy, the ROK turned itself to a country which the government uses knowledge to support and establish technological SMEs.

Since 2001, through "concentration and selection", the government has been investing to grow Inno-Bizs and cultivate invisible champions. This is in the background of high reliance on advanced countries for cutting-edge technology or precision key components and parts, and the proportion of technology trade revenue and expenditure being less than 0.5% for long. The ROK further proposed a 10-year "Basic Plan for the Development of Components and Raw Materials (MCT-2010)", which was extended for another 10 years in 2011. It released the blueprint for "Vision for the Future of Components and Materials 2020".

ii) Strengthen regional industry-university R&D clusters

The ROK's investment in basic research has nurtured key technologies to develop cutting-edge knowledge fields. As a driver of growth, the international science corridor policy was proposed in 2008 and a basic scientific research institution was established to introduce heavy ion accelerators in 2021. This works as a base for the integration of basic research and business to form regional clusters. In 2018, the commercial core SB Plaza was completed with the targeted focus on science, providing technical institutions or enterprises to settle in. In order to activate the innovation of independent R&D capabilities, the Daedeok Science City proposed in 1973 not only centralized the establishment of public-sector research institutions, but also provided private-sector research personnel who were laid off during the financial crisis. The science city provided an avenue for them to gather and start businesses as well as to assist in research and production functions integration, forming the "Daedeok R&D Special Zone System". The idea further expanded to Gwangju, Daegu, Busan, and Jeollabuk-do as future R&D special zones.

iii) Attach importance to talent cultivation

The ROK attaches great importance to education as its society believes that learning and experience affects one's social and economic status of life. Education also provides human resources for industrial development in a timely manner in the context of environmental changes. With the advent of the era of creation and utilization of knowledge, innovation, and entrepreneurship, vocational schools have spread with the spirit of entrepreneurship and business awareness since 2002. At the same time, department of entrepreneurship research was set up in universities and entrepreneurship education courses were offered to cultivate entrepreneurship in both theory and practice. Students were guided to enter new venture services, illustrating that education can be used in economy and society, and thereby creating employment opportunities and accelerating the upgrading of the economic structure. In particular, the IR4.0 was expanded to strengthen its

integration with international standards and a "Science and Culture Industry Innovation Growth Strategy" has been specially designed, emphasizing talent cultivation and focusing on science, culture, and innovation in future industries. In addition, the government attaches great importance to renowned foreign scientists or engineers, including the return of Korean talents who have settled overseas.

iv) Shaping the national image and branding

National image is the key for a country to improve its political and economic status, and having the competitive edge in the international arena. After the financial turmoil in 1998, the ROK invested in the content industry through national policies. Kim Dae-jung proposed a cultural presidential declaration, Roh Moo-hyun set up a national image committee, and in 2009, Lee Myung-bak set up the Presidential Council on Nation Branding, which was directly under the president, to perform all-round and systematic shaping of national status, image, and branding.

In addition, while actively investing in the content industry, the government advocated green growth, thereby demonstrating its willingness to be a model for the world. It has even applied for a world cultural heritage status to promote local cuisines internationally. These demonstrate that the ROK invests national effort and funds to shape its brand image, enabling the added value of the cultural industry to penetrate into related products to enhance the country's image that in turn becomes a driving force for the growth of the industry.

The Korean trend, driven by the Korean cultural industry, also adds value to Korean brands and the national image. By extension, it helps Korean product export around the world. The "Korean wave" driven by the ROK's cultural industry not only adds value to Korean product brands or national image, but also promotes the global market expansion and exports of ROK products. The multiplier effect generated by linking culture with branding is worth looking into by developing countries.

JAPAN'S ECONOMIC DEVELOPMENT AND INDUSTRIAL ADJUSTMENT POLICY

Important Stages of Japan's Economic Development

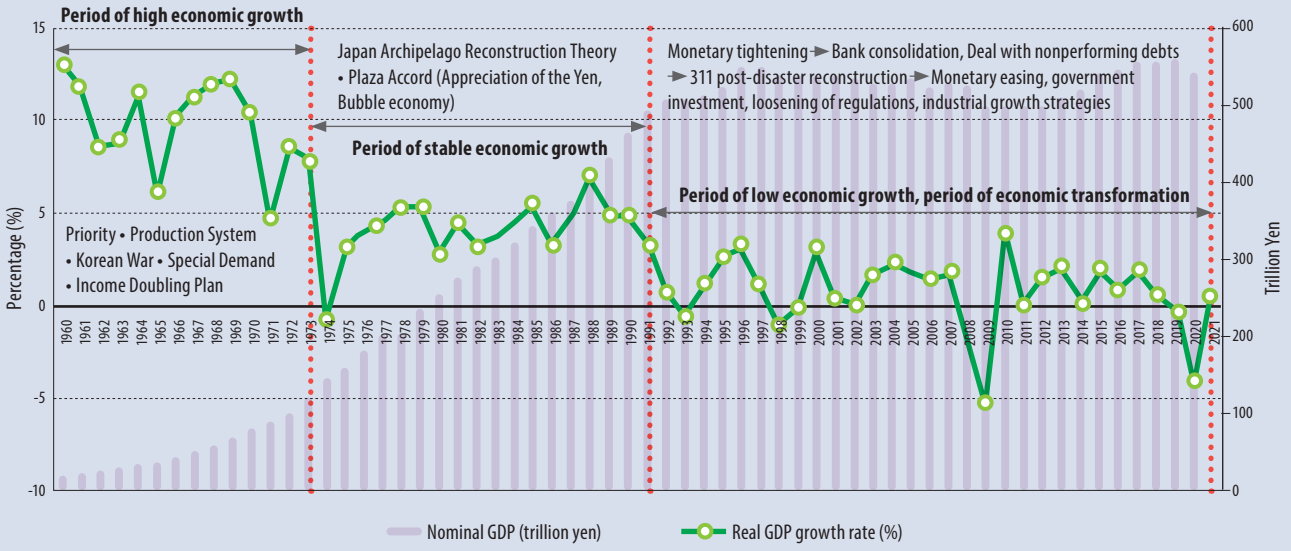
Since the Meiji Restoration era, Japan began to promote the policy of "colonial industry development" to support the development of Japanese capitalism. With the efforts of Shibusawa Eiichi, the father of the banking system in Japan, and others, the "National Banking Regulations" was established. The objective was to: (i) carry out a series of financial reforms and revitalize the private investment; (ii) promote the development of textile, coal, steel, and trade industries; and (iii) form an important basis for Japan's economic growth. Japan became a major military and economic country in Asia in the early 1900s. After experiencing external expansion and defeat in World War II, Japan has been rehabilitating and rebuilding from the post-war ruins since the 1950s. The country soon returned to being one of the world's advanced economies.

According to Honorary Professor Komine Takao of Hosei University, who was the former Director of Investigation of the Economic Planning Agency, Japan's post-war economic growth can generally be divided into three stages: (i) the fast-developing stage from the second half of the 1950s to the first half of the 1970s before the oil crisis; (ii) the stable developing stage after the oil crisis in the first half of the 1970s and before the collapse of the bubble economy in the 1990s; and (iii) the low developing stage after the collapse of the bubble economy in 1991 [44].

According to the Long-term Economic Statistics Database that was produced by the Cabinet Office of Japan, the average growth rate of the Japanese economy between 1960 and 1973 reached 9.68%, showing that the Japanese economy entered a stage of high growth after the war (Figure 3.12). During the period 1974–90, Japan's average economic growth rate remained at 4.2%, entering a stage of stable growth. However, the average economic growth rate during the period from 1991 to 2021 fell to 0.7%, indicating that Japan has been in a low growth stage for a long time since the collapse of the bubble economy.

FIGURE 3.12

JAPAN'S GDP PROPORTION OF SERVICE INDUSTRY (SERVICE GDP SHARE IN %)



Source: Cabinet Office of Japan; https://www5.cao.go.jp/j-j/wp/wp-je21/h11_data01.html.

In the early post-World War II period, Japanese industries, mainly military industries, were devastated. Coupled with the dismantling of Japanese *chaebol* enterprises by CHQ (United Nations Command) (prohibition of monopoly businesses), insufficient civilian resources, and infrastructure construction as well as a surge in the domestic population caused by the repatriation of overseas soldiers, Japan's economy was in chaos.

However, several situations, such as the outbreak of the three-year Korean War in 1950, the USA military stationed in Japan, and the ROK placing a large number of purchase orders for civilian materials from the Japanese industry (forming the trend of "Korean War Special Demand") led to the development of fibers (military uniforms, towels, tents, sacks, etc.), steel (steel pipes, iron mesh, wire, etc.), concrete, various processed foods, vehicle maintenance, and other related industries. In the early postwar period, the "Priority Production System" promoted by the Japanese cabinet led by Prime Minister Shigeru Yoshida (1966–47 and 1948–54) focused policy resources on coal, steel, fertilizer, and power industries, which also became an important foundation, in response to the "Korean War Special Demand".

After the end of the "Korean War Special Demand" trend, Japanese domestic companies made productive capital investment through foreign exchange obtained from exports while post-war infrastructure reconstruction led to private construction business opportunities. The formation of enterprise-specific trade unions increased labor wages, which stimulated the scale of private sector

consumption. Altogether, these factors prompted Japanese manufacturers to show high growth in operations, driving the Japanese economy to enter a stage of high economic growth from the late 1950s.

In 1960, the cabinet led by Prime Minister Ikeda Hayato (1960–64) proposed the "Income Doubling Plan", expecting to raise the GNP to more than two times of JPY26 trillion within 10 years, achieving the same level of national income as western European countries as well as the goal of full employment. Various factors contributed to Japan achieving the goal of doubling the average income of Japanese nationals in only six years, including the organizing of the 1964 Tokyo Olympics and the 1970 Osaka World Expo that drove related demand. The completion of Tokaido Shinkansen, the Tomei Expressway and other factors that connected the high-speed transportation infrastructure between major cities were also part of the factors.

During this period, three types of white home appliances began to be popularized - the television, washing machine, and refrigerator. Known as "the three artifacts", these appliances helped to save time in manpower-based housework and allowing married women to reengage in industrial and social development, which expanded the size of the employed population. Japan's high economic growth from the post-World War II period to this period has also been called the "Japanese miracle" by major countries in the world.

In February 1973, after the Japanese yen exchange rate system changed from the original fixed system to a variable one, it began to appreciate sharply. In October, the outbreak of the fourth Middle East war caused major oil-producing countries to restrict crude oil exports, resulting a sharp rise in global crude oil price that triggered the "first oil crisis". In order to respond to these changes in the international economic environment, the Japanese government responded to the social and economic problems of Japan's domestic price fluctuations by reducing fiscal expenditures and currency supply, which is known as the “Dampen Aggregate Demand Policy”. This also caused the year's economic growth rate to turn from positive to negative, falling to -1.2%. Since then, the Japanese economy has shifted from high growth to a more stable growth stage (moderate growth stage).

Further, since Japan's high economic growth has been driven by labor-intensive industries, the rural population gradually migrated to urban areas. This led to the problem of excessive depopulation in rural areas while urban areas faced social problems of overcrowding due to rapid population growth, that widened the economic development gap. As a solution, the Japanese cabinet led by Prime Minister Tanaka Kakuei (1972–74) advocated the "Japan Archipelago Reconstruction Theory" (reconstruction boom), a policy that began to spread across the country. It looked to bridge the gap between urban and rural areas and improve employment in rural areas by building highways to enhance the transportation network and actively construct hospitals, ports, schools, and other public facilities in rural areas. The measure was expected to reduce the gap in economic development between urban and rural areas.

This policy has also driven large-scale and sustainable public investment by combining with the common growth of local industries and further activating Japan's local economic development and employment scale. After the Plaza Accord, the sharp appreciation of the yen has also triggered an over-investment trend of Japanese companies in real estate at home and abroad, and gradually formed a bubble economy with insubstantial production characteristics. Based on the major changes in the international economic environment that occurred in 1973 and the Japanese government's response policies, the average economic growth rate of the Japanese economy from 1974 to 1990 was maintained at 4.2%, entering a stage of stable growth.

In 1991, Japan's bubble economy began to collapse, resulting in a sharp decline in stock market indexes and real estate market prices. It subsequently led to social and economic problems, such as bankruptcy of financial institutions, sluggish investment, and low willingness for corporate financing and private

consumption, forming the "lost thirty years" phenomenon of the Japanese economy. The reasons included the Bank of Japan's monetary tightening policy by significantly raising the policy interest rate, the long-term political turmoil in Japan caused by the short lifespan of the subsequent cabinet after Prime Minister Nakasone (1982–87), and the nonbanking financial loan company (Housing Finance Semon Corporation) that caused problems of nonperforming debts (unable to recover financing funds released for builders and others), etc. Specifically, after the collapse of the bubble economy, the Japanese industry triggered a wave of layoffs and personnel costs were also cut, which made it impossible for Japanese companies to adhere to the lifetime employment system and began to change the Japanese-style management method.

From the second half of the 1990s, the Japanese economy faced a long-term deflation phenomenon and the loan-based operation model of private enterprises obtaining large-scale financing from financial institutions, such as banks, can no longer be sustained. Thus they were forced to turn to direct financial method, such as public fundraising through the listing cabinet. In addition, due to the sluggish consumption and public construction investment, Japan's economic growth has also greatly increased its dependence on exports and orders from overseas markets. However, at the same time as the collapse of the bubble economy, the sharp appreciation of the yen caused by the influx of safe-haven funds caused by the Persian Gulf War into the Japanese market has caused Japanese companies to move their factories overseas for production in order to overcome the unfavorable factors of exchange rate differences. This made the problem of hollowing out Japanese industries even more serious.

In 2001, the Japanese cabinet led by Prime Minister Junichiro Koizumi (2001–06) promoted the "no sanctuary" economic structural reform policy, where; (i) prompting the consolidation of many urban banks with nonperforming debts; (ii) forming three major banking systems; and (iii) gradually dealing with the problem of bad debts that cannot recover funds faced by the financial industry after the collapse of the bubble economy. However, the long-term deflation problem remained unsolvable. In 2007, more than 21% of Japan's population was over 65 years old, officially entering a super-aged society. It is foreseeable that the aging population would cause labor shortage, which would affect the sustainability of economic growth.

In September 2008, the bankruptcy of Lehman Brothers Holding Company triggered the global financial tsunami, which also caused the Japanese economy to show a negative growth for the first time since 2000. While Japan's economic growth was sluggish, PR China's economy was in a stage of high growth. In 2010, PR China's GDP surpassed Japan's for the first time and became the second largest in the world. Japan has fallen from the second place, a position retained for nearly 40 years, to the third. On 11 March 2011, the Great East Japan Earthquake occurred in Japan and the Fukushima Daiichi Nuclear Power Plant nuclear disaster caused by the tsunami caused all kinds of problems, including subsequent compensation, reconstruction costs, and power supply shortages, which greatly affected the Japanese economy.

On 26 December 2012, the Japanese cabinet led by Shinzo Abe (2006–07 and 2012–20), who took office as prime minister again, proposed "Abenomics". It features bold financial policies, flexible fiscal policies, and a growth strategy to evoke private investment as the three pillars, which was expected to implement high-intensity policy actions at the financial, fiscal, and industrial development levels to lead the Japanese economy out of the long-term deflation and low growth situation. Based on the above discussion, it can be seen that the Japanese economy entered a stage of low growth and transformation after the bubble economy began to collapse in 1991.

Critical Period of Japan's Economic Growth and Industrial Adjustment Policy

According to the World Bank's statistics, "World Bank National Accounts Database" (Figure 3.12), Japan's per capita GDP reached USD10,360 in 1981, exceeding USD10,000 for the first time, and remained stable

afterwards (except in 1982). Through the appreciation effect of the yen driven by the Plaza Accord in 1985, the GDP per capita reached USD17,113 in 1986 (exceeding USD15,000 for the first time) and further reached USD20,749 in 1987 (exceeding USD20,000 for the first time). After that, under the influence of the bubble economy driving the stock market index and real estate prices, Japan's per capita GDP exceeded USD25,000 in 1988, USD30,000 in 1992, and reached USD44,198 in 1995, which was the highest in history.

After the bubble economy's gradual disintegration in the mid-1990s, Japan's per capita GDP began to decline too. In 1998, due to the Asian financial crisis, it fell to USD32,424, but it gradually recovered. After 2000, the outbreak of the 2002 global Internet bubble collapse hit Japan and its per capita GDP fell to USD32,821. However, it showed a long-term and slow upward trend. In 2008, the global financial tsunami and the 2011 European debt crisis drove the influx of safe-haven funds into Japan, which triggered a sharp rise in the yen. Under the influence of the appreciation, the per capita GDP of Japan reached its highest level ever of USD49,145 in 2012. However, after the official establishment of the Abe Cabinet to promote a long-term monetary easing policy, the exchange rate of USD to yen began to return to more than 1:100, and the average per capita GDP of Japan remained at above USD39,000 after removing the impact index of exchange rate fluctuations.

Based on the above data of Japan's economic growth rate, the Japanese economy entered a high growth stage in 1960–73, a stable growth stage in 1974–90, and a low growth stage in 1991–2021. The average per capita GDP of these three economic growth stages were USD1,492, USD12,586, and USD38,374, respectively, which shows a difference from the fluctuation trend of Japan's economic growth rate and its per capita GDP experienced a continuous upward trend. If the influence of the exchange rate is excluded, the Japanese government adopted industrial adjustment policies of different strategic thinking to respond to the changes in the domestic and foreign economic environment in different periods, and gradually increased the per capita GDP of Japan.

According to the statistical results of the APO, adjusted by purchasing power parity [45], Japan's GDP per capita was:

- USD16,130 in 1970
- USD20,590 in 1977
- USD31,330 in 1988
- USD37,470 in 1997
- USD40,190 in 2006
- USD37,910 in 2009
- USD43,660 in 2019

The figures show that after removing Japan's local price adjustment factor, Japan's per capita GDP has shown a steady upward trend, except during the financial tsunami that broke out in 2008. Table 3.4 highlights Japan's economic performance from 1970 to 2020.

TABLE 3.4

JAPAN'S ECONOMIC PERFORMANCE BETWEEN 1970–2020

(%: Average Annual Growth Rate)	1970 –80	1980 –90	1990 –2000	2000 –10	2010 –19	2015 –19	2016 –17	2017 –18	2018 –19	Projection			
										2019–20	2020–21	2021–22	2020–25
GDP growth	4.7	4.5	1.2	0.6	1.0	0.8	1.8	.06	0.2	-4.9	2.7	1.6	1.1
Labor input growth	1.8	1.8	0.0	0.2	0.3	0.3	1.7	1.5	-2.5	1.4	-0.3	-0.4	-0.5
Labor quality growth	1.6	1.0	0.7	0.8	0.3	0.3	0.6	0.1	0.0	0.4	0.5	0.5	0.5
Hours worked growth	0.2	0.7	-0.7	-0.6	0.0	0.0	1.2	0.7	-1.8	1.0	-0.8	-0.9	-0.9
College labor input growth	5.4	4.6	2.6	2.3	1.3	1.2	3.0	2.2	-2.3	2.7	1.0	0.9	0.8
Non-college labor input growth	0.7	0.6	-1.6	-1.8	-1.1	-1.0	0.0	0.5	-2.8	-0.5	-2.3	-2.4	-2.5
IT capital input growth	13.5	16.1	7.3	3.5	2.5	2.6	2.3	2.0	2.8	3.0	0.8	1.9	1.9
Non-IT capital input growth	5.6	4.1	2.0	0.4	0.0	0.4	0.4	0.5	0.3	0.2	-0.1	0.0	0.0
Per worker labor productivity growth	3.9	3.6	0.9	0.7	0.4	0.0	0.7	-1.6	0.3	-4.3	3.2	2.2	1.8
Per hour labor productivity growth	4.4	3.8	1.9	1.2	0.9	0.8	0.5	-0.2	2.1	-5.8	3.5	2.5	2.0
Capital productivity growth	-5.9	-4.8	-2.4	-0.6	-0.2	-0.5	-0.5	-0.6	-0.5	-5.3	2.7	1.4	0.9
TFP growth	1.1	1.5	0.1	0.2	0.7	0.4	0.5	-0.5	1.5	-5.8	2.8	1.7	1.3

Source: APO Productivity Databook 2021.

This chapter integrates the views of Takayuki Matsui [46], Tomotaka Kuwahara [47], and others who divide the transformation of Japan's industrial policy adjustment strategy into three stages.

- **Traditional industrial policy development stage** - from the 1960s to the first half of the 1980s that focused on subsidizing mature industries and supporting key industries. The average per capita GDP was USD4,682

- **Industrial policy development stage in response to changes in the global economic and trade situation** - the second half of the 1980s to 2000, which focused on implementing complete market competition and accelerating corporate growth. The average per capita GDP was USD29,765

- **Industrial policy to promote open innovation** - 2001–20, which focused on promoting the loosening of regulations and accelerate the metabolism of the industry. The average per capita GDP was USD39,360

Traditional Industrial Policy Development Stage

The development stage of the traditional industrial policy evolved to "subsidizing mature industries and supporting key industries" as the main direction of industrial adjustment policies due to:

- Change of global fuel source from coal to oil

- Second global oil crisis

- The main driving force of industrial development, agriculture, and textiles that transferred into heavy industries, such as steel, shipbuilding and petrochemical

- Environmental factors that saw the development of emerging industries, such as domestic automobiles (small RVs), and consumer electronic products (white home appliances, electronic products for entertainment)

Relevant important acts, among others, encompass:

- **Temporary Measures Act for the Promotion of Coal Mining Areas (1961) [48]**

  The act mainly provided preferential financing, capital tax incentives, local government subsidies, and industrial promotion subsidies from local financial institutions as well as water infrastructure for coal industry clusters in Hokkaido and Kyushu as to assist the coal industry to cope with the gradual abandonment of the mines and the environmental pollution problems caused by mining. This was to maintain the survival of the industry for a certain period of time.

- **Specialized Textile Structural Improvement Temporary Measures Act (1967) [49]**

  The main goal of this act was to respond to the threat of low labor cost advantage of the textile industry in less developed countries and to enhance international competitiveness. Various subsidy measures were used to assist the domestic fiber and textile industry to deal with challenges, such as excess old equipment, import of high-end equipment and upgrade production technology, and promote the consolidation of small enterprises to enhance the competitive advantage of scaled economies.

- **Temporary Measures Act for Stabilizing Specified Depressed Industries (1978) [50] and Temporary Measures Act for Structural Improvement of Specified Industries (1983) [51]**

  The main objective of these acts was to respond to the rapid rise in energy prices caused by the two global oil crises that resulted in a decline in the profitability of resource processing industries. The decline affected aluminum refining, the transformation of the fiber textile industry in response to the rapid catch-up of the textile industry in emerging industrial countries, and the stagnation of specific industry development problems, such as sluggish growth of the shipbuilding industry due to lack of global demand. They aimed to provide processing methods for old equipment, subsidize the introduction of new high-end equipment, and help control the production volume of these industries to avoid market oversupply. Under the implementation of these two consecutive policies, Japan was able to become the first country, among the world's major advanced countries, to get rid of the negative impact of the oil crisis and return to positive economic growth, and to guide Japan into a favorable economic situation with a high trade surplus after the second half of the 1980s.

Industrial Policy Development Stage in Response to Changes in the Global Economic and Trade Situation

The Japanese economy experienced the sharp appreciation of the yen caused by the Plaza Accord, the collapse of the bubble economy, and the impact of the international political and economic environment (such as the Asian financial turmoil), causing it to enter from a medium to low growth rate status. This made the thinking of "implementing complete market competition and accelerating the growth of individual enterprises" the main direction of industrial adjustment.

Relevant important acts, among others, encompass:

- **Act on Interim Measures for the Smoothing of Industrial Structure Transformation (1987) [52]**

  This act mainly targeted individual enterprises and provide assistance through credit guarantees, interest subsidies, tax incentives, and other financial assistance measures to assist SMEs to replace

old equipment, introduce high-end equipment, and improve the production and technical capabilities of employees. It also helped them cope with the increasingly fierce international trade friction and technology competition.

The Japanese government also provided various capital investment channels and subsidy measures for nonprofit organizations engaged in revitalizing the local economy and industrial development, expecting that these third-party organizations can connect and promote the growth and development of local SMEs.

After the implementation of this act, the sharp appreciation of the yen after the Plaza Accord pushed up the development of Japan's bubble economy and the overheated domestic consumption situation also accelerated the growth of enterprises and financial institutions. In addition, except for increasing production bases in local counties and cities to strengthen the production scale of the industry, many enterprises also started to invest in the development of tourism and amusement facilities, aiming to develop a diversified business strategy.

- **Act on Interim Measures for the Smoothing of Business Innovation by Specified Enterprises (1995) [53]**

  Mainly for companies whose production scale and employment have decreased, this policy provided tax credits for R&D expenses, equipment investment tax credits for new business development, preferential measures for accelerated depreciation of old equipment, and financing guarantee measures for credit insurance funds, among others. These measures were expected to assist enterprises affected by the collapse of domestic demand and consumption after the slump of the bubble economy to carry out business transformation and explore new outlets. After the burst of Japan's bubble economy, the long-term trend of low economic growth was unavoidable. The value of assets in many places that were overinvested throughout the country has plummeted and cannot be absorbed through domestic consumption. Therefore, enterprises were encouraged to transform, develop, and innovate abroad to strive for overseas new business opportunities, which became an important policy issue and an important task for the implementation of this act.

- **Act on Special Measures for the Regeneration of Industrial Vitality (1999) [54]**

  This act mainly maintained the spirit of the Business Innovation Act, and through the adjustment of laws and regulations related to intellectual property ownership and subsidy measures, among others. The adjustment was designed to assist enterprises engaged in R&D activities to effectively use business resources to improve productivity and then rebuild Japan's industrial competitiveness. In particular, the ownership of the R&D results and their derived patent rights arising from the application of government scientific research funds by enterprises belonged to the government in the old days. However, after the implementation of this act, the relevant patent rights belonged to the enterprises themselves that actually engage in the R&D activities. This increased the willingness of Japanese enterprises to engage in R&D activities, thereby accelerating industrial upgrading and transformation.

Industrial Policy to Promote Open Innovation

The Japanese economy has faced the impact of the collapse of the Internet bubble, the global financial tsunami, the 311 East Japan earthquake, and the impact of the COVID-19 outbreak, and other economic and natural disasters, but has continued a low growth rate. This made the thinking of "Promoting the Loosening of Regulations and Accelerating Industrial Metabolism" an important direction of industrial policies adjustment.

Relevant major policies include, among others:

- **Structural Reform Special District Law (2002) [55]**

  An important policy proposed by the cabinet led by Prime Minister Junichiro Koizumi, its main purpose was to promote the pilot program of regulatory adjustment and to deal with relevant regulations that may hinder the innovative development of private enterprises or the development of local nonprofit organizations. This is kept within a limited area, whereby the regulations are adjusted or the system improved, the results evaluated, and the possibilities of applying to all parts of the country are explored as well as the impact of the collapse of the Internet bubble on the development of new businesses are alleviated. For example, the Vehicle Sharing System promoted in the Sapporo Vehicle Sharing Zone has now been extended to all over the country.

- **Establish New Industrial Innovation Agency (2009) [56]**

  In response to the impact of the global financial tsunami on high-risk venture capital, the Japanese government established an "Industrial Innovation Agency" in accordance with the Japan's post-disaster reconstruction after the 311 East Japan Earthquake. Coupled with the impact of the sharp appreciation of the yen, the cabinet led by the newly elected Prime Minister Shinzo Abe proposed more powerful policies to guide the Japanese economy out of the dilemma of long-term deflation and sluggish consumption. In this regard, the Ministry of Economy, Trade and Industry proposed the third arrow policy of Abenomics in 2013, the "Japan's Revitalization Strategy", to actively rebuild the international competitiveness of Japanese industries. Among them, the policy contents worth mentioning include the National Strategic Special Zone System and the Industrial Competitiveness Enhancement Act.

- **National Strategic Special Zone System (2013) [57]**

  As far as the National Strategic Special Zone System is concerned, the main purpose was to rebuild and strengthen the international competitiveness of industries, and select wide-area special zones to loosen regulations to break through obstacles to the development of various emerging industries, strengthen innovation capabilities in various fields, and attract foreign investment and top-level foreign talents.

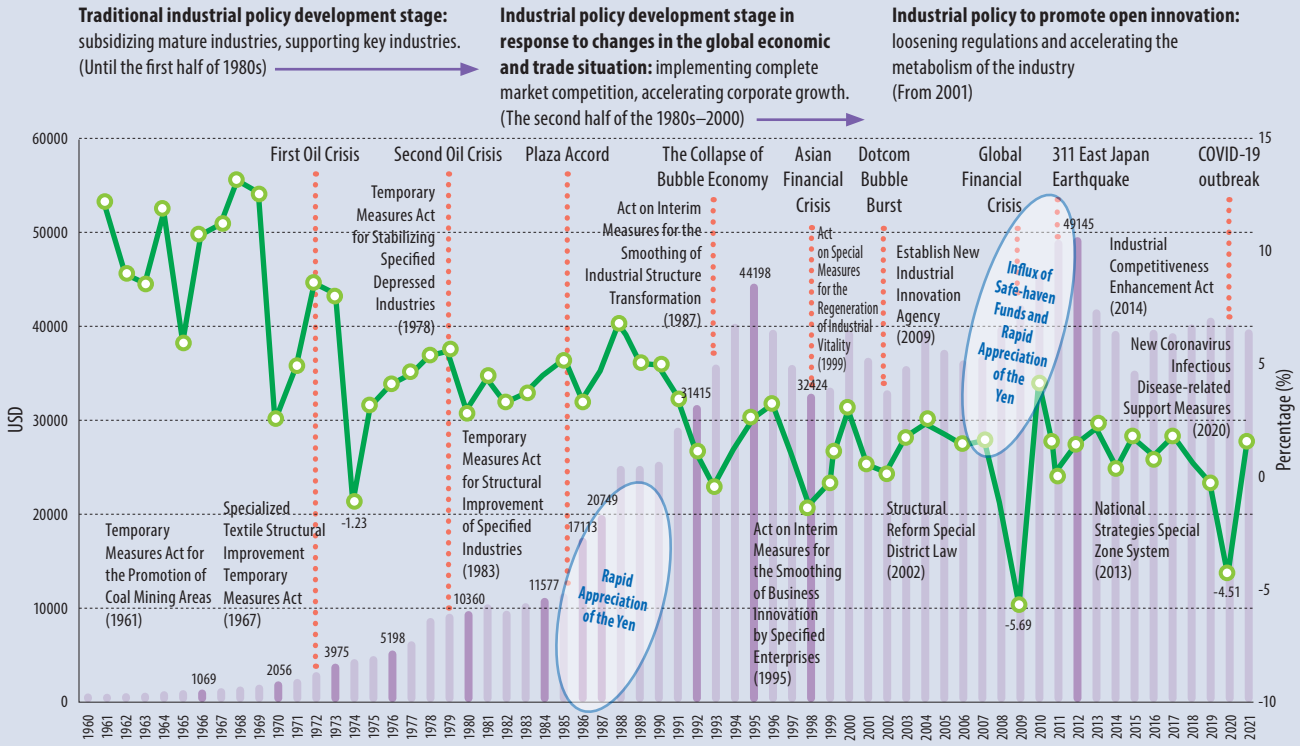
- **Industrial Competitiveness Enhancement Act (2014) [58]**

  This act was mainly under the two major policy axes of "loosen regulations" and "promoting industrial metabolism". Through the Corporate Exception System, the elimination of gray areas, and the promotion of "innovative" business revitalization, it was expected to stimulate private investment and further resolve the phenomena of "excessive regulation, insufficient investment, and excessive competition" as to rebuild the competitiveness of Japanese industries in the international market.

Based on the above discussion, the transformation of Japan's industrial policy adjustment strategy is shown in Figure 3.13.

FIGURE 3.13

JAPAN'S CHANGES IN INDUSTRIAL POLICY ADJUSTMENT STRATEGIES



Source: World Bank National Accounts Database.

Changes in the Japanese Economic Structure and the Sluggish Economic Growth

This study summarizes the trend of changes in the Japanese economic structure and explains it in stages, such as light industry development, heavy industry development, export-oriented industry development, financial service-oriented industry development, and emerging industry development with open innovation characteristics. As the Japanese economic structure develops in different stages, it can also be observed that the Japanese economy has fallen from a high-growth state to a low-growth state.

- **First stage** - As far as light industry development is concerned, after the second half of the 1950s and due to the demand for consumer goods and raw material processing, the Japanese light industry began to develop with industries, such as fibers, processed food, relevant light industry, etc. As a result, Japan's economic growth rate significantly increased and entered a high-growth stage.

- **Second stage** - For the heavy industry development, after the 1960s, due to several factors - the shift in global energy supply sources from coal to oil, the results of the priority production system policy, and the Tokyo Olympics - the industrial development structure shifted from light industries (agriculture and textile spinning) to heavy industries (steel, shipbuilding, and petrochemical industries). Simultaneously, it was also bringing opportunities for the development of white major appliances (TVs, washing machines, refrigerators, etc.) and other electronic industries. Japan's economy also showed a high level of growth.

- **Third stage** - The export-oriented industrial development took place after the 1970s. Affected by the rapid rise in oil and other energy prices triggered by the second global oil crisis, Japan's high economic growth began to slow down. The Japanese government encouraged the development of low energy-consuming products and developed production systems with rationalized costs by subsidizing mature industries and supporting key industries, which led to the export of products, such as small cars and industrial machinery. As a result, after the oil crisis, Japan's industry structure transformation, which was driven by the automobile industry, was able to maintain a growth rate higher than the average of major countries in the world. But the high economic growth state was no longer the same as before, and it entered a period of stable growth.

- **Fourth stage** - With regard to the financial service-based industrial development, after entering the 1980s, the results of the Plaza Accord drove the appreciation of the Japanese yen and also triggered a trend of overinvestment in domestic and overseas real estate by Japanese businesses, forming a bubble economy with nonsubstantial production characteristics. The demand for funds created by these investment trends also further drove the robust development of the Japanese financial services industry. However, starting in 1990, under the influence of tight policies of the Japanese government and the Bank of Japan, real estate and land prices plummeted and the Japanese stock market crashed, leading to serious bad-debt problems and bankruptcy for many financial institutions. This resulted in the "lost thirty years" of the Japanese economy that led to enter a low-growth or even stagnant state.

- **Fifth stage** - For the emerging industry development with open innovation characteristics, after entering the 2000s, the Japanese government began to promote many economic special zones and policies to loosen regulations. The measures were to accelerate industrial metabolism and the development of new enterprises, and to construct an open innovation ecosystem for emerging industries in revitalizing the long-stagnant Japanese economy. However, since 2008, Japan has continued to be affected by external factors, such as the global financial crisis, the 2011 East Japan Earthquake, and the outbreak of COVID-19. Both private consumption and investment have been unable to return to the state before the formation of the bubble economy. Thus the Japanese economy remained in a low-growth state.

Impact of the USA-PR China Trade Friction and the COVID-19 Pandemic on Japan and its Countermeasures

After 2018, affected by the USA-PR China trade friction and the COVID-19 pandemic, Japan's economic growth has shown a trend of sharp fluctuations that demanded for the Japanese government to act.

Impact of the USA-PR China Trade Friction and Countermeasures

The trade friction sees a series of tariff increase in both countries and key technology export restrictions have been implemented between the USA and China since January 2018. The impact has caused sluggish consumer demand in the global market and a reduction in total trade volume, which also impacted the export trade of Japanese companies. In this regard, the Japanese government responded by accelerating the signing of free trade agreements, including, among others:

- Accelerate the completion of bilateral FTA signing with the USA, preventing the atmosphere of the USA-PR China trade war from expanding to the USA-Japan trade and even the bilateral trade with other countries

- Expedite the signing of a digital trade agreement with the USA to deal with cyber security issues

- Accelerate the promotion of regional economic integration, such as Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) to cohere consensus on global intellectual property protection, cross-border e-commerce regulation, improving the constitution of state-owned enterprises, and the development of data circulation

- Strengthen export control of key technologies

Specifically, on 7 October 2019, the USA and Japanese governments signed the Trade Agreement on Goods [59], so that the USA government would pause imposing the heavy duty of 25% on Japanese auto products (currently 2.5%). In return, Japan must reduce tariffs and relax import quantity restrictions on USA beef, pork, and other items. Since the export value of Japanese automobiles and their components to the USA accounts for more than 30% of Japan's export value, avoiding the taxation of key export items by the USA is an important takeaway from this Free Trade Agreement (FTA). The template of the USA-Japan trade agreement can be used as a reference for future USA-PR China FTA and USA-EU FTA.

At the same time, the USA and Japanese governments also signed the USA-Japan Digital Trade Agreement [60]. This is for future outlook, where the cross-border circulation and sharing mechanism of important data, such as digital data, software, and algorithms between the two countries will gradually mature under certain security norms. It will be beneficial to the cocreation and development of smart technology applications, such as AIoT, robotics, 5G, and big data analysis. This agreement is expected to become a reference model for Asian countries to promote transnational digital innovation agreements in the future.

In addition, the Japanese government also announced the "Act on Promotion of Economic Security" on 18 May 2022, which promotes "ensuring the stable supply of important materials", "ensuring that only equipment with security guarantees can be used for important infrastructure", "prohibition of disclosure of important invention patents" (nuclear energy, cyber security, quantum technology), and “assistance in the R&D of forward-looking technology”, among others [61]. The act is formulated in anticipation of responding to the practices of major Western economies to prevent the leakage of key technologies in domestic industries (especially to PR China, etc.), and then strengthen the cooperative relationship with friendly and allied countries.

Impact of the COVID-19 Pandemic on Japan and Countermeasures

In the early stage of the COVID-19 outbreak, due to the short-term border closure of major countries, the Japanese manufacturing industry, which relies on the global supply chain system, was most affected. The Japanese wholesale and retail industry, catering industry, accommodation and hotel industry, and the transportation industry which includes tourism and air logistics and engaged in cross-border commodity trade, were also heavily affected when the pandemic entered the stage of virus spreading and the prevention norms needed upgrading.

From 2020, the Japanese government started to promote "Relief and Revitalization Measures for Industries Affected by the COVID-19 Pneumonia" [62]. The policy covers four strategic implications.

- **Strategy one** - In terms of optimizing the resilience of the domestic supply chain, provides subsidies, tax concessions, and counseling measures for industries that are highly dependent on imports from a single overseas country. This includes pandemic prevention technology industries (masks, respirators, protective clothing, quick screening devices) to promote Japan's domestic production capacity and diversify the source countries of imported raw materials and components (diversify supply sources, multiline production bases).

- **Strategy two** - On the matter of financing, private financial institutions are required to care for SMEs that have received financing, understand the current capital turnover problems in operations, provide appropriate management consulting services, and relax financing review conditions.

- **Strategy three** - This looks into equipment investment and sales expansion, verifies various business models that apply smart technology through subsidies by encouraging private enterprises to introduce information, communication, and automation equipment, thereby driving new noncontact business opportunities and industrial development, such as remote working and e-commerce.

- **Strategy four** - Encompasses the improvement of the business environment, promotes supporting measures, such as caring within the supply chain, adjustment of favorable employment conditions, changes in work patterns, and information sharing in overseas markets, in creating a harmonious relationship between enterprises and labor to respond to the COVID-19 pandemic together.

CONCLUSION

After the revival period of the post-World War II, under the influence of changes in the external market environment, Japan's economic growth entered a stage of high growth in the 1960s and 1970s. It was during this period that the focus of industrial development gradually shifted from light to heavy industry, leading the automobile and the consumer electronics industries into a period of budding growth. Then, due to the impact of the two oil crises in the 1970s and 1980s and the rapid appreciation of the yen driven by the Plaza Accord, the Japanese industrial business model became more international. In addition to maintaining production activities to respond to the dynamic domestic market, the enterprises have also actively engaged in asset acquisitions not just at home, but abroad too. An unproductive economic bubble was triggered and brought the Japanese economy into a stage of stable growth. When the bubble economy collapsed, Japan entered a long-term deflation, caused by the sluggish domestic consumption and investment as well as experiencing labor shortage caused by the development of the super-aged society. These factors led Japan into a stage of low growth.

However, despite Japan's gradually declining economic growth rate, its per capita GDP continued to rise, exceeding USD15,000, USD25,000, and USD30,000 in 1986, 1988, and 1992, respectively, and reached its peak in 2012 at USD49,145. In fact, Japan's per capita GDP data in USD has been affected by the rapid appreciation of the yen in the mid-1980s and after 2010, which has led to a multiplicative upward trend. If the impact of exchange rate is excluded, in the medium and long term, Japan's per capita GDP still showed a continuous growth trend. This may also explain that Japan has achieved a certain degree of improvement in per capita GDP in response to changes in the domestic and international economic environment through different stages of industrial adjustment policies.

As highlighted earlier in the chapter, Japan’s strategic thinking can be divided into three stages. The first stage is the “traditional industrial policy development stage” (from 1960s to first half of 1980s) focused on subsidizing mature industries and supporting key industries in response to changes in the internal and external environment. They include the shift of global energy from coal to oil, the two oil crises, and the gradual transformation of the industrial structure.

The “industrial policy development stage” is the second stage that responded to changes in the global economic and trade situation (from second half of 1980s to 2000). The focus was on implementing complete market competition and accelerating the growth of enterprises in response to the impact of the Plaza Accord on the appreciation of the yen, the collapse of the bubble economy, and the impact of the international political and economic environment, such as the Asian financial turmoil.

The third stage happened from 2001 to 2020, where the "industrial policy development stage for promoting open innovation" focused on promoting the loosening of laws and regulations, and accelerating industrial metabolism in response to the long-term deflation, sluggish consumption, and investment recession in Japan, which took effect in the decline of industrial competitiveness.

In particular, the Industrial Competitiveness Enhancement Act, which the Japanese government has actively promoted and implemented since 2010, is worthy of reference for the ROC. Since both the industries of the ROC and Japan are facing the challenge of the super-aging population, declining birth rate, and the increase of manufacturing costs, the key for getting these economies back on track is through new technologies and emerging technology industries.

The Industrial Competitiveness Enhancement Act is the legal basis for Japan's promotion of industrial revitalization strategies in recent years. It covers two regulatory relaxation measures, including the "Corporate Exception System" and the "Gray Area Elimination System", which help reduce manufacturing operating costs and stimulate the development and innovation of emerging industries thus solving the problem of labor shortage caused by the super-aging society. Relevant authorities in the ROC shall continue to take stock of the follow-up results of the act as to promote industrial upgrading and the development of emerging industries, and review the possibility of applying it to the ROC's industrial development. In addition, it can:

- Strengthen the function of the ROC's political investment funds
- Take the promotion of industrial metabolism as the strategic direction
- Take stock of specific industries that still have development potential but are under slow growth trend
- Carry out innovative restructuring and regeneration
- Make good use of the long-term accumulated technology development in the past achievements and promote its due market application value.

Further, in facing the impact of the USA-PR China trade frictions in recent years, the Japanese government has responded by "accelerating the signing of free trade agreements and digital trade agreements" and "international safety net for key technologies". In this regard, the ROC government can deepen the cooperation with the Japanese government in terms of joining regional economic integration agreements, such as the CPTPP and the Data Circulation Trade Circle led by Japan, the USA, and Europe with high transparency and cocreation characteristics.

In addition, the Japanese government has raised its strategic implications in facing the COVID-19 pandemic in four ways:

- Optimizing the resilience of the domestic supply chain
- Helping SMEs get through the risk of shutting down
- Encouraging enterprises to apply information and communication technology to drive noncontact business opportunities and industrial development
- Promoting 'caring' in the supply chain, adjust employment conditions, overseas market information sharing, and other supporting measures in the business environment, in order to maintain the harmonious relationship among enterprises, labor, and capital

The content of these policies also overlaps with the practice of the ROC government. However, Japan's policy thinking of "focusing on solving key industrial problems" and "promoting harmony and cocreation among the people" is still worthy of reference by the ROC government.

CHAPTER 4

CONCLUSIONS AND POLICY RECOMMENDATIONS

CONCLUSIONS

It is not easy for countries to stride out of the middle-income trap, mainly because low cost production methods and cheap access to capital of the past are no longer available. In addition, moving from the extensive production models of the past to current technology-intensive and brand production, will see them face greater competition from high-income countries, coupled with entry barriers, such as intellectual property rights, industry standards, consumer protection, and environmental protection. Thus the challenge is greater for middle-income countries to upgrade, transform, and overcome obstacles. The ROC, Singapore, the ROK, and Japan were able to emerge from the middle-income trap due to their respective unique development model and an efficient bureaucratic system. In this segment, their major policies are reiterated.

Republic of China (ROC)

The ROC's economy mostly comprises SMEs, with many of them serving as OEMs for international corporations. However, with the overseas deployment of firms, the layout in Southeast Asia and PR China, and the benefit from huge production bases, the information electronics industry has begun to achieve economies of scale and match international branding firms. This has given firms stable profits, allowing them to upgrade and transform, and create entry barriers that other countries cannot overcome.

The foundations laid by the ITRI, Hsinchu Science Park, and other infrastructure and export-oriented policies in the 1980s, coupled with the vigorous development of the electronic information industry and semiconductor industry, and the hinterland of the Chinese mainland market have propelled the ROC's economy to grow rapidly. The establishment of public-research institutes (such as ITRI, the Institute for Information Industry (III), etc.) allow the ROC's SMEs with weak research capabilities to obtain cheap technology transfer, increase their R&D energy, and enable them to upgrade.

Between 1998 and 2015, the ROC's average growth rate was 4.1%, slightly lower than the ROK's 4.3%. This mainly reflects Taiwanese firms facing the trend of moving their operations westward in search of investment opportunities as well as the slowdown in worldwide demand after the global financial crisis and the lack of domestic investment momentum.

In 2018–21, the USA-PR China trade war escalated, and the ROC government took advantage of the situation to attract Taiwanese firms to return. At the same time, the government also launched forward-looking infrastructure programs, which made the combined contribution of the ROC's private investment and public expenditure at 1.9%, higher than the ROK's 1.7%. In addition, the ROC's effective pandemic prevention and its competitive advantage in the semiconductor industry helped maintain strong exports. During this period, the ROC's average growth rate reached 3.5%, higher than the global average of 2.4% and significantly better than the ROK's 2.4% and Japan's 0%.

Thanks to the overseas deployment in the past few years (including ASEAN countries and investment in PR China), and the policy of encouraging the return of Taiwanese businessmen since 2020, the ROC has become one of economies in the world without supply chain disruptions amid the USA-PR China trade war and the COVID-19 pandemic. With a high growth rate of nearly 20% in exports and investment, the ROC has performed excellently - reaching a 6.57% growth rate in 2021, a USD7,000 increase in per capita income, and a high growth rate of an average of 4% in four years between 2019–22.

Singapore

Singapore's main enterprise is its entrepot trade, which focuses mainly on commodity. It has developed related financial, capital, and futures markets that support the development of entrepot trade. Simultaneously, it attracts multinational corporations to develop high-tech industries, such as petrochemical, semiconductor, and biotechnology through tax incentives. Each critical period's major policy and motivation behind such policies are summarized as follows.

- **First critical period: Upgrading to become a modern industrial country**

  Singapore became an emerging industrial country in Asia in the late 1970s and a modern industrial country dominated by capital and technology in the early 1990s. In this period, Singapore government's main policies included: (i) urging companies to turn to technology and capital-intensive industries; (ii) encouraging foreign business to establish partnerships with local enterprises and guide foreign capital to invest in high value-added industries, where high-tech enterprises can enjoy the tax-free policy for 5–10 years; (iii) differentiating Singapore from other East Asian countries and attracting foreign investment with its operational headquarters and financial environment; (iv) strengthening technical training and improve the quality of manpower, and finally (v) developing petrochemical production base and distribution center as well as the Singapore Technology Park to expand the technology industry.

- **Second critical period: Striding into knowledge-based economy**

  In this period, major policy efforts are summarized as: (i) adopting a loose new immigration policy to attract overseas elites with professional knowledge and assets, and grant them permanent residency or citizenship; (ii) create a headquarters economy and adopt an economic circle development strategy with Singapore as the center and seven-hour flight distance as the radius.

  In order to diversify industrial structure, Singapore developed knowledge-intensive industries, such as biomedicine and information industry. Entering the 21st century, Singapore has formulated a series of economic development strategies, such as the "Industry 21 Plan", among which, the high-tech strategy is particularly aimed at the biomedical industry.

Republic of Korea (ROK)

The development model of the ROC and the ROK is based on manufacturing. However, the ROK has its own brands and large trading companies, and its vertical integration model allows it to control key raw materials, which is beneficial for the development of its brands. This also enabled the ROK to escape the middle-income trap earlier than the ROC.

The ROK's per capita income exceeded USD3,000 in 1987 and reached USD11,468 in 1995, successfully breaking through the middle-income trap within a nine-year period. Thereafter, it has increased significantly every year with the pace of its economic growth. Before the global financial crisis in 2007, the threshold of USD20,000 had been exceeded. Impacted by the global financial crisis, its per capita income dropped to below USD20,000 in 2008 and 2009, returned to above USD20,000 in 2010, and exceeded USD30,000 in 2018. In 2021, it reached USD35,000, entering the list of high-income country.

The key factors that made the ROK's per capita income to continue growing successfully can be summarized as follows:

- **Guiding economic momentum through innovative development**

  The ROK has invested in four critical aspects: innovation strategy, innovation drive, innovation input, and innovation environment. These investments; (i) attach importance to the transformation and application of scientific and technological achievements, and strengthen the integration of production, governance, education, and research; and (ii) cooperate with relevant fiscal, taxation, and financial policies to promote innovation, and improve resource allocation efficiency that form a driving force for sustained economic growth.

- **Promoting structural adjustment of economic constitution**

  After the 1990s, with the substantial growth of per capita income while driving the upgrading of consumer demand, the ROK accelerated the adjustment of industrial structure, thereby improving the economy. That is, the government took advantage of the change in demand structure to drive the upgrading of its industrial structure. In the meantime, it also accelerated the introduction of science and technology through the upgrading of the industrial structure, forming an adjustment of the industrial structure every 10 years.

- **Implementation of social policies that are balanced and effective in employment and distribution**

  In the process of economic development, the ROK had the problem of "focusing too much on growth and ignoring distribution," which resulted in a widening urban-rural income gap and escalating social conflicts. To balance uneven income distribution, the Korean government has implemented a series of effective measures to improve employment and distribution balance. These measures have allowed the ROK to rapidly increase its middle-income population, shaping a middle-class society, successfully completing the transformation of its social structure, and becoming a high-income country with sufficient social conditions.

Japan

Japan is an economy that pays equal attention to manufacturing and services. In particular, the export trade promoted by big traders in the past as well as the vigorous development of its own finance and real estate sectors enabled Japan to quickly stride across the middle-income trap.

Japan's important industrial policies and its strategic thinking can be divided into three stages.

- **Traditional industrial policy development stage**

  The period of 1960s to the first half of the 1980s focused on subsidizing mature industries and supporting key industries in response to changes in the internal and external environment, such as the two oil crises and the gradual transformation of the industrial structure.

- **Industrial policy development stage in response to changes in the global economic and trade situation**

  In the second half of the 1980s to 2000, the focus was on implementing market competition mechanism and accelerating the growth of enterprises in response to the impact of the appreciation of the yen and the Asian financial turmoil.

- **Industrial policy development stage promoting open innovation**

  From 2001 to 2020, the policy focused on promoting the relaxing of laws and regulations, and accelerating industrial metabolism, in response to the long-term deflation, sluggish consumption, and investment recession in Japan.

POLICY RECOMMENDATIONS

Due to the different backgrounds and development models practiced by the countries, it is difficult to generalize a commonality. Therefore, before considering a development model, countries must also weigh its own background, factor endowment, strengths and weaknesses, and then decide on a more appropriate development model to follow. The recommendations proposed here are based on the learnings of four economies.

ROC

There are several valuable lessons for other Asian countries to take note of, which can be summarized as the following six policy recommendation:

- **Policy recommendation one - Manufacturing countries can still stride out the middle-income trap through innovation and investment (Chen Tianzhi, 2022)**

  Unlike the ROK, the ROC has no brand and no marketing channels. But as a result of active overseas investment and global layout, it is the OEM for international companies with strategic alliances. With advanced technology and stable orders, it has begun to enjoy economies of scale and scope, and become an indispensable OEM partner for international companies, which has also created considerable barriers to entry. Although the gross profit margin is not high, it has stable profits as a result of the global layout and the expansion of the number, which is also the key to stable economic growth.

- **Policy recommendation two - The layout and policies of major industries are still necessary**

  The ROC's investment in semiconductors in the 1980s was subsidized by public-research institutes and Technology Development Program to reduce the risk of initial investment in semiconductors and leverage effect of the country's resources. This is also an important reason for the take-off of the semiconductor industry after 2000. For the electronic information industry, although the government's policy intervention is not obvious, the ROC's capital market also contributes to the provision of the necessary funds for the electronic information industry to grow, expand, purchase, merge, upgrade and transform, and internationalize.

- **Policy recommendation three - Infrastructure and talent investment are indispensable**

  From the establishment of export processing zones in the early stage, to the investment of science parks and public-research institutes in the middle and later stages, the ROC has achieved certain effectiveness in reducing the risks of early R&D and personnel training conducted by private institutions. The ROC's heavy investment in post-secondary education has cultivated abundant talents and engineers, where they assist in planning, development, and production that push the industry to grow rapidly.

- **Policy recommendation four - Intellectual property rights, equipment value-adding, and appropriate localization are of great importance to nurturing the industry**

  Although the LED, TFT LCD, and other industries in the ROC were booming in the early days, the equipment was mainly imported as their own R&D investment was insufficient and industrial upgrading was limited. Once other competing countries purchase more advanced equipment and recruit talents, the industry will be destroyed, which is why the ROC fell into the quagmire of growth from 2000 to 2015.

- **Policy recommendation five - Make good use of international resources and carry out international division of labor**

  The ROC's resources are limited, so it chose to cooperate with American firms and made good use of the PR China's market, currently creating its' today's electronic information and semiconductor industries.

- **Policy recommendation six - Long-term supervision and evaluation of government projects and policies**

  The Council for Economic Planning and Development (now known as the National Development Council) regularly conducts a four-year supervision and evaluation of the effectiveness of all government policies and industrial development projects as a basis for policy adjustment. This is a good practice that other countries can emulate.

Singapore

Singapore's successful policy measures can be concluded as the following:

- **Successful government policy domination - Balancing free markets and government involvement**

  For other emerging countries, when planning their development strategies, they can take a look at how Singapore balances market forces and government involvement. If political conditions permit, they can follow the Singapore government to set the direction of policies and rules, give enterprises a high degree of profit-seeking space within the framework, which can be conducive to the sustainable development of the industry. However, this path presupposes visionary government leaders and an efficient civil service system. In the case of a military government or a government in a failed state, the Singapore model is difficult to replicate.

- **Phased economic development strategy, maintaining high policy flexibility**

  Singapore has transformed from labor-, technology-, and capital-intensive industries to one economy dominated by knowledge-based economy. From its "two five-year plans", "ten-year plan", and public initiatives of leaders, to the official axis of industrial policy, everything points to a neat phased development.

  For other emerging countries, such arrangement of development stages can help to concentrate the high-intensity development of domestic enterprises and social resources so that the economy will not fall into the predicament of development disorder and vicious competition in the industry. It would first require consideration of the countries' internal and external environment as well as implementing national regulations and institutional systems.

- **Highly open, yet autonomous**

  It is worth noting that during the Lee Kuan Yew period, Singapore realized that it was overly reliant on foreign capital. In the long run, there may be side effects, such as reducing the development of local SMEs, reducing the employment of local labor, and being restrained by advanced countries. Therefore, many key areas are still controlled by state-owned capital to ensure national autonomy. Unlike other developing countries, the Singapore government has not given state-owned enterprises the power to monopolize operations. Thus on the one hand, it can reduce the risk of being highly dependent on private capital, and on the other, government-linked enterprises still need to face market competition, which can effectively avoid eventual inefficiency.

- **Continue investment in digitalization and infrastructure to maintain a friendly business environment**

  For other emerging countries, if they are in the developing stage, the government will generally adopt specific policy incentives, build specific industrial parks, and build infrastructure for purely production purposes. However, when the industry develops to a certain level, the dividends of infrastructure construction must spill over to nonproduction sectors, or expand to diversified industries. This is as way to continue to drive social growth and create a virtuous circle.

ROK

The ROK is a country with a presidential system and generally adopts a top-down approach to economic policy planning. Every president has his own national political think tank team to assist in planning policy guidelines from the beginning of the election, to the next five years when he/she is elected to power in fulfilling the national policy commitments made during elections. The following are some of the presidents that put in place policies that worked in the favor of the ROC.

- Kim Dae-jung was in power in 1998 when the ROK was facing the IMF crisis. He focused on reforming the *chaebols* and industrial structure, introducing dispatched manpower, and proposed the development of the cultural industry.

- Roh Moo-hyun advocated the integration of technology and innovation, strengthening scientific and technological management, and carrying out administrative efficiency reforms in order to “take benefits as the purpose of economic growth”, focusing on the distribution of export benefits and advocated consumption-driven growth.

- Lee Myung-bak regime made the "South Korea 747" commitment, which included an economic growth of 7%, per capita income reaching USD40,000, and leading the ROK to enter the world's top seven largest economies. He formulated the "577 Initiative" basic plan for science and technology, and advocated green policies to shape a leading international image and a national brand.

- Park Geun-hee emphasized the integration of technology and ICT, and advocated the creative economy.

- Moon Jae-in promoted people-oriented, technology-disruptive innovation as a new opportunity for national growth and transformation as to solve industrial and social problems.

Although each regime has its policy axes, their core can be roughly summarized as follows:

- **Implementation of the strategic thinking of knowledge economy**

  With the help of the global knowledge economy, the ROK turned itself into a country where the government uses knowledge to support and establish technological SMEs. A focus that took place

especially since 2001 and through "concentration and selection", the government has been investing to breed Inno-Bizs and cultivate invisible champions.

- **Strengthen regional industry-university R&D clusters**

  The ROK's investment in basic research has nurtured key technologies to develop cutting-edge knowledge fields. As a growth driver, the international science corridor policy was proposed in 2008, and a basic scientific research institution was established to introduce heavy ion accelerators in 2021 as a base for the integration of basic research and business. Thereon, the government moved to forming regional clusters.

- **Attach importance to talent cultivation**

  The ROK attaches great importance to education as its domestic society believes that learning and experience affect the social and economic status of life, and provide human resources for industrial development in a timely manner in response to environmental changes. With the advent of the era of creation and utilization of knowledge, innovation, and entrepreneurship, since 2002, vocational schools have been spread with the spirit of entrepreneurship and business awareness.

- **Shaping the national image and branding**

  National image is the key for a country to improving its political and economic status, and competitive advantage in the international society. After the financial crisis in 1998, the ROK invested in the content industry through national policies.

  The ROK invests national energy and funds to shape its brand image, enabling the added value of the cultural industry to penetrate into related products to enhance the country's image, which in turn becomes a driving force for the growth of the industry. The Korean trend driven by the Korean cultural industry also adds value to Korean brands and the national image, helping Korean products export around the world.

Japan

Japan introduced different policies to cope with challenges in each development stage. The Industrial Competitiveness Enhancement Act, which the Japanese government has actively promoted and implemented since 2010, is worthy of reference for other countries. Since the industries of most Asian countries and Japan are both facing the problems of super-aging population, declining birthrate, and an increase in manufacturing costs, figuring out how to solve these problems through new technologies and then derive emerging technology industries is the key to bring Japan economy back to the growth track.

The act is the legal basis for Japan's promotion of industrial revitalization strategies in recent years. It covers two regulatory relaxation measures, including the Corporate Exception System and the Gray Area Elimination System. These measures also help reduce manufacturing operating costs and stimulate the development and innovation of emerging industries thus help solve the problem of labor shortage caused by the super-aging society.

Moreover, the Japanese government has raised the strategic implications in facing the COVID-19 pandemic. A series of steps were taken to manage the situation, where:

- First, optimize the resilience of the domestic supply chain

- Second, helping SMEs get through the risk of shutting down

- Third, encourage enterprises to apply information and communication technology to drive noncontact business opportunities and industrial development

- Fourth, promote "caringness" in the supply chain, adjust employment conditions, overseas market information sharing, and other supporting measures in the business environment

Japan's policy thinking of "focusing on solving key industrial problems" and "promoting harmony and co-creation among the people" is still worthy of reference for Asian governments.

REFERENCES

[ ] Chen T.J. Taiwan Stride Across Middle Income Trap (in Chinese). Taipei: Universal Culture Co.; 2022.

[2] Wang J.C., Mai C.C. Industrial development strategy and structural transformation. In: Mai C.C., Shih C.S., eds. Taiwan's Economic Success Since 1980. Cheltenham and Northampton: Edward Elgar; 2001, pp. 211–247.

[3] Wang J.C., Daw M. Taiwan's industrial innovation policy and programs to support research and technology based entrepreneurship. In: Mian S.A., ed. Science and Technology Based Regional Entrepreneurship - Global Experience in Policy and Program Development. Cheltenham and Northampton: Edward Elgar; 2011, pp. 286–305.

[4] Chen T.J. Striding Across Middle Income Trap for Taiwan Economy. Taipei: Commonwealth Publishing Co. Ltd; 2022.

[5] Krugman P. The myth of Asia's miracles. Foreign Affairs 1994; 73(6); 62–78.

[6] Wang J.C. Taiwan's semiconductor industry and its supply chain strength, weakness, and prospect (in Chinese). Paper presented at the Chung-Hua Institution for Economic Research and Mizuho Bank industrial exchange conference on 28 April 2022.

[7] Mathews J.A. High Technology Industrialization in East Asia: The Case of Semiconductor Industry in Taiwan and Korea. Taipei: Chung-Hua Institution for Economic Research; 1996.

[8] Nomura Research Institute. Rapid Growth of Taiwan's IC Industry Through Joint Private Sector Efforts. Japan: Nomura Research Institute; 1995.

[9] Science Park Administration. Science-based Industrial Park. Hsinchu: Science Park Administration; 1998.

[10] Sun K.N., Wang J.C., et al. A Comprehensive Assessment of the Tax Reduction and Exemption Incentive Measures for the Statute for Upgrading Industries (in Chinese). Taipei: Chung-Hua Institution for Economic Research; 1997.

[11] World Bank. The East Asia Miracle: Economic Growth and Public Policy. New York: Oxford University Press; 1993.

[12] Wolfgang O. Economic policy and international competition in high-tech industries: The case of the semiconductor industry, Tokyo Club Papers 1995; 8: 11–28.

[13] Chen M., Lin C. Discussion on the causes of the Asian financial crisis; Finance 1999; 1: 69–87.

[14] Zhang Q., Guo J. Understanding Singapore (in Chinese). Hong Kong: City University of Hong Kong; 2010.

[15] Yang J. Reviewing the Economic Transition and Industrial upgrade in Singapore. Urban Insight 2011; 1: 56–65.

[16] Yilin Wu. The political economy of Singapore being a regional financial centre (in Chinese). Kaohsiung: Master's thesis, Institute of China and Asia-Pacific Studies, National Sun Yat-Sen University; 2013.

[17] Lin C.J. The impact of internationalization on economic adjustment policy: The case study of ASEAN countries in Asian financial crises (in Chinese). Taichung: Master's thesis, Department of Political Science, Tunghai University; 2000.

[18] Ministry of Communications and Information. Singapore Yearbook 2003; Singapore; Government of Singapore; 2003.

[19] Economic Strategies Committee. High Skilled People, Innovative Economy, Distinctive Global City. Singapore: Economic Strategies Committee; 2010.

[20] Leinbach T.R., Ulack R. Southeast Asia: Diversity and Development. New Jersey: Prentice Hall; 1999.

[21] Chen H.Y. History of Singapore (in Chinese). New Taipei: The Commercial Press; 2017.

[22] Shih Y. Government-linked companies and state-business relations in Singapore. Taiwanese Journal of Political Science 2009; 43(39): 159–202.

[23] Ke X. New Singapore: New economic and social trends in the Pearl of the South China Sea (in Chinese). Taipei: Global Views Commonwealth Publishing; 2003.

[24] Lu J. Learn from Singapore: The great wisdom of a small country (in Chinese). Beijing: Xinhua Publishing House; 2009.

[25] Wang M., Yuan H. Industrial upgrading and spatial planning in Singapore: Progress and experience (in Chinese). Urban Insight 2011; 1: 66–76.

[26] Intellectual Property Office of Singapore. Singapore IP Strategy 2030 Report. Singapore: Intellectual Property Office of Singapore; 2021.

[27] Ministry of Commerce of the People's Republic of China. Overview of Singapore's Trade in Goods and China-Singapore Bilateral Trade in 2019. China: Ministry of Commerce; 2019.

[28] Fortune Times. The US-China trade war: Singapore's gains and losses. https://www.fortunetimes.sg/cn/?p=18913. Accessed on 21 October 2022.

[29] Vaswani K. Singapore PM: 'Considerable risk' of severe US-China tensions. BBC, 11 March 2021.

[30] Taipei Representative Office in the Republic of Singapore, Government of the ROC. Singapore's Strategies and Counseling Measures to Assist Companies in Responding to the Epidemic. Singapore: Taipei Representative Office in the Republic of Singapore; 2020.

[31] Singapore Economic Development Board. Future ready infrastructure. https://www.edb.gov.sg/cn/why-singapore/future-ready-infrastructure.html. Accessed on 24 October 2022.

[32] Wanxie S. Korean Economic Theory Discussion. Presentation took place at the Chukyo University Business Association, Nagoya-shi, Aichi, Japan on 20 June 1987.

[33] Korea Economic Analysis. Nippon Hyoron-Sha Co; 10 April 1988.

[34] Park C. Miracle of the Han River (translated). Shanghai: Tongji University Press; 2012.

[35] Zhang X., Mu Y. The enlightenment of the successful experience of post-war Korea's industrial structure evolution to Taiwan. Commercial Research 2002: 14.

[36] LYW. How South Korea overcame the middle income trap (in Chinese). China Development Observation, 28 August 2018. Available on https://cdo.develpress.com/?p=6504.

[37] Wen X. The enlightenment of the successful experience of post-war Korean industrial structure evolution to Taiwan. Journal of HangZhou Normal University 1996; 1.

[38] Central News Agency. South Korea's trade deficit with China hits US$5.1 billion as it loses its competitive edge (in Chinese). 3 April 2023. Available on https://www.cna.com.tw/news/aopl/202304030094.aspx.

[39] China Times. South Korea's electronic products hurt by U.S.-China Trade War. 22 May 2019 (in Chinese). Available on https://www.chinatimes.com/realtimenews/20190522004397260409?chdtv.

[40] The Diplomat. The chip 4 alliance might work on paper, but problems will persist. 25 August 2022. Available on https://thediplomat.com/2022/08/the-chip4-alliance-might-work-on-paper-but problems-will-persist/.

[41] Su Yiwen. South Korea's industrial development planning and preparation for the post-COVID-19 era. Works done for World Trade Organization of the Chung-Hua Institution for Economic Research, 9 December 2020.

[42] Ministry of Science and ICT (ROK). Corona 19 ICT industry support program (2020). Available at https://www.msit.go.kr/eng/index.do.

[43] Korea Emergency Economic Central Countermeasures Headquarters. K epidemic prevention industry development plan, 2020.

[44] Takao K. Introduction to the Latest Japanese Economy (5th edition). Tokyo: Nippon Hyoron-Sha Co; 2016.

[45] Asian Productivity Organization. Asian economy and productivity map. Available at https://www.apo-tokyo.org/asian-economy-and-productivity-map/.

[46] Matsui T. Changes in industrial adjustment assistance policy and its background - The Fudai Keizai Ronshu. Journal of Economic Studies 1998; 43(2): 485–508.

[47] Kuwabara T. Changes in Economic and Industrial Policy. Tokyo: Economic and Industrial Policy Bureau, Ministry of Economy, Trade and Industry; 2015.

[48] The House of Representatives. Temporary measures act for the promotion of coal mining areas (1961). Available at. https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/03919611113219.htm.

[49] The House of Representatives. Specialized textile structural improvement temporary measures act 1967. Available on https://hourei.ndl.go.jp/simple/detail?lawId=0000058438&current=-1#infomation.

[50] The House of Representatives. Temporary measures act for stabilizing specified depressed industries (1978). Available on https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/08419780515044.htm.

[51] The House of Representatives. Temporary measures act for structural improvement of specified industries (1983). Available on https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/09819830524053.htm.

[52] House of Representatives. Act on interim measures for the smoothing of industrial structure transformation (1987). Available on https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/10819870401024.htm.

[53] House of Representatives. Act on interim measures for the smoothing of business innovation by specified enterprises (1995). Available on https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/13219950331061.htm.

[54] House of Representatives. Act on special measures for the regeneration of industrial vitality (1999). Available on https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/housei/h145131.htm.

[55] Prime Minister's Residence. Outline of the structural reform special district law (2012). Available on https://www.chisou.go.jp/tiiki/kouzou2/hourei/021211/021211kuiki_s.pdf.

[56] Japan Investment Corporation. Innovation network corporation of Japan (July 2009). Available on https://www.incj.co.jp/PDF/091001.pdf.

[57] Cabinet Office of Japan. Basic Policy for Special Zones of National Strategy. Tokyo: Cabinet Office; 2014.

[58] Ministry of Economy, Trade and Industry. Industrial Competitiveness Enhancement Act : Guide to Use Special Case System for Corporate Certificates and Gray Zone Elimination System. Tokyo: Ministry of Economy, Trade and Industry; 2014.

[59] Ministry of Foreign Affairs. Trade agreement between Japan and the United States Available on https://www.mofa.go.jp/mofaj/ila/et/page23_002886_00001.html.

[60] Ministry of Foreign Affairs. Agreement between Japan and the United States on digital trade. Available on https://www.mofa.go.jp/mofaj/ila/et/page3_002912.html.

[61] Cabinet Office. Act on the promotion of national security through integrated economic measures (Economic Security Promotion Act). Available on https://www.cao.go.jp/keizai_anzen_hosho/index.html.

[62] Ministry of Economy, Trade and Industry. Support measures related to the COVID-19 coronavirus disease. Available on https://www.meti.go.jp/covid-19/index.html.

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

3C	Computer, communications, and consumer electronics
AI	Artificial intelligence
AIoT	Artificial intelligence of things
APO	Asian Productivity Organization
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
EDAC	Economic Development Advisory Conference
ERSO	Electronics Research and Service Organization
FDI	Foreign direct investment
FTA	Free trade agreement
IC	Integrated circuit
ICT	Information and communication technologies
III	Institute for Information Industry
IMF	International Monetary Fund
IoT	Internet of Things
IPR	Intellectual property right
IR4.0	Fourth industrial revolution
IT	Information technology
ITRI	Industrial Technology Research Institute
JPY	Japanese yen
KRW	Republic of Korea won
LED	Light-emitting diode
LP	Labor productivity
OECD	Organization for Economic Cooperation and Development
OEM	Original equipment manufacturer
R&D	Research and development
ROC	Republic of China
ROK	Republic of Korea
SGD	Singapore dollar
SME	Small and medium enterprises
TFP	Total factor productivity
TFT LCD	Thin-film-transistor liquid-crystal display
TWD	New Taiwan dollar
USA	United States of America
USD	United Stated of America dollar
WTO	World Trade Organization

LIST OF CONTRIBUTORS

Chung-Hua Institution for Economic Research	**Jiann-Chyuan Wang** Vice President and Researcher
	Tsung-Che Wei Researcher
	Sung-Yu Hsieh Researcher
	Jaw-Yang Day Researcher
	Chia-Hui Lin Researcher
	Chiu-Ying Kao Research Assistant
	Tang Kao Research Assistant
Asian Productivity Organization	**Huong Thu Ngo** Program Officer