

Analysis of Innovation-Driven Economy in Singapore's Economic Transformation

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Abstract. Singapore has achieved great success in economic transformation and industrial upgrading. The four reforms after Lee Kuan Yew took office changed the economic situation of Singapore, which included the development of import-oriented economy, labor-intensive industries, capital-intensive industries, and knowledge-based industries. Finally following the Industry 4.0 era began the development of artificial intelligence technology and innovation reforms. However, Singapore's industrial transformation was still problematic, and over-reliance on international trade caused Singapore's economy to take a hit during COVID19. In addition, Singapore is facing human resource problems, including a growing aging and unemployed population. This paper will analyze the implementation methods and effectiveness of Singapore's economic reforms through the process of economic transformation and review the reasons for Singapore's rapid economic development. Based on the transformation of Singapore's economy, it will also examine the aging population and the impact of COVID-19. Ultimately, we may provide some useful thoughts and lessons for the development of developing countries by analyzing Singapore's successful experience as well as the dynamics and reasons behind it.

Keywords: Singapore; Innovation economy; Economic transformation; Policy effectiveness; and Industrial structure lay.

1. Introction

Separated from Malaysia in 1965, Singapore was recognized as one of the "Four Asian Tigers" in the 1970s, and categorized as a "developed country" by the OECD in 1995. In 2014, Singapore was ranked as the fourth largest international financial center in the world. Within the span of just a dozen years, Singapore has become the largest freight terminal, the second largest electronics center, the third largest oil refining center, and the third largest foreign exchange market [1]. Furthermore, according to the Global Competitiveness Report 2017-2018 published by the World Economic Forum, Singapore has become the third most competitive economy in the entire world. In 1960, the Gross Domestic Product (GDP) per capita of Singapore was barely \$428, but today, in just six decades, it has reached as high as \$72,766, which represents a significant increase in the country's standard of living. What factors contributed to Singapore's phenomenal economic development during the period of the economic transformation?

In the early years after Singapore's compelled independence, its economy was behind, its crime rate was high and its population was low. Concerningly, Singapore was forced to proclaim its independence in 1967 despite the country's severe political and economic situation. Life was difficult in the teeny-tiny republic of Singapore because it was encircled by powerful rivals. Therefore, Singapore needed to build its economy. However, the economic transformation of Singapore may be broken down into five distinct stages, with the pre-stage of economic transformation occurring between the years 1959 and 1965, the early transformation occurring between 1966 and 1978, and the initial transition occurring in 1979.

The initial transformation occurred from 1966 to 1978, the mid-transformation occurred from 1979 to 1997, the service revolution occurred from 1998 to 2012, and the industry 4.0 era will occur from 2013 to 2022. During each of these eras, several forward-thinking policies have been introduced to assist Singapore in keeping pace with the rest of the globe. Through an examination of the four distinct phases of economic change that Singapore has experienced in the past, the objectives of this study are to (1) investigate the factors that have contributed to Singapore's achievements and (2) suggest

some guidelines for the ongoing process of economic reform and transformation in Singapore. In addition to this, the essay will concentrate on a case study of Singapore's industrial transformation plan called "Industry 4.0," which is based on the development of the fourth wave of the industrial revolution. The article will include a forecast and recommendations on the potential challenges that Singapore may face, as well as an analysis of the effectiveness of government policies in Singapore, an analysis of the history of Singapore's economic transformation, and an analysis of the drivers of that transformation.

2. Singapore's economic transformation history and motivation

2.1 Review of Economic Transformation

After Lee Kuan Yew's administration, Singapore had four reforms before and after, and some economists classified them as import-oriented economy, development of labor-intensive industries, development of capital-intensive industries, and development of knowledge-based industries [2].

2.1.1. Import-oriented economy (1959-1965)

The period 1959-1965 was crucial in laying the foundation of Singapore's future economy. In terms of political reforms, Singapore established the People's Action Party (PAP) to form authoritarian politics. Social reforms included the integration of diverse ethnic groups and the importance of equal education for all. In terms of economic reforms, Singapore strengthened its infrastructure and lowered industrial taxes. In terms of foreign policy, Singapore implemented import substitution and protected domestic industries.

2.1.2. Development of labor-intensive industries (1966-1978)

1966-1978 was Singapore's first industrial revolution, during which the government strengthened infrastructure and attracted foreign investment. Consolidating authoritarian politics, forming a single party, strengthening censorship, and building a clean government. Fostering a sense of nationhood. Temasek managed government-linked enterprises, nominally government-owned, but the government did not interfere with business operations, and strengthened infrastructure development. Actively attract foreign investment and expand tax incentives.

2.1.3. Development of capital-intensive industries (1966-1978)

1979-1997 belonged to the second industrial revolution, during which the Singapore government focused on developing high-tech and service exports and privatizing state-owned enterprises. Expanded the democratic base and reduced speech control. Adjustment of the Home Ownership Policy and diversion of education according to the needs of the population. Encouraging high-tech innovation, the disappearance of the demographic dividend increased the pressure of rising labor costs, and the government implemented a flexible wage policy in which wage increases could not exceed the increase in labor productivity, reduced personal income taxes for companies, tax burdens for new industries, tax breaks for R&D capital expenditures, and promoted the demutualization, privatization, and internationalization of state-owned enterprises. Regional service centers were established to develop international service exports such as communications, trade, finance, and consulting.

2.1.4. Development of knowledge-based industries (1998 till now)

Finally, Singapore has focused on the knowledge economy since 1998. Under the premise of ensuring one-party rule, the government consulted social groups and the people on policy advice to practice consultative democracy and to focus on high-end education in order to attract research talents. What's more, it also established high-tech industrial parks, distributed the internationalization of state-owned enterprises, encouraged Capital export, and constructed overseas Singapore industrial parks.

2.1.5. The effect of Singapore's reform

After four reforms, Singapore accelerated the process to democracy. With high government salaries, efficiency, high transparency, reduced fiscal spending on "institutions", fast-growing state-owned enterprises, stable social order, harmony among diverse communities, full employment, effective inflation control, and high quality of life, the country's economy is growing at a fast pace and industries are being upgraded. Ranked No. 1 in the competitiveness of the international business environment in 2011 and became the fourth largest international financial center in the world in 2014, Singapore has become a strictly separated, domestically regulated and offshore international financial center [3].

2.2 Drivers of Economic Transformation

Prior to Lee Kuan Yew's administration, Singapore's economy was in poor shape in 1959, so the economic transformation was necessary. The issue was how to save the nation's economy and resolve the Singaporean people's fundamental issues of subsistence. At the start of Lee Kuan Yew's administration, Singapore faced three significant challenges [4].

2.2.1. Significant global re-export status was replaced

Singapore's national economy was long dominated by the re-export trade, and after the 1860s, when Britain became a world power as a result of the industrial revolution, it desperately needed a market for its goods. Due to Singapore's unique geographic location, entrepot trade was extremely prevalent in the country. The re-export trade could generate enormous profits for Britain, so Britain placed a high priority on its development in Singapore. In the 1850s, re-export trade comprised 90-95% of Singapore's foreign trade, employed 70-75% of the labor force, and accounted for 80-85% of the nation's gross domestic product. In addition, Singapore's single deformed entrepot economy made it highly reliant on foreign markets and highly susceptible to the volatility of international markets and capital. The re-export trade brought prosperity to Singapore by facilitating the development of its transportation infrastructure, processing industries, and financial investment activity. However, re-export trade prosperity lacked a solid economic foundation. In 1952, as a result of the downgrading of the war, global demand for rubber and tin dropped sharply, making its trade to essentially come to a halt, and the development of other industries related to trade to be severely hampered.

2.2.2. Oppressive international climate

After the independence of Southeast Asian nations, various trade protection policies posed a serious threat to Singapore's free trade policy. Approximately 50% of Singapore's foreign trade consists of rubber and tin, with the majority of the rubber coming from Malaysia and the remainder primarily from Indonesia. In order to improve their trade structure, upon achieving independence, the two nations relocated their export ports from Singapore to the country and began trading directly with other nations, which had a significant impact on Singapore's trade, as the proportion of rubber and tin exports decreased from 53.29% in 1950 to 34.8% in 1958.

2.2.3. Global internal economic turmoil and industrial backwardness

In the early years of its independence, Singapore's industrial level lagged significantly. Before independence, Singapore's secondary industry consisted primarily of manufacturing and construction and accounted for only about 17% of the national economy. For example, manufacturing accounted for only 8.63% in 1959. The low level of industrialization was due to two factors: on the one hand, it was due to the squeezing effect caused by the re-export trade, which was primarily free trade; and on the other hand, it was due to the lack of capital investment. Despite the fact that re-export trade stimulated the growth of certain industries, these industries were unable to compete with imported goods and operated in a precarious manner. At the same time, re-export trade necessitates the implementation of free trade policies, while the initial development of industry necessitates a protected market due to its lack of competitive strength. Singapore's market was small, and its wage

level was second only to Japan's in Asia during the same time period. However, Singapore's labor productivity was significantly lower than Japan's [5].

In addition, the population of Singapore at the time grew rapidly, unemployment and housing shortages were severe, and Singapore was a typical multicultural immigrant country with a long-standing high population density. At the same time, the traditional Chinese belief of "more sons, more blessings" and advances in medical care have led to a decline in mortality rates, so Singapore's birth rate has remained at a high level of between 4.75 and 5 %, while China's population growth rate, which was also high during the same time period, was only 2.3%.

In 1957, the unemployment rate in Singapore was 4.9%, but by 1959 it had risen to 13.2%. In 1953, the Straits Times predicted that 110 000 families would be homeless within a decade. At the time, the "housing shortage" was a pressing issue for the government. Poverty and unemployment also fueled discontent, and the number of strikes skyrocketed, resulting in social unrest.

After attaining independence, Singapore faced a lack of internal corporate resources as well as intense international competition. To save the national economy, Lee Kuan Yew was compelled to implement an economic transformation strategy.

3. Policy measure

3.1 Industrial policy

From 1959 to 1965, Singapore struggled with a number of issues, including political unrest, social disorder, a single economic structure, a vulnerable industrial foundation, and a high unemployment rate. At the level of industrial construction, Singapore's first action was to implement economic reforms to strengthen infrastructure development and reduce industrial taxes. In addition, Singapore has implemented preferential policies for industrial enterprises, such as tax reductions and tax exemptions. In addition to issuing decrees to encourage the establishment of businesses in Singapore, the government also established official institutions to aid in the establishment and growth of industries. During this time, Singapore also decided to implement import substitution, thereby safeguarding domestic industries. To protect immature national enterprises, Singapore adopted an import substitution policy by implementing an import quota policy and imposing heavy taxes on imported consumer goods and daily necessities. During the years 1966-1978, Singapore faced a number of issues, including a decline in trade due to its separation from Malaysia, insufficient domestic demand as a result of the withdrawal of British troops, and an unreasonable allocation of resources. In response, Singapore's Finance Minister Lim Kim Son stated that "fiscal measures were taken to encourage export-oriented industries and attract investment while requiring them to have market development capabilities." The government of Singapore decided to increase infrastructure development [6]. In order to strengthen infrastructure development between 1966 and 1978, Singapore established Temasek Corporation to manage government-affiliated enterprises. During the Five-Year Public Works Programme, the Singaporean government allocated \$25.8 billion for the development and construction of infrastructure, including public utilities, transportation, and communications, between 1973 and 1977. At the end of the 1970s, Singapore's primary focus was the development of the oil refining industry. In 1979, focusing on the privatization of state-owned enterprises, Singapore began to develop high-tech and service exports.

During this time, the government supported technology-intensive industries, phased out labor-intensive industries, and led the shift of labor to high-tech projects. To reduce production costs, the government provided preferential policies and adjusted tariffs. The employer's provident fund contribution rate was reduced from 25% to 10%, and both corporate income tax and personal income tax were reduced proportionally; the income tax for investment in new industries was only 10%, and the capital expenditure for all approved research and development projects was reduced by 25% in the first phase and by 3% per year thereafter. In order to develop the economy based on knowledge, the Singapore Economic Development Board proposed the "Industry 21 Plan" in order to cultivate the knowledge economy. It aims to develop manufacturing and service industries as the twin

economic engines of Singapore within the next decade. The government invested a substantial amount of money to establish a committee charged with establishing a research and development fund to promote life sciences as the fourth manufacturing pillar. Singapore has also developed the Industrial Park 21 plan, a new industrial park that will integrate a variety of business, industry, technology, and research and development activities in order to facilitate the country's economic transition to a knowledge-based economy.

This shows that the government has elevated Singapore's technological development from national to international by developing an industrial park program.

3.2 Government policy

The government of Singapore prioritized the improvement of the country's infrastructure and the reduction of industrial taxes from 1959 until 1965. In the early years of Singapore's existence, the country's physical infrastructure was in a very poor state. Between the years 1966 and 1978, the government of Singapore carried out political reforms that included the establishment of authoritarian politics and the development of a situation in which a single party held a dominant political position in Singapore. In the general election that took place in 1968, the People's Action Party was successful in gaining 58 seats in Parliament. The government of Singapore took the following steps in order to consolidate authoritarian politics: strict media censorship was introduced, and Singapore's regulations prohibited the propagation of any news that endangered political stability; social groups were controlled, and the trade unions that originally served workers in Singapore were transformed into organizations that cooperated with the PAP to curb wage increases and maintain labor order; and a clean governance system was implemented.

Since the year 2000, Singapore has abandoned its dogmatic ideology in favor of pragmatism, which places an emphasis on achieving concrete goals. In terms of effectiveness, in order to develop tourism, on the one hand, the government has allotted \$1.2 billion in funding; on the other hand, the cautious and conservative government, which once refused to allow the World Formula 1 to build a racing circuit in Singapore, finally broke the rigid mindset and announced the issuance of two casino licenses and the opening of a leisure complex in 2005. Both of these steps were taken in order to develop the tourism industry. In terms of equity, the Singaporean government issued \$2.7 billion in "New Singapore Shares" for the purpose of income redistribution. This was done in an effort to lessen the impact that the financial crisis had on the middle and lower classes of society. At a price of one dollar per share, dividends of at least 3% per share are payable for the next five years, with increased profits expected as the economy continues to improve.

3.3 Talent policy

Singapore's social structure is composed primarily of Chinese, Malays, and Indians. 1824, during British colonial statistics, the Malay ethnic group dominated Singapore. Due to the labor shortage and the influx of immigrants, the Chinese eventually became the majority of Singapore's population. Each ethnic group has its own religious beliefs, cultural traditions, and language, as well as varying levels of economic development, and occasional ethnic conflicts occur. In response to sensitive ethnic issues, the government of Lee Kuan Yew downplayed Chinese consciousness and gave preference to the Malay population. From the beginning of his administration, Lee Kuan Yew gave education a high priority. He believed that Singapore lacked natural resources and that, consequently, only human resources could not be exploited. Despite the country's economic decline in its early years, Lee Kuan Yew invested heavily in education, providing equal education to all, emphasizing the connection between education and employment, and focusing on adult education. Singapore is a nation of immigrants, and many of its people lack a sense of national identity. In order to foster a sense of national belonging among Singaporeans, the country underwent reforms between 1966 and 1978 in terms of values and rule of law mechanisms. Regarding the rule of law in society, Singapore enacted legislation governing political, economic, and everyday conduct. In addition, Singapore practiced

strict law, not only retaining the death penalty but also the whipping, which had a significant deterrent effect.

To attract scientific talent, the government focuses on advanced education. Government student education: the government spent S\$500 million to establish a lifelong learning fund, while establishing scholarships to attract young people to engage in scientific research; for employment skills: in 2001, the government arranged S\$140 million and the sponsorship of associations to set up a skills upgrading program to help those workers whose positions have been replaced or career for skills training; for innovative thinking: the government in order to encourage creative thinking, threw in S\$100 million and the sponsorship of associations to set up an innovative thinking program to encourage The government has allotted an additional S\$6.3 billion to train students in innovative thinking and other knowledge economy-related skills.

4. Policy effectiveness and issues

4.1 Policy effectiveness

4.1.1. Industry-level policy effectiveness

In its early years, Singapore's infrastructure was extremely deficient. In 1961, the government allocated 100 million Singapore dollars for infrastructure development and 6,480 hectares of land in Jurong for the development of industrial parks. For protection, the Singapore Manufacturing Control Act of 1965 states that "certain goods shall not be manufactured unless registered and approved." Between 1960 and 1965, the proportion of trade to GDP decreased annually, whereas the proportion of gross capital formation rose annually, with the proportion of manufacturing to GDP increasing from 8.63% in 1959 to 16.27% in 1967, while the proportion of trade decreased from 81.7% to 32.22%. This reflects Singapore's gradual transition away from a re-export-based economic structure and toward industrialization. Simultaneously, Singapore reduced the number of import quotas and increased tax incentives. 1967 Singapore enacted the Economic Expansion Incentive Act, the first tax incentives for export-oriented industries, as well as tax exemptions for intermediate goods, machinery, and other raw materials. From 88 commodities in August 1965 to 26 commodities in 1969, import quotas were reduced. As mentioned previously, Singapore's manufacturing output at this time was dominated by the oil refining industry, which accounted for more than 30% of the total. It became one of the world's three largest refining centers. In 2018, due to the development of import trade, manufacturing, and infrastructure, Singapore's economic structure was more diversified at this time. The economy has maintained a high growth rate, escaping the middle-income trap, but still profoundly impacted by changes in the international environment, around 1965 by the separation from Malaysia and the British withdrawal, and GDP fluctuations. In the 1970s, the global oil crisis caused a significant decline in GDP, but it did not fall below the global GDP growth rate. At that time Singapore's GDP growth rate was 13.97%, United States GDP growth rate was 3.21%

4.1.2. Effectiveness of government-level strategies

As previously mentioned, Singapore experienced a housing shortage in the early years of its existence; however, the shortage was largely alleviated when the government began to adjust the Home Ownership Policy from 1979 to 1997 by increasing the housing supply for middle-income groups. In the early years of Singapore's existence, when there was a severe housing shortage due to the high population density, the government proposed building low-income housing units for rent. By the 1870s, Singapore's standard of living had risen, and the government began modifying its Home Ownership Policy. In 1986, 86 % of Singapore's population resided in public housing. On the one hand, the Home Ownership Scheme solved the problem of low- and middle-income housing, while on the other, the mixed-income community living enhanced social cohesion. Since then, the objective of Home Ownership has been substantially attained, and its standing has gradually diminished. Since 1998 and the current financial crisis have had a significant impact on Singapore, and the world is competing to develop knowledge-based industries, the Singapore Competitiveness Council has

published a report with eight long-term strategies, anticipating that Singapore will become an advanced and globally competitive knowledge-based economy within the next decade. After Goh Chok Tong ascended to power, he loosened the control of associations and permitted the formation of political associations; opened an Internet forum to discuss and criticize Singapore government policies; granted MC members the ability to propose motions in Parliament to question the government; and so on. Singapore established the Renewed Action Committee in 2002 to alleviate some of the previous restrictions. The PAP's image was more vivacious and pro-people than in the past, and the political climate was enlivened.

4.1.3. Effectiveness of talent strategies and innovation programs

Beginning in 1979, the government instituted a high-wage policy that would last for the next three years and include annual wage increases of 20%. There is no doubt that this policy made it possible for workers to transition to more technologically intensive industries; however, the increase in wages outpaced the increase in labor productivity, which made it difficult for small and medium-sized businesses. In 1987, the government of Singapore began offering financial assistance to families who had three or more children as a way to encourage families to have more children. In addition to this, Singapore started to improve the education of its citizens in the year 1979. In that year, the "Skills Development Fund" was established in order to raise funds from companies. Companies whose annual wages were less than S\$750 were required to contribute between 1% and 4% of those wages to the Skills Development Fund. The focus of education has shifted from academic education to technical education and vocational training in order to avoid wasting educational resources. This has resulted in the introduction of three different student streams. In addition to this, Singapore's wage policy reform forced companies to upgrade their industrial structure. Furthermore, in 1979, the government implemented a three-year high wage policy that increased wages by 20% each year. This policy was in place for the duration of the high wage policy. It is undeniable that this policy made it possible for workers to transition into technology-intensive industries.

4.2 Policy issues

4.2.1. Aging population

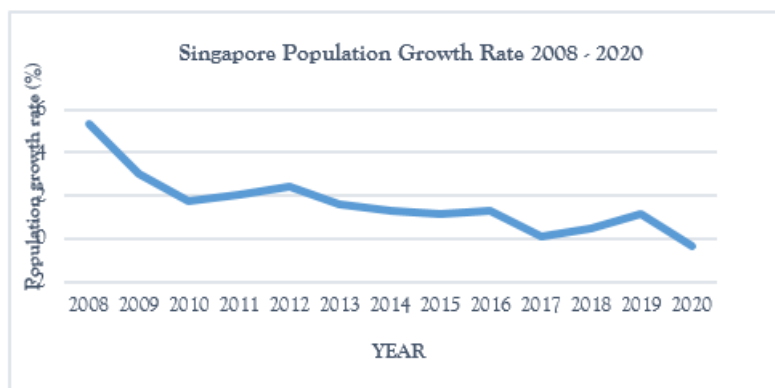


Figure 1. Singapore population growth rate 2008-2020.

Figure 1 obviously demonstrates that the population growth rate in Singapore has declined recently. According to published statistics, the number of births in Singapore, which was 62,000 in the early years of the country (1959), decreased to 39,000 in 2011, and the average fertility rate dropped to 1.15, almost 0.85 lower than the rate in the late 80s. But these figures are based on the doubling of Singapore's population, which means that Singapore's native population will become smaller and smaller, referring to the Chinese, Indians and Malays who lived in Singapore when the country was founded.

The low fertility rate will firstly bring about a decrease in the number of people, and secondly an imbalance in the age structure, i.e. an aging problem, where the young will have to bear the burden of the elderly, which is a lot of pressure for the young and will inadvertently have an impact on the

willingness of the younger generation to have children. Although the increase in the number of elderly people will drive the economy of recreation and health care, their low spending power and lack of willingness to spend compared to young people will slowly hit the development of the domestic market and have a negative impact on the economic development of a country.

It is important to know that the problem of aging population exists in many countries, such as Japan and South Korea, and the sharp decrease in population is fatal to the economic development and long-term development of the country, after all, no country can still maintain good momentum of economic development based on the shrinking population, therefore, for the long-term development of Singapore, the population issue is a difficult problem that must be solved.

4.2.2. GDP has continued to decline

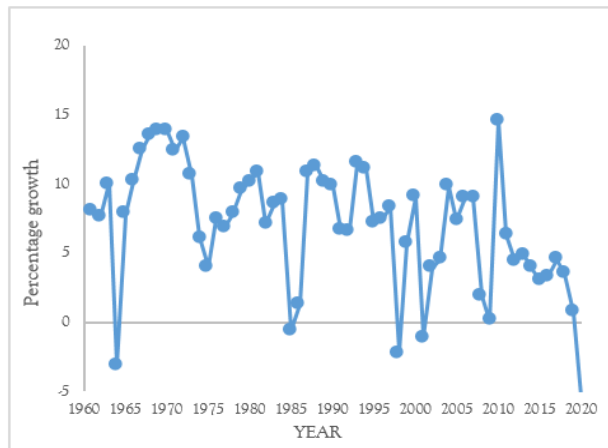


Figure 2. Singapore GDP growth rate between 1961-2020(%).

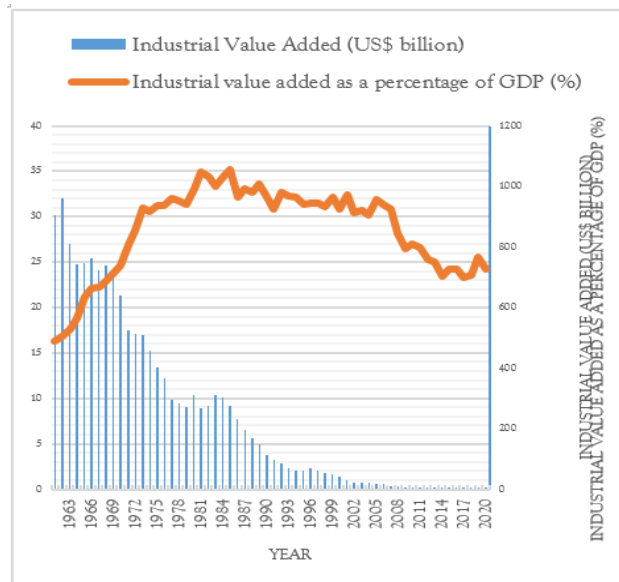


Figure 3. 1960-2022 Singapore industrial value added and share of GDP.

Figure 2 presents the Singapore GDP growth rate between 1961-2020, which reflects that Singapore’s GDP growth rate has slowed down in the recent decade. Figure 3 provides a visualization of 1960-2022 Singapore industrial value added and share of GDP. Singapore's Minister of Trade and Industry, Tan Chin Seng, stated that the 13.2% year-on-year economic contraction in the second quarter of 2020 (April to June) is the worst in Singapore's history. In addition, by 2020 Singapore's GDP growth will be -5.39%. Data indicate that manufacturing accounts for 20% of Singapore's GDP, of which 40% is comprised of electronics and precision engineering. However, the world's largest economy has placed many countries' semiconductor companies on a "entity blacklist," which also

includes Singapore. In 2019, the manufacturing sector in Singapore contracted by 1.5% annually. This indicates that the economic downturn in Singapore is partially attributable to the impact of manufacturing. The new crown pneumonia has fundamentally altered how people live and work, and businesses that fail to adapt quickly face closure in many instances. Singapore, recognizing the importance of digital transformation for businesses, has implemented measures to help businesses digitally transform and has set a new goal to become a global manufacturing hub. Currently, manufacturing accounts for approximately 21 % of Singapore's gross domestic product (GDP) and employs approximately 12 % of the labor force. The outbreak of Newcastle disease has emphasized the significance of manufacturing to the nation.

5. Suggestion

5.1 How can Singapore solve the problem

5.1.1. Optimize the social structure

Raising awareness of the significance of optimizing social structure is a direct way to combat population aging. A reasonable level of fertility is also required to improve and maintain a country's technological level, as high-quality young people are the driving force behind technological innovation. To solve the problem of low fertility, the government must contribute to the cost of raising children. In conjunction with China's three-child birth policy, Singapore could implement a similar incentive policy. The government of Singapore can provide counseling services to young people of marriageable age on self-care, interpersonal relationships, and the concept of marriage and parenting to increase the marriage rate and marriage stability rate of the marriageable age group; control the rise in property prices, curb the brutal development of out-of-school training, and reduce the cost of raising children for families; and promote gender equality within families. The government should also promote gender equality within the family, encourage husbands to take up more household chores, and increase women's willingness to have children; vigorously develop childcare services for infants and toddlers under the age of 3, explore the system of maternity leave for men, and encourage enterprises to provide places for mothers and babies to alleviate women's work conflicts at home; innovate policies on childbirth-related subsidies and tax deductions, and reduce application-based policies and increase automatic satisfaction policies. In addition, Singapore has the option of accepting immigrants to bolster its dwindling population. Since Singapore is an international country with a robust economic development and superior overall strength, it is the immigration destination of choice for a large number of foreigners.

5.1.2. Maintain a diverse industrial structure

The government of Singapore should invest less money in the semiconductor industry for the time being and instead put that money into developing services like information technology, finance, and other areas. And being market leaders not only in manufacturing, but also in new and fast-growing industries such as agri-tech, biotech, and urban transportation, Singapore has the potential to accomplish new goals by luring global technology leaders to establish operations in the country. Because of this initiative, Singapore will be able to establish a foothold in global value chains, and at the same time, it will help develop the local business ecosystem. Furthermore, as these cutting-edge companies continue to grow, they will also drive Singapore's small and medium-sized enterprises to grow along with them. Additionally, as technology continues to advance, manufacturing provides workers with jobs that not only require them to perform repetitive tasks, but also require them to have interdisciplinary skills. The growth of other industries will help to offset the negative effects of the semiconductor industry. As a result of this investment, Singapore may also be able to create new technologies and take advantage of new opportunities [7].

5.2 Insights from other developing countries

5.2.1. Emphasis on human resources education

The Singaporean government invests approximately 4% of its annual GDP and 20% of its annual fiscal expenditures in education. The stable investment policy has allowed Singapore to achieve excellent educational outcomes. The World Economic Forum's 2007-2008 Global Competitiveness Report ranks Singapore's education system as the best in the world. Singapore's education system has become one of the most advanced in the world as a result of the implementation of policies such as streaming education, teaching less and learning more, and elite education. However, the jade's beauty is not without flaws. Although Singapore has innovated the curriculum, there has not been a major reform in the content and manner of examinations, and as a result, the younger generation in Singapore has not been particularly innovative. In addition, Singapore's overemphasis on academic diplomas has fostered a culture in which education is prioritized over talent. Unfortunately, the country's economic growth cannot be achieved without the efforts of talented individuals. The same applies to other developing nations. Science and technology are the primary productive forces in modern society, whereas people are the most decisive factor in productivity. And scientific and technological progress is a decisive factor in economic development, scientific and technological innovation is a foundation and a signal of the social movement and growth of social productivity, which determines the economic development process [8]. In the final analysis, economic competition, science and technology competition are talent competitions. We can only achieve leapfrog development of the national economy by strengthening talent training and talent team building, enhancing the quality of the labor force, and accelerating the development of science and technology. In addition to the necessary institutions, legal norms, and material bases, the development of a country requires human resources to manage, implement, and operate; therefore, human resources are the most essential resource a country needs. Talent capital is the primary driver of modern economic growth and social progress, and has become a significant indicator of a nation's prosperity. We can only occupy the high ground and seize the initiative in the new round of revolution and industrial change in the world if we can create and collect a great many talents [9].

5.2.2. Diversification of industrial structure

Throughout its corporate transformation, Singapore has successfully bolstered the nation's industrial structure. The proportion of primary industry to all industries peaked at 6% in 1960 and declined to 0.3% in 1996. From 17% at the time of re-export trade to 23.9% in 1965, 37.6% in 1980, and 36.9% in 1993, the secondary industry increased. Due to its previous share of about 80% in re-export trade, the tertiary industry began to decline and then rebounded. Not only did the proportion of the three major industries change, but so did the structure of each industry, which shifted from lower to higher industry types. Initially, the primary industry was dominated by marine fishing and pig farming, but by the early 1990s, ornamental goldfish farming had become the primary focus, accounting for 78% of the fishery and livestock industry's annual exports [10]. Second, the secondary industry produced garments, toys, and paper for the purpose of sustaining the population during a period of economic decline. Subsequently, in order to solve the unemployment problem, it was determined that the manufacturing industry would be the pillar of the ship repair industry, the electronics industry, and the chemical refining industry. In the 1980s, ship repair accounted for 74% of total manufacturing output, while the electronics industry was the third largest exporter of goods. In the 21st century, the government proposed a shift to a knowledge-based economy, and it promoted the rapid development of biopharmaceuticals and high-tech electronics. The tertiary sector has been ascendant and dominant. During the period of re-export trade, re-export-related services such as banking, catering and lodging, and retailing stood out. With its prime location and port conditions, Singapore's transportation sector continued to expand after independence. As Singapore rebuilt its infrastructure and created technological industrial zones, high-tech communications also flourished. Singapore, a shopping paradise, attracted a large number of foreign tourists, and tourism became a major economic pillar. Singapore has placed a greater emphasis on business and finance and media

and information since the transformation of the knowledge economy. When faced with external shocks, the economic resilience among countries shows greater variability, with countries with a diversified industrial structure showing greater resilience and countries with a more diversified industrial structure being able to restructure their industries more quickly, resulting in a longer and more solid economic resilience. Therefore, for developing countries, maintaining a diversified industrial structure can avoid certain risks [11].

6. Conclusion

In the past six decades, Singapore has achieved astoundingly high economic growth and success through continuous economic transformation and policymaking. Singapore has been able to progress by repeatedly adapting and adjusting to new circumstances. It has ultimately developed its own distinctive economic structure and national culture. Using an analysis of Singapore's economic transformations over time as well as an analysis of the policies used during Singapore's transformation, the text attempts to investigate the policies and policy effectiveness used in Singapore's four economic transformations following Lee Kuan Yew's administration. In the early years of the country's existence, Singapore faced economic instability, a monolithic and deformed economic structure, and a significant lag in industrialization. Diverse immigrants were confronted with racial tensions and a variety of social issues, including unemployment, poverty, and housing shortages. Following the administration of Lee Kuan Yew, the following strategies were implemented to alter Singapore's economic status quo. (1) Concentrate on developing an import-driven economy, labor-intensive industries, capital-intensive industries, and knowledge-intensive industries. (2) Enriching the industrial structure while the government issued a number of preferential policies and bolstering the infrastructure in order to attract foreign investment. (3) The government places a high priority on education for its citizens and implements a policy of equal education for all [12]. According to the material, the government has implemented a diversionary education and focused on training skilled personnel. (4) The government established high-tech industrial parks by introducing qualified individuals. From 1960 to 2021, under this series of policies, Singapore's GDP per capita increased from \$428 to \$72,766. In addition, between 1994 and 2021, Singapore's total exports increased from \$5,050 million to \$94,055 million. This demonstrates the effectiveness of the policy initiatives implemented during Singapore's economic transformation.

Even though Singapore has a high economic growth rate, it continues to face challenges. Singapore faces a significant aging population and the negative effects of COVID19 on its manufacturing industry. By accepting immigrant populations and increasing government subsidies for childbirth, Singapore can mitigate the effects of its aging population. Moreover, Singapore can maintain a diversified industrial structure by investing in other industries to mitigate the effects of COVID-19 on the manufacturing sector. In conclusion, Singapore's economic transformation journey provides policy inspiration for other developing nations, which should focus on developing human resources and attracting skilled talent while maintaining a diverse industrial structure to strengthen the economic resilience of the nation.

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