

STOCKHOLM SCHOOL OF ECONOMICS

Department of Economics

5350 Master's thesis in economics

Academic year 2020–2021

The Effect of Government Spending on the Economic Growth Rate: Empirical Evidence from Asian Tigers

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Abstract

In this paper, I use fixed effects model and random effects model first to estimate the effect of government spending on economic growth rate in the four Asian Tigers from 1981 to 2018, including Taiwan, Hong Kong, Singapore, and South Korea. Afterwards, the Hausman specification test determines that random effects model is more preferred in this scenario. Besides, due to the dynamic panel bias and endogeneity bias latent in the two models, I further adopt the generalized method of moments technique to deal with the potential problem. The empirical result indicates that the increase in the share of GDP for both government social spending and government public investment will have significantly negative influences on the economic growth rate in the next year. Nevertheless, the relationship between government consumption spending and the subsequent economic growth rate is not significant at any confidence levels.

Keywords: Asian Tigers, economic growth rate, government consumption spending, government public investment, government social spending

JEL: O43, O47, O530

Supervisor:	Kelly Ragan
Date submitted:	December 5, 2020
Date examined:	December 17, 2020
Discussant:	Hossame Asarar
Examiner:	Andreea Enache

Acknowledgements

I would like to thank you for all whom I met during my study at the Stockholm School of Economics, Sweden. All of you motivated and inspired me to go further when I was faced with setbacks here.

Many thanks to my supervisor Kelly Ragan for providing so many novel insights and constructive suggestions, which indeed helped me to focus more on the topic. Also, I would like to show my gratitude to my examiner Andreea Enache. Her useful and invaluable feedbacks let me know that the presentation day is not the end of this thesis, but that there could be more possibilities for this paper. Besides, I am really thankful to my thesis supervisor Li-Chen Hsu at National Chengchi University. Her rigorous training in academic writing really guided me to here.

Also, I am really appreciative of those attending my presentation. I am grateful to Ingrid Löfman for attending both my mid-term seminar and final presentation and for sharing with me so many practical comments.

I will never forget that one day in the “darkest” night in Stockholm, some students and professors met online and then enjoyed the time discussing one thesis together. It feels really good!

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1. Introduction

1.1. Background

Negative macroeconomic shocks are always difficult to predict and striking the whole world, and it often leads to a global economic recession. Some countries spent many years to go through it, while others recover its economy in a short period. After the World War Two, the world stepped into a new period with high tension, which was just the so-called Cold War period. The global economy in this time was filled with uncertainty and volatility. Many major countries around the globe were experiencing the economic recovery period from the war. The society was preoccupied with different kinds of unstable factors, inclusive of poverty, problem of starvation, high unemployment rate, insecure environment, and many other social problems.

During this post-war period, many East Asian countries were actually affected seriously by the war. People led their lives with a very low living standard. The countries were full of chaos. In general, some researchers predicted that the prospects in this region were quite pessimistic. For example, Gunnar Myrdal (1968) states that since countries in other continents of the world, including African countries and South American countries, were not the war-stricken regions, it was natural and rational to expect that the future economic growth in the world will be mainly driven by these countries.

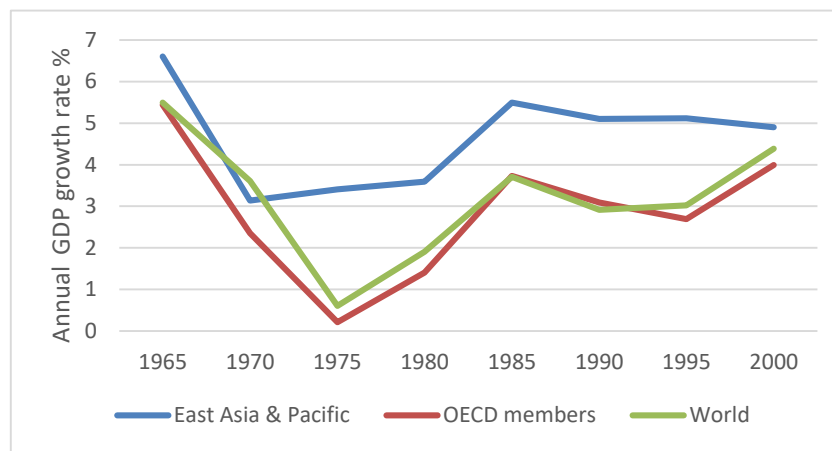
Nevertheless, the real story just went the very opposite way. It was actually the East Asian countries that went through a rapid and exceptional economic development for the next 50 years since the Cold War period. Approximately in the early 1960s, the GDP in many East Asian countries were just at the same level with that in most African countries. However, the economic development in several Asian countries exceeded most countries in the whole world and the long-lasting economic growth rate successfully turned these under-developed East Asian economies into high income societies within just several decades. The unanticipated phenomenon in these Asian countries was known as the “East Asian Miracle”. Besides, the four particularly outstanding countries are Taiwan, Singapore, Hong Kong, and South Korea. They are called the “Four Asian Tigers” together.

The story of the economic miracle in the four Asian Tiger countries was originally inspired by the successful Japanese experience. Under the difficult post-war times, many countries were dedicated to taking policies to stimulate their economies. After the World

War Two, first national-wide policy implemented to save the economic recession in Asia began in Japan. The prime Minister of Japan Ikeda Hayato then formulated the national “Income Double Plan”,¹ promising that the GDP in Japan will double within the next 10 years. In fact, the policy was more effective than expected. It took only 6 years for Japan to reach this goal and, besides, Japan experienced an average 11 percent of economic growth rate every year. During the 1960s, the GDP in Japan already surpassed the GDP in many advanced European countries, including Germany, France, Italy, and United Kingdom. In the meanwhile, the economic success in Japan provided a model for countries in East Asia under the ally of the United States to learn and imitate. The four Asian Tigers started to create a high speed and level of industrialization and this strategy successfully turned into high economic growth rates in the following decades. These countries are not affected by the unstable post-war period for too long. On the contrary, they wrote their own successful stories in Asia. Starting from the early 1960s, the four Asian Tigers experienced rapid economic growth rates, which were significantly higher than those of the countries in other regions. During this period, many East Asian countries developed from agricultural or under-developed countries into modernized countries. The economic miracle lasted for around 40 years, from the 1960s to the 1990s. From the following figure 1, we can detect that the trend about economic growth rate for the Asian countries in this miraculous period are apparently higher than both the OCED countries and world’s average level.

¹ The “Income Double Plan” was first launched in 1961. However, the miraculously economic growth was much higher than expected, causing the price level in Tokyo to increase by 76% in the 1970s, and weakened the effect significantly.

Figure1: Annual GDP Growth Rates, 1965-2000

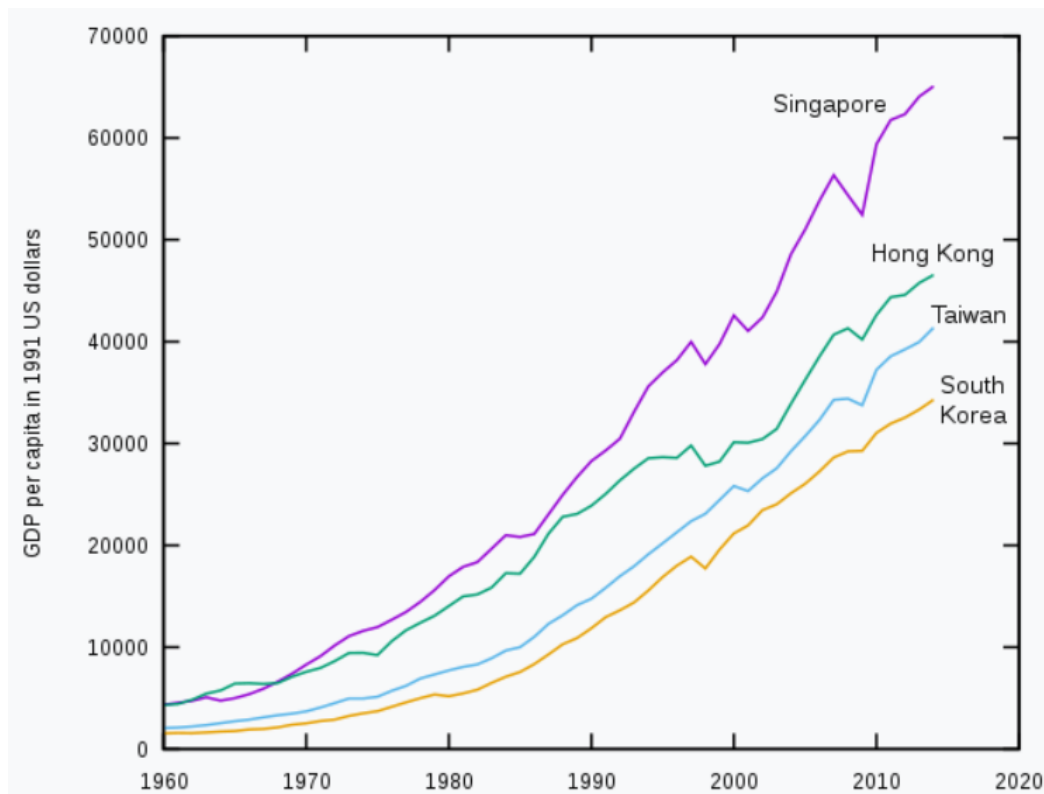


Source: World Development Indicators (2020)

From the figure 1, we can clearly observe that the trend for GDP growth rate from 1965 to 2000 for OECD members, the World's average and the East Asian countries. The figure reveals that generally for the whole period the average economic growth rate in East Asian countries is significantly higher than any other places around the world. Despite the two global oil crisis in 1973 and 1978, the East Asian economies were not affected much by the economic shock. In addition, for the East Asian financial crisis in 1997, we can still observe that the East Asian Tigers still maintained an outstanding economic growth rate. The exceptional performance for these countries for such a long period should have something special to focus on.

This kind of high and continuous economic growth rate was considered to be an economic paradigm of the world. The economic growth rates were more than 6 percent every year in these four countries, and it lasted for many decades. In addition to that, the purchasing power parity in the Asian Tiger countries were also growing steadily and rapidly. The figure 2 below just illustrates the fact. The “East Asian economic miracle” not only speeded up the industrialization and modernization in these countries but also increased the living standard simultaneously.

Figure 2: The Per Capita Purchasing Power Parity for Asian Tigers, 1960-2016



Source: *Economic Research at the Federal Reserve Bank of St. Louis*

Due to the excellent performance depicted in the figure 2, many researchers and international organizations tried to figure out the reason behind the growth. The report “The East Asian Miracle” published by the World Bank (1993) named the success in these countries as an “East Asia Model”, which is a successful development pattern in East Asia.

It has already been more than 50 years since the East Asian miracle. Many different schools of economics delved into this issue, trying to figure out what determinants are the key drives for the success. Despite the heterogeneity and the different policies adopted in the four countries, different perspectives try to get a consensus. They found that these countries all have something in common. These determinants include the change in the trade system, financial policy, cultural thoughts, education, innovation, productivity increase, and technological progress. The main idea for the success was starting from “doing the basic things right” to “finding out the adaptability of different related policies and laws”. Besides, the combination of domestic appropriate environment and the external friendly atmosphere is also an important factor.

For the rapid and continuous growth in the East Asian countries, Word Bank (1993) concluded many possible crucial determinants, which are listed below: increase in the productivity and output of agricultural products, higher level of exporting products, drastically and rapidly dropping in the fertility rate, rapid accumulation in the physical capital, a general enhance in the productivity. In addition, OECD (2006) proposed the following factors, which are the innovation, fast and effective regional integration, and the consistency and coordination in laws across countries. As a result, many later literatures are mainly focusing on these possible determinants, discovering the relationship between these factors and the East Asian miracle and on analysing the effect of these determinants on the economic growth rate in the four countries for many decades.

Even though the four countries were not affect by the Asian financial crisis much or adjusted and recovered the economies in a short period, the term “Four Asian ‘Tigers” became less used after the threshold year 1997.

1.2. Research motivation and question

After the East Asian economic miracle, many researchers try to find out the key determinant contributing to the exceptional performance. Nevertheless, different literatures generate different results. Taking one key possible factor, human capital, for example, Krugman (1994) concludes that there was only the rapid increase in the labour the capital causing the high economic growth rate. The productivity increase does not exist in this region. Therefore, the growth is not possible to last for a long period. On the other hand, Hsieh (1999) thinks that actually the increase in the productivity plays an important role in the rapid development in the four countries. In addition, recent research done by Kwon and Kang (2011) consider that the core determinant for the growth in the Asian Tigers is the accumulation in human capital.

Even though there are many literatures investigating the effect of different determinants on the rapid economic growth in the East Asian countries, few literatures are discussing the intervention of the government in these countries. How important the role of government spending is on the East Asian Tiger countries? Therefore, this study will focus on the topic which was less discussed by the previous papers. That is, the effect of different categories of government spending on the economic growth rate in the four

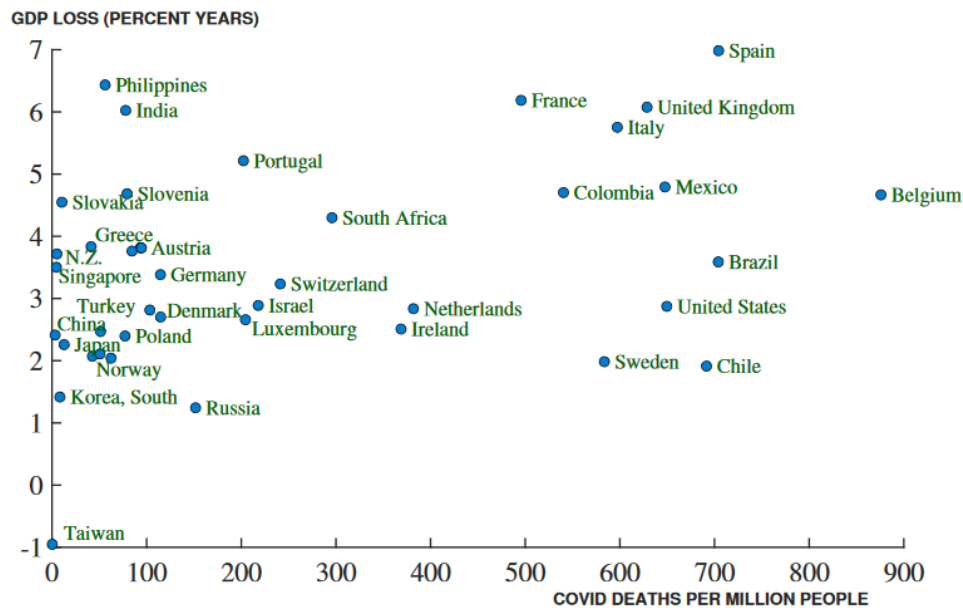
Asian Tiger countries. In this study, the government spending, based on Connolly and Li (2016), is divided into the following three categories:

1. Government public investment: gross capital formation of plant, property, and equipment, including public hospitals, schools and housing.
2. Government consumption spending: spending to produce non-market goods, such as national defense, justice, police, fire, military payroll for collective consumption, such as health care, housing, and education.
3. Government social spending: old age pensions, survivors and disability benefits, unemployment compensation mostly in cash and health, health services and housing – mostly services in kind.

The main purpose of this study is to estimate the effect of different kinds of government spending on the economic growth rate in East Asian Tiger countries throughout the years. Although after the Asian financial crisis in 1997, the term Asian Tigers became seldom mentioned, the steady economic growth rate for these countries indeed continued. As a result, it will be crucial to understand how the government spending plays the role on these societies after the key drives for these countries between the 1960s to the 1990s became less important.

Another noteworthy highlight regarding the possible importance of the function of government in this area is the 2020 global pandemic. Under the corona situation, most countries were stricken hard by the disease. Many countries are experiencing a negative economic growth and a historical high rate of unemployment. Even the prediction for the economic performance in 2021 is fairly pessimistic. Nevertheless, according to a latest report from Fernandez-Villaverde and Jones (2020), even though basically every country in the world is faced with the same pandemic crisis, not every country is affected hard by the disease. From the following figure 3, we have an interesting finding.

Figure 3: International COVID Deaths and Lost GDP



Note: "GDP Loss" is the cumulative loss in GDP since the start of 2020 and is annualized. For example, a value of 6 means that the loss since the start of 2020 is as if the economy lost six percent of its annual GDP.

Source: Macroeconomic outcomes and COVID-19: A Progress Report (2020)

From the above figure 3 we see that, if one country is not affected hard by the pandemic, it might be because of a coincidence or pure luck. However, if all the Asian Tigers are escaping from the great loss from the disease, then it is of course worthy investigating. In the year 2020 perhaps no one still call the term "Four Asian Tigers" again, and all the successfully policies for the four countries' high economic growth rate in the 1970s have already faded away. Therefore, there should be some other reasons accounting for the economic success in East Asia.² The intervention of the government is very likely to be part of this. It again motivates me to probe into this issue – the effect of government spending on the economic growth rate in the four Asian Tigers.

² When many countries suffer a lot from the COVID-19 pandemic in 2020. Coincidentally, the government from three of the Asian Tigers launched similar policies to boost the economy. Both South Korea and Singaporean government distributed cash to every citizen to enhance domestic consumption level. The Taiwanese government launched cash-equivalent consumption vouchers to every citizen likewise. As for the effect for these policies, it leaves for the future research.

In addition, the 50-year history of rapid and continuous economic growth rate was already regarded as an economic model or paradigm by many neighbour countries. The story affected the other four South East Asian countries including Indonesia, Thailand, Malaysia, and Philippines. They are so-called “Tiger Club Economies”.³ The success of the story in the East Asian countries inspires the neighbour developing countries, gave insights, and led them to create another miracle in Asia. Besides, the economic miracle in East Asia also becomes a model for South American countries also. Perhaps the result of this study will provide another insight to help them to get rid of the phenomenon and problem of the “Dependency Theory”.⁴

1.3. Expected contribution and main findings

After the analysis from this study, it is expected that the empirical result will be helpful for understanding the relationship between different kinds of government spending and the economic growth rate in the East Asian Tiger countries. The anticipated contributions will be the following:

1. Most of the previous literature investigating the phenomenon in four Asian Tigers focus on the industrial transformation, special cultural facts in this region, related laws or policies, and the trade strategies in these countries. On the contrary, this study will focus on the other factor, different kinds of government spending, which is less discussed in the past. I will examine how the government spending contributed to the East Asia miracle in the four Asian Tiger countries.
2. Besides, after the Asian financial crisis in 1997, the term “Four Asian Tigers” became less used. However, there are still many global negative shocks, including the financial crisis in 2008 and the COVID-19 pandemic in 2020. From the fact that these four countries are affected less and recovered rapidly, it is natural and rational to assume that there are other factors contributing these four countries to maintain an

³ In the 1990s, the economic performance for these new developing countries were almost as good as the Asian Tigers. However, they were all suffering seriously from the Asian financial crisis in 1997 because of lacking in a solid foundation at this rudimentary stage.

⁴ The perspective was proposed by Latin research Raul Prebisch et al. in the late 1960s. It describes the fact that modernization does not bring prosperity to developing countries. On the contrary, developed countries tend to exploit these countries by taking advantage of the cheap labour and goods, which suppressing the development in this region.

outstanding economic performance. The result from this study will provide another angle to look into this issue.

3. Regarding the new group of countries Philippines, Indonesia, Malaysia, and Thailand. They are called the “Tiger club Economies” together and are now classified as developing countries. They are learning from the East Asian model and looking forward to becoming a more modern country soon. Aside from the existent policy suggestions and implications provided by the previous findings, perhaps the result from this thesis can generate another insight or angle for these countries to boost their economy from the East Asian experience.

After the estimation process, the main finding in this study is that the effect of government consumption spending on the following economic growth rate is not significant. However, the increase in the share of GDP for both government public investment and government social spending have significantly negative impacts on the economic growth rate in the subsequent period.

The remaining structure of this study will be divided into the following: chapter 2 will be the introduction and the historical context about the four Asian Tiger countries, discussing how each country reached their success and demonstrating what categories of their government spending were focused on in each country; chapter 3 is the literature review. The first part will be regarding the different determinants that contribute to the high economic growth in East Asian countries, while the second part will review the literatures which estimate the effect of government spending on the economic growth rate in different parts of the world or organizations; chapter 4 is the description about the source of the data and the methodology used, followed by the empirical result in chapter 5; finally, chapter 6 concludes.

2. Historical context about the East Asian Tigers

The term “East Asian Tigers” refers to the exceptional and long-lasting high economic growth rates for four countries in East Asia, including South Korea, Singapore, Taiwan, and Hong Kong. Starting from the early 1960s, at a time when most major countries across the world were experiencing the social and economic uncertainties and insecurities under the intense post-war period. The four Asian Tigers merely spent several

years getting through this bad times and generating the economic booming decades. The four countries, on average, created more than 6 percent of economic growth rates every year for many decades. In some years, the growth rates are even higher than 10 percent. Until the East Asian financial crisis in 1997, this “East Asian Miracle” had successfully turned these four under-developed societies into modernized and high-income countries. The living standard in these places also rose significantly along the years. From the following table 1, we can observe the change of the real national income per capita by countries from 1950 to 1980, and the great performance the four Asian Tigers were making during the 30 years.

Table 1: Real National Income Per Capita by Countries, 1950-1980

	1950	1980	How many times increases from 1950 to 1980	Rank
World's Average	2111	7614	3.6	
Europe				
West Europe	4569	21672	4.7	
East Europe	2111	8569	4.1	
U.S.	8561	31178	3.3	
Latin America	2510	6973	2.8	
Argentina	4987	10995	2.2	
Chile	3670	13185	3.6	
Africa	889	1780	2.0	
East Asia	666	5673	8.5	
Japan	1921	22816	11.9	9
Singapore	2219	28107	12.7	8

Hong Kong	2218	31704	14.3	5
Taiwan	916	20926	22.8	3
South Korea	854	19614	23.0	2
China	448	6725	15.0	4
Thailand	817	8750	10.7	10
Philippines	1070	2926	2.7	
India	619	2975	4.8	

Unit: 1990 International Geary-Khamis dollars

Source: Maddison (2010) Historical Statistics of the World Economy 1-2008 AD

Consequently, many researchers are trying to find out what factors behind the progress. However, because of the heterogeneity and different strategies taken in these countries, it is difficult to conclude one universal determinant to explain the phenomenon. As a result, in the following of this chapter, it will be focusing on the historical backgrounds in these four countries respectively. The preliminary historical context will help to understand the past and the present of the development and situation in the East Asian countries. Besides, a preliminary introduction to the structure of the government spending in each country will be helpful and pave the way for the analysis in the next chapters.

2.1. Taiwan

Taiwan suffered a lot from the Second World War. Right after the war, militaries and hundreds of thousands of refugees fled from China to Taiwan. This led to the society at that time full of chaos and uncertainties. Besides, because of the drastic increase in the total population within a short period, the government spending increased significantly and it caused a serious problem of the budget deficit. However, the unstable and gloomy economic situation in Taiwan started to stabilize after the break of the Korean War from 1950 to 1953, and Taiwan started to receive foreign aids from the United States. During the 14 years under the protection and support from the U.S., Taiwan was provided with a great number of daily necessities, mechanical equipment, raw materials, and related technology for agricultural and industrial development. All of these instant help together

is indispensable to the subsequent rapid economic growth in Taiwan. As a result, many researchers consider the year of the end of the Korean War to be the very critical turning point for the rapid development in Taiwan.

From the following table 2 we can observe some key economic indicators in Taiwan for different periods. The serious problem of the inflation was under control effectively and immediately right after the end of the Korean War, and the economic growth rate was about to rise since then. According to the estimation by Jacoby (1967), during the years when Taiwan received foreign aids from the United States, it accounted for approximately 30% of the capital formation in Taiwan. Besides, it also caused the economic growth rate to double.

Table 2: Some Key Economic Indicators in Taiwan, 1953-2000

Period	Real GDP growth rate	Saving rate	Export/GDP	Inflation rate
1953-1960	7.6	9.9	9.6	9.4
1961-1972	10.2	21.5	24	3.9
1973-1984	8.4	32.3	49.7	9.4
1985-1992	8.2	32.1	51.4	2.5
1993-2000	6.2	26.6	47.7	1.5

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Taiwan

Starting from the 1960s, the average economic growth rates every year during the next 12 years was up to 10.2%. In addition, the Taiwanese government also stabilized the inflation rate at the same time. The government implemented a series of policies, causing the high economic growth rate continuously. First, from the early 1960s, the government took the reform for foreign exchange to set a single exchange rate between New Taiwan dollar and the US dollar. This setting of the exchange rate was very beneficial to the Taiwanese export-oriented industries and was fixed until the global oil crisis in 1973. Second, the government formulated the regulation promoting investment. By reducing the tax rate, the purpose was to stimulate private saving, investment, and export. From the

table 2 above we can see that the saving rate increased significantly since the 1960s. In the meantime, the ratio between the value of export and the total GDP also increased a lot. Third, the government constructed two major Export Possessing Zone in the city of Taichung and Kaohsiung. The main goal was to attract foreign capital and to stimulate the export. According the National Statistics data from the Taiwanese government, compared with the year 1961, the total value of export in 1972 was around 15 times higher than that in 1961. This kind of phenomenon is difficult to detect in such an under-developed country.

The global stagflation caused by the oil crisis in 1973 actually had negative impact on the economy in Taiwan. The economic growth rate declined and the inflation rate increased sharply. Nevertheless, Taiwan adjusted its economy well and maintained the growth soon. The main reason was because the government launched a new program named “Ten Major Construction Project”.⁵ A great amount of government spending put in the construction of infrastructure including nuclear power plant, road highway, international airport, and railway. This “Keynesian” method of development not only stimulated domestic demand and the economy but also upgraded the infrastructures in Taiwan.

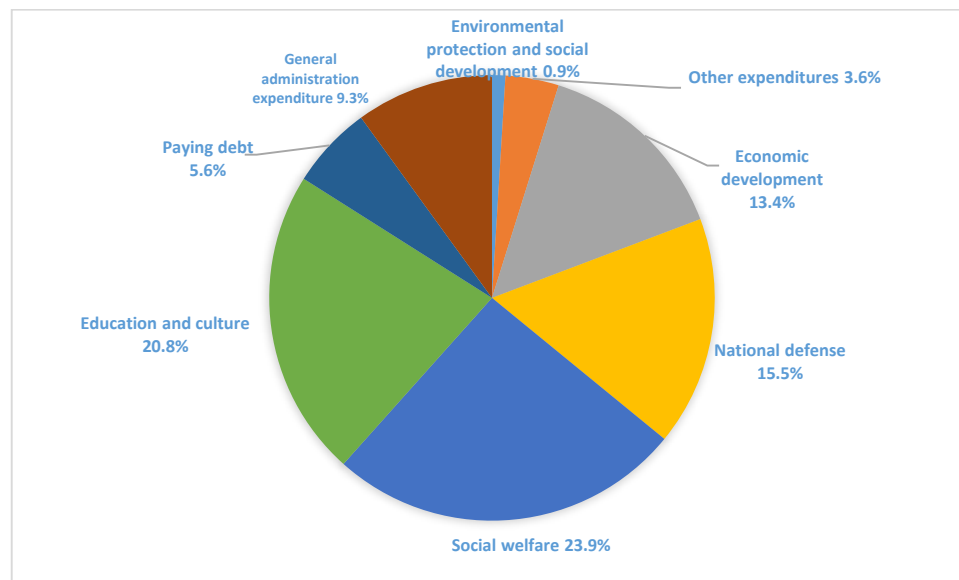
After the construction project, Taiwan was gradually transforming to a high-tech country. The government built national science park to develop mechanical and electronic industries. Under the support from the government, high-tech IT products exporting industry became the major industry in Taiwan. The new technology-intensive strategy continued to create high economic growth rates. From the above table 2 we can see that in the period 1985-1992 the value of export accounted for more than 50% of the GDP in Taiwan, among which half of the exports were sold to the United States.

After the golden growth period, Taiwan had already laid a solid foundation for future development. The purpose for the Taiwanese government is directing at becoming a welfare state. Therefore, the structure of the government spending gradually changed. The following figure 4 reveals the government expenditure in Taiwan by category. It illustrates

⁵ The project was adopted by the prime minister in Taiwan then. The ten projects include Taiwan Taoyuan International Airport, two major ports, first national highway, national steel corporation, north link line, CSBC corporation Taiwan, first nuclear power plant, and CPC corporation Taiwan.

that the spending on social welfare and education and culture occupies the largest share of the government spending.

Figure 4: Government Spending by Category in Taiwan, 2007



Source: Chief Accounting Office of the Executive Yuan, Taiwan (2007)

There are various reasons for Taiwan to create the success. First, because Taiwan was a colony of Japan for 50 years, the Japanese government introduced many modernized ideas, set appropriate educational system, built ideal health care policy, and constructed infrastructures for Taiwan, which are all essential to the future development. Second, the foreign aid from the United States also played an important role for the quick recovery from the post-war time. Third, the exceptionally high saving rate, which is uncommon in other places, which perhaps was related to the traditional culture in this region. To sum up, during the 40-year rapid development, it actually turned Taiwan from an under-developed society to a high-income and modernized country.

2.2. Hong Kong

If we would like to put the success story of Hong Kong in a nutshell, then the extreme high level of “free economic market” has played a crucial role on it for a long time. The Hong Kong government tries its best not to intervene in the function of private sectors to let the economic system adjust to the best condition automatically. Furthermore, the low tax rate policy is another key drive for the development in Hong Kong. The purpose of these regulations were mainly to let the invisible hand function as effectively as possible.

It also optimized the allocation of resources in Hong Kong. Besides, there are many other determinants contributing to the economic success of Hong Kong, including the freely competitive environment between companies, the efficiency and transparency of its government, the appropriate rule of law, and the unrestricted movement of capitals, and even the wage rate and the price level under the free economy. It was just because of these factors that make Hong Kong flexible and be able to recover and stimulate its economy in a short period when confronted with unexpected negative shocks.

From the historical perspective, Hong Kong is a very special society in the world, with its own kind of economic and political state. Except for the field of national defence and diplomatic affairs, in essential Hong Kong is a totally autonomous state. As for the sovereignty, before returning it to China in 1997, Hong used to be one of the colonies of UK. After returning its sovereignty to China, the Chinese government promised that Hong Kong can still maintain its original economy, politics, and its own laws for the next 50 years. That is, Hong Kong people can still lead their own style of life until at least the year 2047, although the promise was broken by the “Hong Kong National Security Law” passed by the Chinese government in 2020.⁶

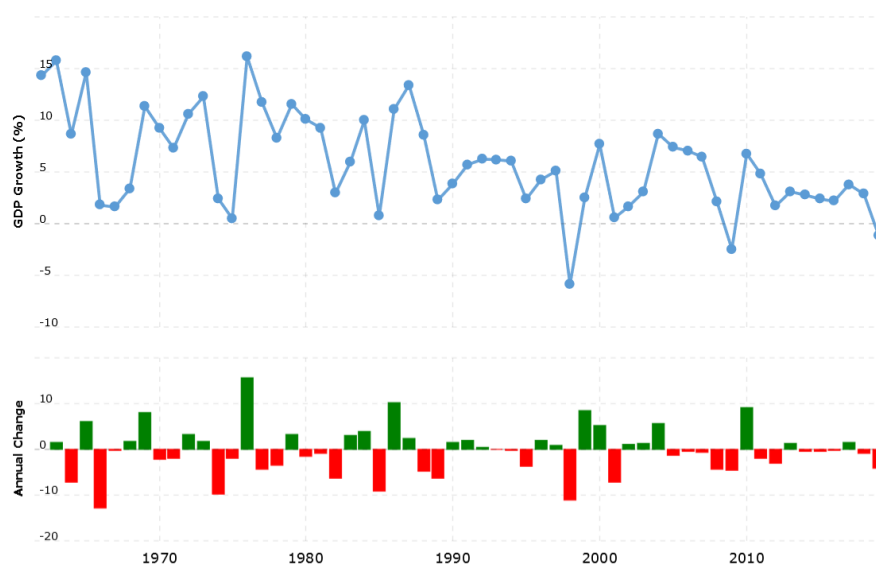
Before 1997. There were two decisive periods for the rapid development in Hong Kong. The first period can be traced back to the 1950s, at the time when the Korean War broke. The embargo imposed on China by the United Nations left a negative impact on Hong Kong, because Hong Kong was a free port famous for its intermediary trade. In order to overcome this comprehensive crisis, Hong Kong started to transformed its industries into light industry, taking advantage of its human capital and ability of innovation. Plenty of factories were thus built at this time and it contributed to the first wave of the high economic growth rate in Hong Kong.

The second decisive period was around the late 1970s, when China was about to reform and open its economy to the world. During this period, many factories were relocated to China to the take advantage of the cheap labour in mainland China. In the meanwhile, it was the time for Hong Kong to experience its second industrial transformation.

⁶ The Hong Kong National Security Law was passed in June 30, 2020. The law destroyed the promise “One country, two system” given by the Chinese government and the independence of law was devastated in Hong Kong.

Depending on its complete rule of law and attractive and friendly environment for foreign countries to invest, Hong Kong step by step became the middle point for the international trade between China and Western countries. Furthermore, the share of financial industry went up significantly and it is now still one of the most important financial cities in the whole world. According to a recent report from the World Economic Forum, Hong Kong was ranked as the first place for the index of financial environment stability. From the below figure 5 we can clearly see the trend of the economic growth rate in Hong Kong for the two periods respectively.

Figure 5: The Annual Economic Growth Rate in Hong Kong, 1960-1997



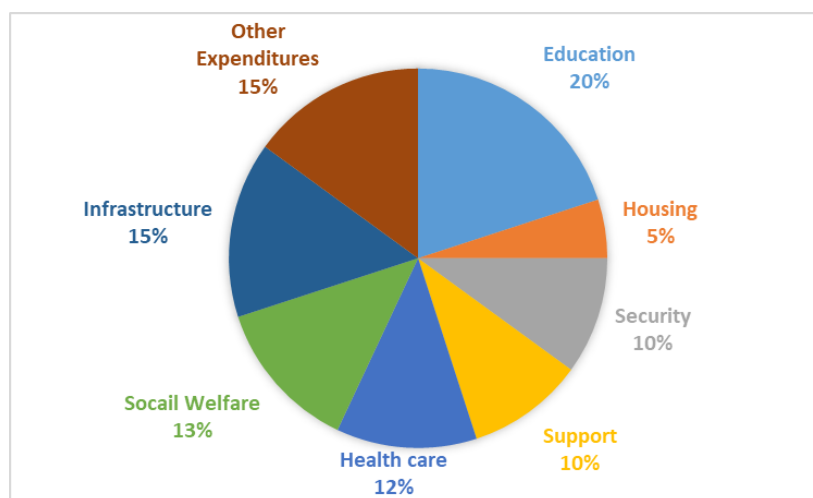
Source: World Bank database (2020)

With an attractive investment environment for foreign companies, Hong Kong was the third largest economy for foreign direct investment and took this advantage to accumulate a great amount of capital. The government used this resource to improve the local infrastructure, constructed schools, built roads and hospitals, and also provided social services. It increased the living standard. According to the related statistics, the GDP in Hong Kong in 1997 was around 180 times higher than that in the 1950s. Even though Hong Kong was again faced with many social problems and uncertainties after returning its sovereignty to China, it still steadily developed its financial industry, travel industry, logistics, and business. The economy reached its climax in 2007. Although the global

financial crisis indeed brought negative influence on Hong Kong, it adjusted very soon and began to recover its economy in the next year.

Regarding the government spending in Hong Kong, in order to be in line with its purpose – maximize the economic growth rate. Accordingly, the fiscal policy in Hong Kong never put much emphasis on redistributing income. Instead, the government focuses on the essence of private sector. For example, by spending a large share of the government expenditure on education to foster and accumulate its human capital and then boost the future development. The ambition for the government was just to ensure that every citizen is able to make their fortunes in a totally free market. They believe that the result would be the best no matter for individuals, local companies, or foreign investors. From the below figure 6, we can see the breakdown of the government spending structure in Hong Kong, which highlights the main points above.

Figure 6: Public Expenditure by Category in Hong Kong, 2009



Source: Hong Kong Yearbook (2010)

Additionally, perhaps inheriting the British way of thinking, Chiu (2004) states that the Hong Kong government seldom takes initiatives in the economy unless it is really necessary to intervene in the market. According to the Hong Kong Yearbook (2012), Hong Kong held a huge foreign reserves, which was fairly enough for the government to govern the city for at least 21 consecutive months without collecting any taxes from the citizen.

However, when we look back to the history from today's viewpoint. Hong Kong indeed succeeded in generating an exceptional economic performance, but simultaneously it sacrificed the income equality and a stable and reasonable housing price. According to the international housing affordability survey by Cox and Pavletich (2018), the "International House Price to Income Ratio" in Hong Kong is ranked as the first place in the world for many years.

Besides, the second largest share of its government spending was on infrastructure. This value was not as high as other countries because its purpose was to improve and maintain the quality of its infrastructure to create a better environment for foreign investment.

2.3. South Korea

After the end of the Korean War in 1953, many infrastructures in major cities like Seoul were completely destroyed. People were living in poverty and the unemployment rate was quite high. Until the early 1960s, South Korea was still a poor and under-developed country. It focused mainly on agriculture. To get rid of this poverty stage, the government launched a "Five-Year Economic Development Plan" in 1962.⁷ The first period for the economic development in South Korea just started. The whole country transformed into an import substitution industry. After that, South Korea moved into a labour-intensive exporting industry. The whole process of industrialization in South Korea was led by the government. Under this rapid growth period, the value of export increased by at least 40% each year and South Korea kept an average of 8.5 percent of economic growth rate every year.

In the early 1970s, South Korea was faced with problems from both domestically and internationally. Internationally, the oil crisis is striking. Domestically, South Korea started to face the pressure from the labour-intensive light industry because the wage rate increased significantly. It forced South Korea to transform again. As a result, the industries moved into heavy manufacturing and chemistry industry. The successful transformation contributed to a drastic increase in the value of export as a share of GDP, from about 13%

⁷ The plan was lasting for 35 years from 1962 to 1996. Therefore, there are 7 "5-years" periods in total. During each 5-year period, the government adopted different policies to follow the world trend to develop local economy.

in 1970 to 39% in 1979 and the value increased from 1 billion U.S. dollars to 15 billion U.S. dollars. During this period, the average economic growth rate was about 9 percent each year.

By this time, South Korea was catching up with other nearby countries like Taiwan, Singapore and Hong Kong, revealing the characteristics of “Asian Newly Industrializing Economies” (NIEs). Because the domestic saving was less than investment, the government changed its direction to attract foreign investment. This was the stability-oriented growth strategy period.

Until the 1980s and 1990s, because the democracy in South Korea was still not stable and the industry had a structural problem of “high cost, low efficiency”, the development strategy at this period was focusing on increasing the government spending to balance the regional development and increasing the citizen’s overall welfare. The government started to provide good educational system to accumulate human capital, and also provide health care policy, housing policy, and transportation to boost the overall living standard. In 1997, the economy reached its highest point.

Even though South Korea indeed suffered a lot from the Asian financial crisis in 1997, in which the Korean currency depreciated by 15 percent and the economic growth rate in that year was -5.8 percent, the economic structure in the country was robust because of the solid foundation it laid throughout the years. It only took South Korea a year to recover. In 1999, the economic growth rate climbed back to 10.7 percent and the unemployment rate dropped at a significant level.

From the following table 3, I summarize the change of some key economic indicators in South Korea during the 40 years, from which we can see the change of these key indicators, capturing the change of South Korea in these years.

Table 3: Key Economic Indicators in South Korea, 1962-1996

	1962	1970	1979	1990	1993	1996
GNP(US\$)	87	253	1647	5886	7811	11380

Real GDP growth rate(%)	2.1	8.8	7.1	9.5	5.5	6.8
Export(Billion, US\$)	0.11	1.03	15.84	70.83	92.95	151.33
Import(Billion, US\$)	0.44	1.90	20.68	72.98	91.28	169.94
CPI growth rate (%)	-	16.3	18.2	8.5	4.8	4.9

Source: World Bank database (2020)

2.4. Singapore

Singapore gained its independence from Malaysia in 1965. However, at that time the country confronted high levels of poverty and unemployment. Both GDP per capita and the literacy rate were quite low. In terms of the tough situation, the first step for the Singaporean government to develop domestic economy was to improve the living standard and secure social stability for its citizens. Many government resources were poured in the education to foster human capital in order to stimulate local industries. At the same time, the government adopted a series new policies to support and transform the industries. Jurong Industrial Park was therefore founded by the government in 1968 to upgrade domestic economy. Because of the geographical restriction, Singapore had to rely on international trade to a large extent to increase its importance in the world. As a consequence, to attract more foreign capital and investments, the government implemented policies to encourage foreign companies. In this way, the rapid industrialization in Singapore gradually turned the country into one of the most important exporting countries for electronic products in the world within just 10 years. The export-oriented industries brought continuous and high economic growth rate for many years. Aside from the related policies, the excellent geographical location of Singapore makes it one of the most important ports in the world, connecting Australia, Asia, India, and West coast of America. This natural advantage makes Singapore the target for foreign direct investment. In order to attract more and keep foreign capital in the nation, Singapore is well-known for its national credit, high efficiency of the government, and complete rule of law, which all led Singapore to become a major international financial city. By putting much effort in strengthening the national intangible asset, Singapore was able to maintain one of the most indispensable countries in the world until now. According to the report from The

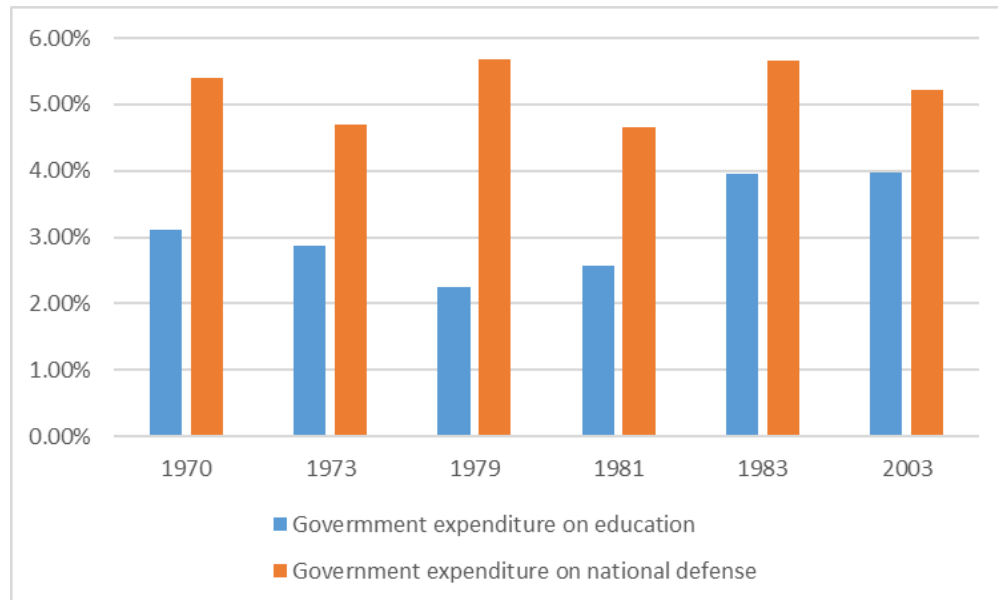
Wall Street Journal, Singapore is now ranked as the first place for the index of economic freedom in the whole world.

Along the way for Singapore to move from an under-developed country to a totally modernized society, the share of its government spending was quite consistent with its development strategies and actually played a crucial role in its economic development. Basically, the main purpose was to make the city as competitive as possible, so the government consumption spending was focusing primarily on maintaining and upgrading the local infrastructures to create a better and appealing environment for foreign companies. For instance, in the 1980s when the economy was quite stable and robust, the government started to construct the Changi international airport, one of the best airports in the world, which further enhanced the importance of the position in Asia.

On top of that, although Singapore has gained its independence for many years, it was still under the threat from neighbour countries, like Malaysia and Indonesia. The father of the nation Kuan-Yew Lee launched a well-known strategy named “Poisonous Shrimp” to prevent the country from being attacked by other countries.⁸ As a result, the government spending in national defence accounts for a large share of its GDP throughout the years. From the following figure 7, we can observe this phenomenon. It summarizes the change of the government spending in two of the most major part, national defence and education, from 1970 to 2003 in Singapore.

⁸ It implies that even though neighbour countries might be able to successfully take Singapore by force, the countries will definitely pay a huge cost for it.

Figure 7: Government Spending on National Defence and Education as a Share of GDP in Singapore, 1970-2003



Source: World Bank database (2020)

In addition, from the above figure 7, we also see that the share of education also takes a large part of its GDP. The reason is just in line with the development policy – to improve the literacy rate and to accumulate human capital; therefore, the government expenditure focused on providing primary education. Apart from national defence and education system, Singapore was also dedicated to making progress in health care and public housing system to increase the living standard at a national level.

3. Literature review

After the Second World War, many researchers have been focusing on the economic growth rate in both theoretical models and practical issues. In particular, the astonishing economic performance in East Asia, especially referring to Taiwan, Hong Kong, Singapore, and South Korea, drew the worldwide attention. The so-called “Four Asian Tigers” were globally considered to be an economic paradigm or model because they created an average of 6 percent of the economic growth rate every year for decades, and successfully transformed from under-developed societies into high-income and modernized countries. Regarding the phenomenon of the “East Asian miracle”, a plenty of studies were investigating what factors contributed to this exceptional economic performance in this

region. However, about discovering the actual reason accounting for the success story in East Asia, different perspectives and angles of the analysis lead to different conclusions.

Despite many literatures investigating different determinants leading to the high economic growth rate, very few of them discuss the role of government spending in the development in these countries. As a consequence, in this chapter it will be divided into two sections. The first section will discuss those important factors referred to in the existent papers to reveal what the majority of previous papers have accomplished. The second section will review the papers regarding the effect of government spending on the economic growth rate. It will include both theoretical view and empirical findings.

3.1. Factors leading to the rapid development in Asian Tigers

About the reasons causing the high economic growth in the East Asian countries, no single determinant is able to explain the whole story. For example, Hughes (1995) points out that there might be several reasons including the economic environment, cultural effect, technological improvement, and political changes contributing to the success. Khan (2010) investigates the development strategies in East Asia and attributes the achievement in this region to the strategic trade openness, multiple heterodox macroeconomic strategies, decrease in the social inequalities, and more flexibility in the institutions by using an adaptive systems approach. Gill and Kharas (2007) mention that the economic renaissance in this region was mainly due to the dynamic process of the integration among these countries and the evolving institutions. The OECD report (2006) also concludes that the sources of the drive for the growth includes innovation, the increase in the international integration, and the cooperation and coordination for the policies between these countries.

Many reasons combined contributed to the story. To be more specific, the first focused point would be the relationship between the education, human capital, and the development in this countries. Many related literatures conclude that the major cause for the growth in the East Asian countries was the investment in the human capital by their governments. For instance, Fontana and Srivastava (2009) compare the difference in the accumulation in human capital between East Asian countries and India and find that a better human capital accumulation and a more decrease in the income inequalities in the East Asian countries could partially explain why India cannot reach the similar economic performance as Eastern countries did between the 1960s and the 1990s. In addition,

Charles et al. (2011) create a new human capital index to measure the economic outcomes between the “High Performing Asian Economies” and the other parts of the world. They find that a fair-wage system is the main drive for the growth in the human capital, and further boost the economy.

When focusing on the role of education, different countries have different historical background, so the stories are all different. Taiwan and South Korea were once the colony of Japan. However, the development of education for the two countries differs a lot. For instance, Despite being as a colony, the Japanese government still introduced appropriate and modern educational system and structure, which is described by Sorensen (1994), to Taiwan. The Japanese government at that time brought the American-style education to Taiwan, which built a solid foundation for future development. Clark (2002) illustrates that the reason why the ratio of people who do not receive education dropped quickly and the accumulation of the human capital increased significantly was that, in 1957, the Taiwanese government implemented a 6-year compulsory education and further implemented a 9-year compulsory education for all the citizen. It was all built on the Japanese policy. However, in South Korea, even though the Japanese government also tried to introduce the new education system to them, the result was totally not as effective as the outcome in Taiwan.

As for Hong Kong, before returning its sovereignty to China, it was a colony of United Kingdom until 1997. Therefore, the educational system in Hong Kong just followed the policy from United Kingdom, which includes a 6-year elementary school, a 3-year secondary school, and a 2-year senior secondary school.

Because Singapore is a multi-ethnic country, the Singaporean government faced a lot of difficulties when integrating the educational system. Goh (1979) shows that the effect was not quite good in the first years.

From the following table 4 we can observe the trend mentioned above. It summarizes the education attainment rate in the four countries from 1950 to 2010. In addition to no schooling, the education is classified into three categories, including primary school, secondary school, and tertiary school. The table depicts that no matter how negative the impact was from the Korean War, or the social uncertainties in Singapore when it just

declared its independence, until the 1990s, the education system in all the four countries had already become fairly complete, reaching the level of a modernized country.

Table 4: The Education Attainment of First Generation in Asian Tigers, 1950-2010

Country	1950	1955	1960	1970	1980	1990	2000	2010
Taiwan								
Primary	33.54	37.91	42.48	44.81	35.5	28.87	20.5	13.42
Secondary	16.83	18.42	20.25	25.18	38.8	46.33	51.12	46.17
Tertiary	3.12	3.17	3.62	6.45	9.9	15.32	23.52	38.03
No schooling	46.51	40.51	33.65	23.56	15.7	9.48	4.86	2.38
Singapore								
Primary	22.14	24.7	26.96	29.6	38.41	49.75	12.14	6.95
Secondary	15.73	18.06	22.11	34.15	28.48	36.68	51.66	40.17
Tertiary	0.97	1.13	1.54	1.93	3.28	3.33	16.64	37.61
No schooling	61.16	56.1	49.39	34.29	29.82	10.24	19.56	16.27
South Korea								
Primary	62.3	62.69	36.94	39.13	28.03	16.06	11.76	9.64
Secondary	8.33	12.66	17.78	30.77	49.79	58.65	52.03	45.28
Tertiary	1.51	1.81	2.6	5.78	9.12	17.24	30.24	41.64
No schooling	27.86	22.83	42.6	24.31	13.07	8.05	5.93	3.44

Hong Kong

Primary	39.97	42.87	44.83	41.05	34.42	24.91	18.49	16.96
Secondary	17.8	18.21	18.98	32.31	42.79	51.21	49.77	59.62
Tertiary	3.58	4.15	4.49	2.61	6.67	11.29	13.43	18.05
No schooling	38.65	34.77	31.7	24.08	16.22	12.59	18.3	5.38

Unit: all the numbers are measured in percentage (%)

Source: Barro and Lee (2013) dataset

From the viewpoint of an empirical study, many researchers investigate the role of the schooling system in these countries both in the rapid economic growth rate and in the accumulation of human capital. For example, Morris (1996) concludes that despite the difference in many aspects, including the source of funding for educational purposes, the nature and the role of the school curriculum, and the institution for providing education, all the countries put emphasis on elementary schooling to increase the rate of literacy and to maintain the social cohesion. In spite of the heterogeneity of the Asian Tiger countries, the development of their educational system is actually one of the key drives for their rapid industrialization and growth.

Other than adopting policies to improve educational foundation and enhance the national competitiveness, relying on international trade is another important driver. The other crucial determinant discussed much in the previous studies is the trade openness in the four countries. Since trade liberalization has long been considered to be a crucial factor for economic growth for many years, whether there is a positive relationship between the trade openness and the economic development is an important issue for both researchers and policymakers. This is of great importance particularly in East Asian countries since it is widely acknowledged that the development from import substitution to export-oriented industries policies have contributed significantly to the economic development in Asian Tiger countries. The following table 5 summarizes the change of the share of GDP in export and import for the four countries from 1960 to 1990.

Table 5: Trade Openness of the Asian Tigers, 1960-1990

Country	1960	1970	1980	1990
Taiwan				
Export (% GDP)	15.12	41.03	47.54	45.23
Import (% GDP)	17.32	35.56	48.05	35.14
Trade (% GDP)	29.37	60.23	104.19	87.83
South Korea				
Export (% GDP)	2.62	11.44	28.44	24.99
Import (% GDP)	11.98	21.12	37.09	25.76
Trade (% GDP)	14.6	32.56	65.53	50.75
Singapore				
Export (% GDP)	162.83	126.03	202.01	177.19
Import (% GDP)	176.48	145.03	208.93	167.14
Trade (% GDP)	339.31	271.06	410.94	344.33
Hong Kong				
Export (% GDP)	0.0	93.19	88.75	117.27
Import (% GDP)	0.0	85.48	89.26	108.73
Trade (% GDP)	0.0	178.67	178.01	226%

Trade: export + import as a share of GDP.

Source: South Korea, Singapore, and Hong Kong from World Bank (2020), Taiwan from World Development Indicators (2020)

We can see from the above table 5 that even though there is a large variation between countries in trade openness in the 1960s, the share of export plus import in all of the

countries increased rapidly, which were quite in line with their economic growth rate. In fact, the findings from many empirical studies are also consistent with this phenomenon. Khan (2010) discovered that trade openness is a major boost for the economic growth rate in developing countries, especially in the Asian region. Yanikkaya (2003) also reaches to the same conclusion. Dollar (1992) estimates from 16 Asian countries from 1976 to 1985 and finds that the GDP per capita growth rate was about 3.4 percent, which was primarily driven by the outward-oriented policies. Additionally, Dollar and Kraay (2002) not only discover the positive relationship between trade openness and economic growth rate, but also find that the increased level in trade liberalization will effectively solve the problem of poverty in a country. Therefore, it could be a good tool for policymakers to deal with the poverty and corruption. Basically, literatures in this topic usually conclude that trade openness played an important role in the economic development in East Asian countries.

In addition to the factors including education, human capital, and trade liberalization, which are often mentioned in the growth literatures, several researchers also regard the cultural predilection as another factor contributing to the economic development to a certain extent. For instance, Lajčiak (2017) claims that the economic policies to boost the economy in East Asia will not be so effective if the people and policymakers in these countries did not take their unique social organizational models into consideration. The main thought of Confucianism behind these countries was really important. The core value of Confucianism is the belief of social order, everyone with their duties and privileges, hierarchical lines, and heavily relying on self-control of every individual. Bell and Chaibong (2003) state that it was just because the Confucian values was deeply rooted in the daily lives of every people in this region that the whole function of the government could run so smoothly.

3.2. The relationship between government spending and economic growth

Even though many papers have already discussed different factors contributing to the success story in East Asian countries in the last section, very few of them truly focused on the influence of government spending on the high economic growth rate in these Asian countries. Most of them were putting emphasis on the importance of education, accumulation of human capital, regional integration, trade policy, and even cultural influence in this area. However, government spending might be in effect quite an essential

issue because the rapid development in this region was indeed stimulated by the government's policy.

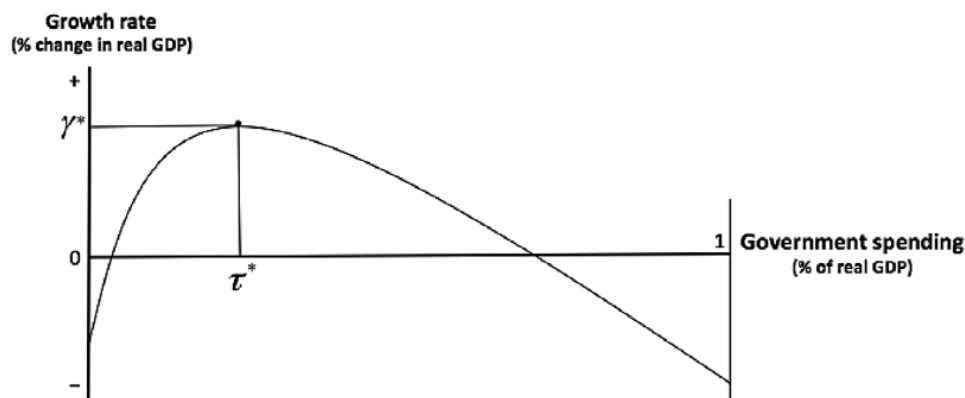
As mentioned in the previous chapter, for instance, when almost the whole world was hit hard by the adverse oil crisis, the Taiwanese government at this time launched the "Ten Major Construction Project" to strategically boost its domestic demand. This project not only created a solid foundation for the local infrastructure but also made the country more competitive in the world. On the other hand, the Hong Kong and Singaporean government made endeavour to make it a suitable place to attract as much foreign capital as possible. Therefore, the government in this two countries managed to upgrade their infrastructures and to provide appropriate health system to create a friendly environment for foreign companies. Furthermore, because the regional development in South Korea was not balanced, the government put emphasis on equally developing the remote area and improving people's welfare. Different countries were confronted with different tough situations, but they all adopted various policies to find the way out. It again reveals that the intervention of the government is crucial for the growth in these countries. As a result, this section will review the paper discussing the relationship between government spending and economic growth rate.

When a country is confronted with an unexpected adverse shock and the economic growth path deviates from its normal trajectory, should the government step in to help the economy recover? Regarding this long-lasting issue, different economic schools hold totally different viewpoints. The classical theory emphasizes the function of the economy itself. In this view, the government should not adopt any policies to intervene in the economy at all, and then the self-adjusting economy will lead itself to the normal status automatically. Nevertheless, the Keynesian theory views the issue entirely on the other side. It highlights the importance of the government implementing fiscal policies to stabilize the economy. Accordingly, whether the government should intervene in the economy has long been a controversial issue. When we focus on different angles, different literatures have the opposite results.

From the theoretical point of view, Barro (1990) proposes that there exists a relationship between the government spending and economic growth rate, just like the traditional "Laffer curve" describing the relationship between the optimal tax rate and the

tax revenue. In the Barro's description, when the scale of the government spending is exactly at the optimal level, then it will create the highest economic growth rate. However, if the scale of government spending deviates from the optimal point, then it will be harmful to the overall economic growth rate. The following figure 8 just illustrates this scenario.

Figure 8: Relationship Between Government Spending and Growth Rate



Source: Barro (1990)

Depicted in the figure 8, when deviating from the optimal level of government spending, there are two different cases. First, if the government spending is smaller than the optimal value, the more the government spending is, the higher growth rate it will create. On the contrary, if the government spending exceeds the optimal value, once the government spending increases, it will drop down the economic growth rate.

Except for the theoretical perspective, there are also many empirical findings regarding the relationship between government spending and economic growth rate. For example, Connolly and Li (2016) use the panel data for 34 OECD countries from 1995 to 2011 to study the influence of three sorts of government spending on the economic growth rate. The empirical result shows that the rise in government social spending even has a significantly negative impact on the following economic growth. Besides, neither government consumption spending nor government public investment has a significant influence on the economic growth in the subsequent year.

On the other hand, there are also literatures with different results. Furceri and Zdzienicka (2010) also use the panel data for OECD countries to investigate the effect of government social spending on the whole economic activity. They find that the

government social spending has an expansionary effect on the total output. To be more precise, a 1 percent increase in the social spending will increase the GDP by 0.1 percent. The effect will be more significant when the society is in severe economic recession times. In addition, Zagler and Durnecker (2003) conclude that the government expenditure in educational system and infrastructure investment are also beneficial to the economic growth rate, yet the related tax policy and the expense in R&D together have a more remarkable impact on the economic growth boosted by the innovation.

Regarding the role of government consumption spending, different literatures yield various results. For example, Landau (1983) uses the cross country data for 96 countries to estimate the effect, and finds that there exists a significantly negative correlation between the government consumption spending and the economic growth rate. A 10 percent increase in the government consumption spending will lead the economic growth rate to decrease by 0.7 percent approximately. However, there are also literatures concluding that when the size of the government is getting bigger, then the economic performance in a country will be greater. Al-Yousif (2000) illustrates the situation in Saudi Arabia, and concludes that when the government size becomes bigger, meaning that the government intervenes more in the economy, then it will positively affect the economic growth rate.

Other than specifying the role of government spending on the economic growth rate in a general scenario, many papers discuss this topic from a developing country's perspective. Stanciu et al. (2017) investigate the case in Romania. They find that in effect there is a positive relationship between the public investment and the economic growth rate, especially in the downturns. As for in Africa, Ocran (2011) studies the case in South Africa, the author finds that both government consumption spending and the gross fixed capital formation are contributing to the economic growth in the country. In particular, the effect of the government consumption spending is much more significant. Nevertheless, not all papers conclude positively. Todorova (2019) analyses the condition in several countries which are new members in the European Union. The author summarizes that in order to secure the high economic growth, the government should reduce the government public spending.

Additionally, Blanchard and Perotti (2002) intend to investigate the relationship between government spending and taxes in the U.S. for the post-war period. The finding

suggests that there is a positive effect of the government spending on overall aggregate output.

Apart from the direct effect of government spending on the economic performance, sometimes the government also tries to boost the economy through indirect channels. For instance, one of the most common channels is through consumption, yet there is no universal consensus now. Some researchers stand from Keynesian standpoint and believe that when the government spending is increasing, then it will rise the output level. The government spending and the private consumption are complementary. Finally, people tend to consume more to create a higher economic growth because of the increase in their disposable income. That is, the government spending will crowd-in private consumption and then increase the economic growth. Devereux et al. (1996) conclude that the higher the government spending, the higher the private consumption. Besides, it will also be beneficial to the productivity growth. Also, Kuehlwein (1998) analyses the effect of government spending in education, housing, medical service, and public transportation on the private consumption in the U.S. The author finds that there is a complementary relationship to some degree.

On the other hand, other researchers stand from a Ricardian viewpoint and consider that the increase in the government spending at the current period might lead the people to think that there will be a tax increase in the future. Therefore, the private consumption will decrease, and then further reduce the current output level. The relationship between government spending and private consumption is substitute. For the empirical finding, Ahmed and Miller (2000) analyse the case in developed countries and find that actually the government spending will crowd-out private consumption.

More recently, in 2020, the global COVID-19 pandemic also put many countries in a severe recession. Many governments under this tough circumstance try to take fiscal policies to recover the economy. For instance, the Taiwanese government launched a consumption voucher worth US\$ 100 to every citizen, targeting to boost the household consumption and stimulate the economic growth rate in this year. Regarding the effect of the consumption voucher policy, it was actually first introduced in Japan after the Asian financial crisis in 1997. However, no matter in 1997 or in 2020, the main idea of launching the consumption voucher to the citizen is to save the economic growth rate through

government spending. Several literatures try to estimate the effect of this policy. For example, Hsieh et al. (2010) find that the effect of this policy will only be effective in the first months of this policy implemented. On the other hand, Chang et al. (2010) estimate that this consumption voucher program successfully created around 0.43 percent of economic growth rate in 2009 in Taiwan.

In conclusion, most of the previous work focusing on the effect of government spending on economic growth rate rarely investigate the scenario in East Asian countries. However, according to the historical background, it is indeed an important factor to help to explain the story. As a result, this paper focuses on the less discussed issue. Hope to provide another insight to look into the relationship between government spending and economic growth rate in several developing Asian countries.

4. Methodology and data

This chapter focuses on the appropriate empirical model used in this study to estimate the effect of different kinds of government spending on the economic growth rate in the four Asian Tigers. The main estimation equation in this analysis is primarily based on Connolly and Li (2016), who use the model to analyse the effect of government spending on other countries. With cross-sectional time-series data, the most commonly used method to estimate is panel data model. Therefore, I will then use three different estimation methods, including fixed effects model, random effects model, and generalized method of moments (GMM) estimation developed by Arellano and Bond (1991) to analyse the data. About choosing between the fixed effects model and random effects model, I will conduct the Hausman specification test (1978) to determine which one is the most suitable method to interpret the analysis result. After that, I will use the GMM method, trying to deal with the potential problem fixed effects model and random effects model might face. The following of chapter will discuss the main estimation model used in this study, choosing of dependent and explanatory variables, the estimation process in this paper, and the source of the data.

4.1. Estimation model

Since the data form is cross-section time-series data, the most universal estimation methods are fixed effects model and random effects model. As a result, the main estimation equation can be at first expressed as the following:

$$y_{i,t} - y_{i,t-1} = \theta y_{i,t-1} + \beta X_{i,t-1} + \eta_i + \xi_{i,t} \quad (1)$$

In the equation (1), $y_{i,t}$ is the log form of GDP per capita of country i (Here are Taiwan, Singapore, Hong Kong, and South Korea respectively) in year t . The purpose of including the term $y_{i,t-1}$ on the right-hand side is to test whether the initial value of GDP per capita has a specific impact on the subsequent economic growth rate. For instance, if the value of θ is positive, then it implies that a higher value of GDP in the current year will be beneficial to the economic growth rate in the following year. If the value of θ is negative, then the story is just the opposite. In addition, $X_{i,t-1}$ is a vector of all the interested explanatory variables which may affect the economy in the four countries, including country i 's government social spending as a share of total GDP in year $t-1$, country i 's government public investment as a share of total GDP in year $t-1$, and country i 's government consumption spending as a share of total GDP in year $t-1$. Apart from the three most interested explanatory variables mentioned above, $X_{i,t-1}$ will also include some other factors that are likely to affect the economic growth rate in a country. For example, country i 's fertility rate in year $t-1$, country i 's population growth rate in year $t-1$, and country i 's life expectancy in year $t-1$. In this model, we use the stock values of the variable at the end of the year rather than the flow variables evaluated during the year. In this way, we should avoid the endogeneity bias. η_i is used to denote the time-invariant country-specific variables which should also affect the economy in a country, including the countries' geography, religion, and the particular lifestyle or culture and convention. The final term is the normally distributed error term $\xi_{i,t}$.

By rearranging the equation (1), it will be easier to understand and then analyse, and the equation then becomes the following:

$$y_{i,t} = \lambda y_{i,t-1} + \beta X_{i,t-1} + \eta_i + \xi_{i,t} \quad (2)$$

where $\lambda = 1 + \theta$.

In the equation (2), if we finally get the value of $\lambda > 1$, then it implies that the value of $\theta > 0$ and we can start to interpret the result, and vice versa. In this way, despite some re-arrangement of the equation, we can still reach the final appropriate interpretation based on the value of λ .

4.2. Estimation process

In this study, I will use the estimation model illustrated in the previous section to conduct the panel estimation analysis, using the aggregate data from 1981 to 2018 in four Asian Tigers (Taiwan, South Korea, Hong Kong, and Singapore) to figure out the effect of different categories of government spending, including government public investment, government consumption spending, and government social spending, on the economic growth rate in these four countries.

First, by controlling for the country-specific variables η_i which will not change over time, and by using the stock value of each interested variable in a certain time of a year instead of the flow variables during the year, we are able to at least partially prevent from both the omitted-variable bias and the endogeneity bias in the estimation process.

The estimation analysis will start from fixed effects model and random effects model to obtain the effect of each interested explanatory variable on the economic growth rate. By using this two analysis methods, the advantage is that it eliminates the potential omitted-variable bias problem if some unobserved country-specific factors correlated with other independent variables in the growth equation are not included in the regression. In this way, the fixed effects method will create more consistent results. However, on the other hand, if choosing the random effects model, we will instead get more efficient estimators, yet less consistent ones.

Different methods will reach to different results and have different benefits. With both models, we can correct the heteroscedasticity problem. However, regarding which technique is more suitable for the following interpretation, I will then conduct the commonly used methods the Hausman (1978) specification test to determine which one is more correct in the analysis. The main idea of this method is to test whether the unique error u_i in the random effects model is correlated with the explanatory variables (I use the notation u_i here to describe the error term in a general situation in Hausman specification test. It is shown in equation (3). That is, the error term in random effects

model). The null hypothesis is that they are not correlated with each other. The Hausman specification test can be expressed as the following:

$$H_0 : E(u_i, X_{i,t}) = 0$$

$$H_A : E(u_i, X_{i,t}) \neq 0 \quad (3)$$

In the above hypothesis test, the null hypothesis is that random effects model will not merely yield efficient but also consistent estimators. If we fail to reject the null hypothesis, then the result from random effects model is the preferred one. On the contrary, if we reject the null hypothesis, then we turn to choose the fixed effects model as our preferred model to interpret. The Hausman statistic is the following:

$$H = (\beta_{FE} - \beta_{RE})' (M_{FE} - M_{RE})^{-1} (\beta_{FE} - \beta_{RE}) \sim \chi^2(K) \quad (4)$$

In the above equation (4), β_{FE} represents the estimator in the fixed effects model; β_{RE} represents the estimator in the random effects model; $M_{FE} - M_{RE}$ stands for the covariance matrix of an efficient estimator with its difference from an inefficient estimator. Finally, H is the chi-square distribution with K degrees of freedom. After we obtain the Hausman statistic, the deciding rule can be expressed as the following:

$H > \chi^2(K)$, **Reject** H_0 , then fixed effects model is preferred

$H < \chi^2(K)$, **Fail to reject** H_0 , then random effects model is preferred

Nonetheless, no matter we use fixed effects model or random effects model, we all have to face the same potential problem. The fact is that it is very likely that the economic growth rate and the amount of government spending will affect each other. For instance, if the performance of the economic growth rate is not as good as expected, then through the automatic stabilizers, the government is likely to adopt expansionary fiscal policies, increasing the government spending to boost the economy. Nevertheless, on the other hand, if the level of the government spending becomes too high, then, according to the figure 8 in the previous chapter, it will start to be harmful to the economic growth rate. In

addition, based on the so-called “dynamic nature of the estimation equation”, the country-specific effects η_i might be correlated with other explanatory variables in the equation.

To be more specific about the potential problem, due to the country-specific variables η_i included in the growth equation (2), we are likely to be confronted with the “dynamic panel bias” developed by Nickell (1981). In the author’s illustration, the reason is that the country-specific effects might be correlated with other variables in the equation. We can have a better understanding about it through the following equation:

$$E[\eta_i, y_{i,t-1}] = E[\eta_i(\lambda y_{i,t-2} + \beta X_{i,t-2} + \eta_i + \zeta_{i,t-1})] \neq 0 \quad (5)$$

In the above equation (5), we can see that the value of $E[\eta_i]^2 \neq 0$. Therefore, the final estimators will lose both its efficiency and consistency.

To deal with two above-mentioned potential estimation bias, I will introduce the generalized method of moments (GMM) technique proposed by Arellano and Bond (1991) in my analysis to address this problem. By using this technique, I will first create a first-difference variable for every explanatory variable. This one-period lagged value of every variable will also avoid the endogeneity bias. Furthermore, by first-differencing each explanatory variable, the effect of time-invariant country-specific determinants will be eliminated. It will then help us to get more appropriate estimators. Actually, some previous literatures in this topic often use this method to address the problem. For instance, Connolly and Li (2016) use this GMM method to investigate the effect of different kinds of government spending on economic growth in the OECD countries. Forbes (2000) uses the same methodology to figure out the relationship between inequality and economic growth.

As a result, by using the GMM method in this study, the result will hopefully be better to interpret. First, by taking the first-difference of every term in the growth equation (2). We will get the following equation:

$$y_{i,t} - y_{i,t-1} = \lambda(y_{i,t-1} - y_{i,t-2}) + \beta(X_{i,t-1} - X_{i,t-2}) + (\xi_{i,t-1} - \xi_{i,t-2}) \quad (6)$$

In the growth equation (6), we can see that the country-specific effects η_i is therefore eliminated. On top of that, because we now use the lagged value of the variable to estimate, we are able to escape from the simultaneity bias.

To sum up, I would like to use above-mentioned variables to verify the influence of different categories of government spending, and other relevant factors that might affect the economy in a country on the economic growth rate in Taiwan, Hong Kong, Singapore, and South Korea. The reason to include these four countries in the study is because they share a lot of same history, yet have different development process. Therefore, I believe that by estimating different categories of government spending on their economic growth rate, the analysis result will indicate some implications for future policies in this area.

To sum up for the analysis in this study, first, I will use fixed effects model and random effects model to estimate the results, and then perform the Hausman specification test to determine which model is more appropriate in this scenario to interpret the result. However, no matter which model is used, it is inevitable to be faced with the potential estimation bias. To deal with this problem, I will further perform the third model, GMM estimation, to analyse. Finally, based on the statistical result, I will use the appropriate model the interpret and then understand the relationship between different categories of government spending on the economic growth rate in these four East Asian countries.

4.3. Variables and source of data

In this paper, the study period for the four countries is from 1981 to 2018. There are two main reasons to choose this study period. The first one is due to the data availability. The second one is that because in the 1970s all the four countries experienced the very high level of economic growth rate. If I include this period, then chances are that it might be difficult to detect whether the rapid growth is driven by the overall regional trend or by the intervention of the government. However, if I choose the period from 1981 to 2018, then I not only study the period when the four countries were still known as the Asian Tigers, but also study the period when the term became less used. In this way, it will be clearer to estimate the effect of government spending on the economic growth rate in the four countries.

In the estimation equation, one of the main independent variables will be estimated by the logarithm form of the GDP per capita in each country. The data source is coming from

the World Bank database, and is measure in 2010 US dollars. Besides, there are other 6 explanatory variables in this study. The most interested topic is the effect of government spending on the economic growth rate. The government spending here is divided into three different categories. The first one is country i 's government social spending as a share of total GDP in year $t-1$. Government social spending includes old age pensions, survivors and disability benefits, unemployment compensation mostly in cash and health, health services and housing. The second one is country i 's government public investment as a share of total GDP in year $t-1$, which includes gross capital formation of plant, property, and equipment, including public hospitals, schools and housing. The third one is country i 's government consumption spending as a share of total GDP in year $t-1$. It incorporates the spending to produce non-market goods, such as national defense, police, fire, military payroll for collective consumption, such as health care, housing, and education. The data is from each country's official website: Taiwan is from Chief Accounting Office of the Executive Yuan, Taiwan; Singapore is from Singapore Department of Statistics (DOS); Hong Kong is from the website of Social Indicators of Hong Kong; South Korea is from National Symbols of South Korea.

In addition to the three most interested explanatory variables mentioned above, the other three control variables are country i 's fertility rate in year $t-1$, country i 's population growth rate in year $t-1$, and country i 's life expectancy in year $t-1$. All of these data is from the World Bank database. However, because Taiwan is excluded from the World Bank. The data of Taiwan is from the Chief Accounting Office of the Executive Yuan, Taiwan

We use the following table 6 to summarize all of the variables and it provides the basic information of each variable.

Table 6: Summary of the Variables

Variables	Denotation	Unit	Data Source
GDP per capita	logGDP	2010 US dollars	World Bank (Taiwan: official website)
Lagged log of GDP per capita	lagGDP	2010 US dollars	World Bank (Taiwan: official website)
Government consumption spending	GOVcon	Share of GDP	Each country's official website
Government public investment	GOVinv	Share of GDP	Each country's official website
Government social spending	GOVsoc	Share of GDP	Each country's official website
Population growth rate	Pop	%	World Bank (Taiwan: official website)
Fertility rate	Fer	%	World Bank (Taiwan: official website)
Life expectancy	Exp	Average age	World Bank (Taiwan: official website)

5. Empirical results

After the historical backgrounds about each country, we have a better understanding regarding the rapid and continuous economic growth rate in the four Asian Tiger countries from the 1960s to the 1990s, and even until now. Although many literatures have already classified several important determinants, which the four countries all have in common, contributing to the economic miracle in this region, the history reveals that there are still significant differences between these countries. For instance, the government spending in these countries focused on different parts in order to upgrade the local infrastructures, improve domestic environments, or enhance living standards, and each component counts. As a result, the government spending may be another key drive for the exceptional economic growth rate for these East Asian countries.

This chapter discusses the empirical result about the effect of different kinds of government spending and several interested factors on the economic growth rate in the four Asian countries, Taiwan, Singapore, Hong Kong, and South Korea, using the aggregate data for each country from 1981 to 2018. The model chosen in this study is developed by Connolly and Li (2016). Besides, because it is a panel estimation process, I will first use fixed effects model and random effects model to estimate, and then use the Hausman specification test to determine which one is better to interpret the result. Finally, I will also conduct the generalized method of moments proposed by Arellano and Bond (1991), trying to deal with the potential problem faced in fixed effects model and random effects model.

First, the following table 7 provides the descriptive statistics of each interested variables, and the trend of the mean values.

Table 7: Summary Statistics of Each Variable

Variable	Observations	1980s	1990s	2000s	2010s
GDP per capita					
Taiwan	38	4,222.05	11,913.24	15,777.83	22,631.48
South Korea	38	5654.92	11709.1	17970.33	24357.02
Singapore	38	17185.41	27831.20	38746.99	53445.51
Hong Kong	38	14,130.43	20,969.00	26,963.27	35,673.53
GOVsoc					
Taiwan	38	1.68%	3.84%	5.95%	7.88%
South Korea	38	2.14%	3.42%	6.12%	9.78%
Singapore	38	0.82%	0.9%	0.6%	1.1%
Hong Kong	38	0.8%	1.36%	2.35%	2.65%
GOVcon					
Taiwan	38	16.03%	17.07%	15.73%	14.55%
South Korea	38	10.78%	10.69%	12.73%	15.14%
Singapore	38	10.95%	8.96%	10.46%	9.76%
Hong Kong	38	6.77%	7.95%	9.58%	9.42%
GOVinv					
Taiwan	38	8.06%	9.95%	5.15%	2.99%
South Korea	38	7.35%	8.12	8.79%	6.98%
Singapore	38	7.67%	5.86%	4.31%	4.65%
Hong Kong	38	8.99%	11.52%	7.86%	8.14%

Fer					
Taiwan	38	2.06%	1.72%	1.23%	1.12%
South Korea	38	1.85%	1.59%	1.21%	1.18%
Singapore	38	1.68%	1.66%	1.32%	1.21%
Hong Kong	38	1.55%	1.22%	0.98%	1.19%
Pop					
Taiwan	38	1.39%	0.8%	0.51%	0.29%
South Korea	38	1.5%	1.28%	0.72%	0.49%
Singapore	38	2.15%	3.01%	2.4%	1.36%
Hong Kong	38	1.29%	1.5%	0.54%	0.74%
Exp					
Taiwan	38	72.61	74.65	77.40	79.53
South Korea	38	68.81	73.54	77.84	81.77
Singapore	38	73.77	76.38	79.59	82.39
Hong Kong	38	76.24	78.85	81.84	83.96

Note: The GDP per capita is measured in 2010 US dollar; government spending is the share of GDP.

Generally, from the above table 7, we have some important findings. First focus is the share of different categories of government spending for the four countries. For instance, Taiwan and South Korea put more emphasis on the government social spending, while Hong Kong and Singapore are not. On the country, Hong Kong is focusing on government public investment and Singapore has a higher share in government consumption spending. As a result, the fiscal policies for the four countries are different throughout the years. Second, it is the same for all the four countries that population

growth rate and fertility rate are gradually decreasing and the life expectancy is increasing. This fact reveals the characteristics of a modernized country.

After some preliminary summary of the data, I then start to use the panel estimation method to estimate the result. The following table 8 shows the regression results from three models respectively, which are fixed effects model, random effects model, and GMM technique developed by Arellano and Bond.

Table 8: Empirical Results

VARIABLES	(1)	(2)	(3)
lnGDP	Fixed effect	Random effect	Arellano and Bond
Laggdp	0.918*** (0.0220)	0.921*** (0.0173)	0.911*** (0.0154)
Govsoc	-0.0115*** (0.00419)	-0.00699*** (0.00218)	-0.00882*** (0.00294)
Govcon	-0.00842** (0.00385)	-0.00318 (0.00236)	-0.00343 (0.00250)
Govinv	0.000436 (0.00178)	-0.00234*** (0.000700)	-0.00294*** (0.000958)
Fer	-0.0450* (0.0267)	-0.0457* (0.0252)	-0.0441** (0.0218)
Pop	-0.0106* (0.00574)	-0.00917* (0.00554)	-0.0116** (0.00494)
Exp	0.0105*** (0.00354)	0.00554* (0.00286)	0.00685*** (0.00243)
Constant	0.233	0.551***	0.556***

	(0.241)	(0.156)	(0.153)
Observations	136	136	136
R-squared	0.993		
Number of country	4	4	4

*Note: The dependent variable is the log form of the GDP per capita. Also, Robust standard errors in parentheses. The significance levels are expressed by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ respectively.*

The result for the fixed effects model is in the first column of the table 8 and the result for the random effects model is in the second column in the table 8. When we first look at the regression result, the focus should be at the comparison between the fixed effects model and random effects model. Basically, the estimation coefficients are quite similar for the two models. For example, for the fertility rate and the population growth rate, both models suggest that there exists a negative relationship between the two factors and the economic growth rate in the following year, and the result is significant at the 10% significance level. In addition, both models also indicate that an increase in the life expectancy in the current year will be conducive to the subsequent economic growth rate.

The difference in the estimation result between the fixed effects model and random effects model appear in the interested variables in this study. First, for the government social spending, both models reveal that the relationship between the government social spending and the following economic growth rate is negative, and is significant at 1 percent significance level. Nevertheless, regarding the government consumption spending, the result in fixed effects model is significant at 5 percent significance level and that the correlation is negative, while the random effects model reveals that the more government consumption spending this year, the higher economic growth rate in the following year, yet the result is not significant. Furthermore, there is also a difference in the government public investment. Fixed effects model shows that even though it is not significant, the relationship between the government public investment and the following economic growth rate is positive. Nevertheless, random effects model shows that there is a quite significantly negative relationship between the government public investment and the economic growth rate in the following year.

Despite the fact that generally the result for both models are similar, there are still differences between the two outputs. Regarding which model is more appropriate in this analysis, I conduct the Hausman specification test to determine what model I will use to interpret the estimation result. After the Hausman test, I get that the test statistic is $\chi^2(7)=5.64$. The test result indicates that we fail to reject the null hypothesis in the test. As a consequence, random effects model is more appropriate in this analysis. In addition, as mentioned in the previous chapter, no matter I use fixed effects model or random effects model, it will inevitably be confronted with the potential bias. In order to correct this potential problem, I further use the GMM method developed by Arellano and Bond.

Comparing the estimation result between the random effects model and the GMM technique, we can clearly see that the sign for every estimation coefficient is the same for both models, only with some slight effect differences. When having a closer look at the result, I find that the relationship between the government consumption spending and the following economic growth is negative, which is the opposite from the result in the research from Connolly and Li (2016). However, the result in both this paper or from their analysis are not significant. Therefore, this might not be the most important part in this analysis.

About the government social spending, the result from GMM method is significant at the 1 percent significance level and it shows that a percentage point increase in the government social spending as a share of GDP this year will give rise to a decrease in the subsequent economic growth rate by approximately 0.88 percent. Furthermore, the result for the government public investment is quite similar. It reveals that a percentage point rise in the government public investment as a share of GDP this year will lead to an around 0.3 percent decrease in the economic growth rate in the next year. Besides, the result for government public investment is different from Connolly and Li's findings (2016), in their paper the coefficient is not significant at all.

As for other determinants which are very likely to affect the economic growth rate, the estimated coefficients are all significant at 5 percent significance level at least. The results from GMM estimation are that for both the fertility rate and population growth rate, an increase in the population growth rate or in the fertility rate in this year will generate a decrease in the economic growth rate in the subsequent year. However, the story is

different for life expectancy, the result indicates that for the Asian Tiger countries, an increase in the life expectancy will generate a positive impact on the economic growth rate in the next year.

Finally, the interpretation of the analysis result is the convergence test. That is, whether the initial value of GDP per capita has some particular influence on the following economic growth rate or not. From the above table 8 we can see that in effect no matter in fixed effects model, random effects model, or in GMM estimation method, the results are all basically the same and the coefficients are all significant at the 1 percent significance level. Besides, the finding is consistent with that in the Connolly and Li's paper (2016). The coefficients in all the three models are less than one. Namely, the value of θ is negative, which is in line with the findings from Barro (1991) and it actually makes sense. That is perhaps because of the Ricardian equivalence hypothesis. The concept is that if the government adopts expansionary fiscal policies to boost the economy, although the government spending in every category is increasing, like pension or social subsidy, a rational household will expect that the government will in the future levy more tax to make up for the budget deficit at this moment. As a result, we are not able to anticipate that there will be a boost in the economy.

6. Conclusion

Four Asian Tiger countries including Taiwan, South Korea, Singapore, and Hong Kong were experiencing a rapid and continuous economic growth rate for several decades. This exceptional phenomenon motivates many researchers to figure out what determinants are the key factors contributing to the East Asian economic miracle during this period, at a time when countries in other regions were suffering from the social instabilities. The previous proven determinants comprise their financial system, export-oriented industry, regional integration, educational system, cultural predilection, and related regulations. Nevertheless, the intervention of the government in this time was also another crucial role for the development, speeding up to transform these countries from under-developed countries to modernized ones. As a consequence, the purpose of this study is to empirically estimate the effect of different categories of government spending on the economic growth rate in the four countries.

In this study, I use fixed effects model, random effects model, and generalized method of moments estimation, and then to compare the difference among them. In general, the empirical result indicates that the effect of government consumption spending on the economic growth rate is not significant at any confidence levels. However, both government public investment and government social spending have significantly negative impact on the economic growth rate in the following period. As for the effect of other interested variables, the relationship between life expectancy and the subsequent economic growth rate is positive, while the increase in fertility rate and population growth rate have negative influence on the following economic growth rate.

Even though the increase in the government social spending and government public investment will decrease the economic growth rate in the next year, this does not imply that the government spending will be harmful to the country's future development. It might be because for these countries they are at the "right hand side" of the Barro's curve mentioned in the literature review. For the four Asian countries in this study, if they continued to aim at increasing the economic growth rate, perhaps they could re-consider the fiscal policies in their countries by adjusting the scale of their government spending.

However, for other neighbour developing countries trying to learn from the East Asian experience, like the "Tiger Club Economies" including Thailand, Malaysia, Indonesia, and Philippines. The result from this study also provides some different insights for them. Although basically government spending is negatively correlated with the economic growth rate in Asian Tigers, it is still of crucial importance for the developing countries to consider and learn a moral. When at the rudimentary stage of the countries' development, the government in Asian Tigers in fact spent a lot to make their societies better. They all put a lot of efforts in upgrading local infrastructures, balancing regional development, and enhancing overall living standard. Consequently, for the new developing countries, it would be better to look at their countries' specific conditions, and then elaborate on different policies to modernize their countries.

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