

Colonial Transition to Modern Economic Growth in Korea and Taiwan

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Rapid improvement in the living standards of Taiwan and South Korea during the recent decades is a familiar story. The economic development of the two countries in the first half of the 20th century is less known, however. Taiwan became a colony of Japan in 1895, and Korea in 1910. Using national income statistics, we argue that the Japanese colonial rule not only initiated the transition to modern economic growth, but also had lasting influence upon the post-colonial growth in Taiwan and South Korea.

In order to understand the economic transformation of the two economies, we study the development policies of the Japanese colonial government. In discussing Korean development, we have taken advantage of the data availability to do growth accounting analysis. We identify key factors driving Korea out of secular stagnation and initiating the sustained growth. In the case of Taiwan, we compare the self-strengthening reform movement of late Ch'ing and the Japanese development policies, and try to identify the most important factors to development.

In the following, we discuss the development of the two countries sequentially. Sections 1 to 4 are devoted to Taiwan, and 5 to 7 are to Korea. Some concluding remarks are given in section 8.

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1 Taiwan Before 1900

From the early 17th century to 1895, Taiwan was first ruled by the Dutch (1624–62), then by the Cheng regime (1662–1683), which was followed by the Ch'ing empire (1683–1895). In the early 17th century, Ming China restricted foreign trade. Nevertheless, smuggling and pirates flourished in the South China Sea, where Japanese and Chinese traded commodities produced in China, Japan, and Manila. Located along the international trade route, Taiwan was a convenient meeting place for Japanese and Chinese traders.¹

When the Dutch East India Company came to the East, the primary aim was to trade with China. After repeated rejections by Ming China, the Dutch finally settled in southern Taiwan in 1624. During this time, there were some Chinese and Japanese staying on the coast, but the island was inhabited mainly by aborigines. The residents of Taiwan engaged in fishing, hunting, and trading. Agricultural activities were limited. In the beginning, the Dutch regarded Taiwan as an entrepôt, but they soon realized that Taiwan could produce various tradeable goods that would generate profits. Among the goods produced in Taiwan, and exported by the Dutch, deer hide and sugar were the most important.² Taiwan is a small island economy of only 36,000 square kilometers, and has relatively little natural resources. Foreign trade is important not only to satisfy domestic needs and but also for economic growth.

The Dutch was defeated by Cheng Ch'eng-kung in 1661. The Cheng's regime was short-lived and was soon succeeded by the Ch'ing government in 1683. In 1685, the Ch'ing government eased restrictions on foreign trade, foreigners were now allowed to trade with the Chinese, but only via Amoy, which was located in the south eastern part of China not far way from Taiwan. Because of the policy change, Taiwan's role as an entrepôt for Chinese foreign trade changed immediately.³ For most of the Ch'ing years, Taiwan was only a small part of the Chinese economy. There were reports that

¹See Ts'ao (2000), p. 20 and Wills (1999), pp. 86–7.

²During the years 1633–60, Taiwan's annual export of deer hide averaged 71,915 pieces. The maximum was reached in 1638, in which 151,980 pieces of hide were exported. Taiwan's sugar export to Japan increased from 99,600 kilograms in 1635 to 392,411 kilograms in 1658, see Nagaseki (1999, p. 51). Sugar export to Persia was 112,800 kilogram in 1639, and 480,000 kilograms in 1658, see Iwao (1955).

³See Ts'ao (2001).

large amount of rice and sugar were exported to China, but except for the last thirty years of the Ch'ing rule, no reliable data were available for detailed analysis.

The Manchu government imposed restrictions on emigration to Taiwan in the early days. The restrictions were enforced on and off for some time, but were lifted in the mid-1830s. Taiwan's population and cultivated land area increased accordingly. It is unfortunate that little quantitative data are available for understanding Taiwan's economic development during the Ch'ing period. Even the official population count and cultivated land area data are unreliable. Following the detailed analysis of Shepherd (1993, pp. 137–76), and using 1684 and 1905 as the terminal years, Taiwan's average annual population growth rate was 1.31%, and the cultivated land area growth rate was 1.25%. Taiwan's population growth rate was much higher than in China during the same period, reflecting the fact that Taiwan's population increase was a result of immigration from China.⁴ If agricultural technology remained constant, then the growth rate of the cultivated land area being smaller than population growth implied that per capita output was decreasing. It has been argued, however, that there was improvement in agricultural technology.⁵

During the Ch'ing era, the government did not actively involved in economic development. For example, almost all the irrigation systems were constructed, maintained and managed by the private sector. This is in contrast to the Korean case. After 1895, the Japanese colonial government, however, regarded irrigation system as an important public affair, and heavily financed the constructions of many irrigation systems. The biggest project was the Chia-Nan Reservoir system constructed during 1920s and early 1930s. The system greatly increased the agricultural productivity in the irrigation area.

In early 1860s, Keelung in the north of Taiwan and Kaoshiung in the south were opened for international trade. Again, for the first time since the late 17th century, Taiwan's products entered international markets, and foreign trade brought opportunity for growth. Toward the end of the Ch'ing rule, the most valuable export was

⁴Using the data compiled by Maddison (1998), p. 158, China's average population growth rate in 1820–1913 was 0.15%.

⁵See, for example, Myers (1972). Wang (1994, p. 119) argued, however, that the agricultural development during the Ch'ing era was mainly in the increase in the cultivated land area.

tea, followed by sugar. Tea was grown in the mountain of northern Taiwan, while sugarcane was planted in the plains of the south. Taiwan exported 82 tons of tea in 1865. Thirty years later, tea export had increased to 8,210 tons in 1894. In contrast, sugar export was 35,847 tons in 1879, and 44,134 tons in 1894. Tea was sold at a higher price than sugar. The flourishing of the tea industry attracted labor and capital from outside Taiwan. Before Taiwan was opened for trade, most of the land in the north was used to grow rice, which used to be an important export to China. After the boom in the tea industry, some lands was switched to growing tea, and northern Taiwan sometimes had to import rice instead.⁶

It has been argued that open to foreign trade might have enhanced Taiwan's economic development, but the evidence is hard to find. In 1887, recognizing its strategic position, Taiwan was declared by the Ch'ing government as an independent province. The first governor, Liu Ming-chuan, had actively pursued a self-strengthening program. Among the reform efforts, a railway was constructed in northern Taiwan. But in general, the economic effects of the self-strengthening program were limited.⁷

2 Income and Distribution

2.1 Change in GDP Level and Growth Rate

There have been several estimates on Taiwan's national income during the colonial period. Among them, Wu (1991) covers the period of 1910–50. Unfortunately, the method used in the estimation of real GDP has some problems. The data used in this study are compiled from a new GDP estimate for 1937–50, and an indirect GDP index for 1903–36, which is based on revised estimates on agricultural production and the value-added of sugar industry.

Figure 1 compares per capita GDP of Taiwan, China, and Japan. In 1905–40, average growth rate of per capita GDP was 1.89% for Taiwan, and 2.07% for Japan. Maddison (2001) compiles world's long-term GDP estimates, from which growth rate for 1913–50 can be calculated. For the 1913–50 period, growth of per capita GDP was 0.91% for the whole world, and 1.55% for the Western Offshoots (Maddison,

⁶See Wang (1994), pp. 115–6. See also the discussion in Gardella (1994), p. 75.

⁷See Davidson (1903). pp. 170–256, for a description on Taiwan in late Ch'ing.

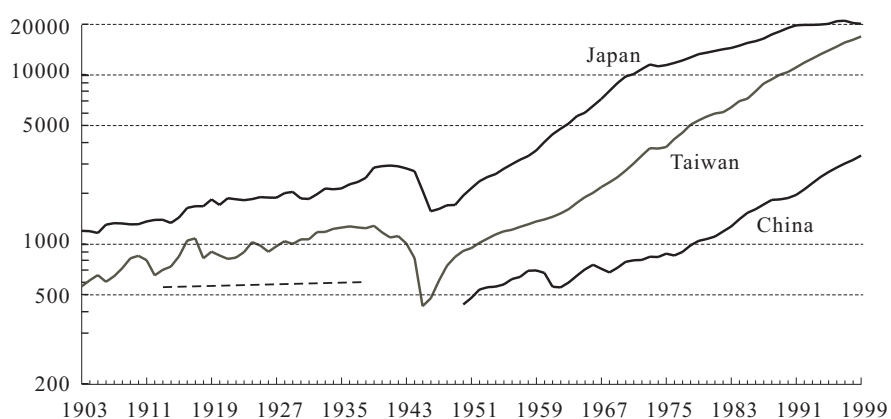


Figure 1: Per Capita GDP of Taiwan, China, and Japan

Source: Japan, from Maddison (2001) and GGDC data set: <http://www.eco.rug.nl/ggdc/homeggdc.html>. China, 1950–98, GGDC data set; before 1950, the estimates of 1913, 1933, and 1938 are from Maddison (1998). Taiwan: First use GGDC data for 1951–99, the series is then linked to the estimate of Kuo et al. (1997) for 1937–50. In order to link to the 1903–36 period, we use an indirect GDP index by summing up the agricultural output in Wu (2001) and the value-added of sugar in Koo and Wu (2001). We then divide GDP by population to get the per capita GDP.

2001, p. 126). The period covers World War II, during which national income of many countries, including Taiwan, China, and Japan, were severely affected by war. Taiwan's average growth rate for 1913–50 was 1.41%. The data suggests that Taiwan's economic growth during the Japanese colonial period was quite robust comparing with the rest of the world.

Table 1 shows per capita GDP of Taiwan, China, and Japan for some years. According to this estimate, Taiwan's per capita GDP in 1903 was 560 dollars (in 1990 U.S. dollars), slightly lower higher than China's 547 dollars. To have a better understanding of Taiwan's economic growth during the Japanese colonial era, we need to know the economic performance during the Ch'ing rule. Unfortunately, given the data available, a direct estimate of Taiwan's national income level or growth rate during the Ch'ing dynasty is impossible. Nevertheless, an indirect estimate can be made following the ingenious method of Pritchett (1997).

Pritchett argues that the minimal subsistence level in any society is about 250 dollars in the unit of 1985 U.S. currency. This is equivalent to 297 dollars in 1990 U.S. dollars. In the beginning of the Ch'ing rule, Taiwan's population was small, and

Table 1: Per Capita GDP

	1890	1903	1913	1933	1938
Taiwan	–	560	701	1175	1236
China	540	547	552	578	589
Japan	1012	1193	1385	2122	2449

Unit: 1990 U.S. dollars.

Source: See Figure 1.

so was the cultivated land. If we assume that in 1683 per capita GDP was 350 dollars, then with the per capita GDP in 1903 estimated to be 560 dollars, average growth rate was 0.21%. If per capita GDP in 1683 was assumed to be higher than 350 dollars, growth rate would be lower than 0.21%. Both of the numbers are much lower than the growth rate during the Japanese period.

Alternatively, it might be that before Taiwan was open to foreign trade in early 1860s, growth rate was near zero. And from 1860 to 1903, per capita GDP grew from 350 to 560 dollars. As discussed above, given what was known about the economic situation during the time, this seemed to be unlikely. However, even though this was what had happened, per capita GDP growth rate in late Ch'ing would be 1.1%, still much lower than the growth rate in 1905–40. The above analysis suggests that the Japanese administration had transformed a traditional stagnant economy into a growing economy. And this was accomplished within a relatively short period of time.

2.2 Life Expectancy

It is recognized that due to data problem, Taiwan's national income estimate in the early 20th century might be subject to large errors. So it is better to double-check the reliability of the national income estimate with other statistics. As a supplement to the national income estimate, we can look at life expectancy and body height data. Table 2 compares life expectancy at birth of Taiwan, Japan, and China. Taiwanese life expectancy was 27.7 years for male in 1906. It increased to 34.5 years in 1921, 38.8 years in 1926–30, and 41.1 years in 1936–40.⁸ In contrast, Chinese life expectancy for male in rural area was only 24.6 years in 1929–31. Japanese life expectancy has

⁸For a survey of Taiwan's demographic changes during the colonial period, see Chen (1979).

Table 2: Life Expectancy At Birth

	sex	1906	1921	1926–30	1936–40	1956
Taiwan	male	27.7	34.5	38.8	41.1	60.2
	female	29.0	38.6	43.1	45.7	64.2
China	male	–	–	24.6*	–	46.1
	female	–	–	23.7*	–	48.1
Japan**	male	–	42.1	44.8	46.9	62.8
	female	–	43.2	46.5	49.6	66.8

Note: * These figures are constructed from a survey in agricultural vil-
lages during 1929–31. ** For Japan, figures of 1921 were constructed
from 1920–25 statistics; 1926–30 from 1925–30 statistics; 1936–40
from 1935–36 statistics; 1956 from 1954–55 statistics.

Sources: Taiwan: Barclay (1954, p. 154) and Chen (1979), p. 165;
China: Banister (1987, pp. 6, 116); Japan: Taeuber (1958, p. 288).

already exceeded 40 years in 1919.

According to Maddison (2001, pp. 29–31), the lowest life expectancy at birth on record was 24.0 in Roman Egypt, during 33–258. Life expectancy was 24.3 years in England, 1301–1425, and 24.8 years in France, 1740–49. These statistics suggest that the lowest life expectancy in any society was about 24 years. We thus conjecture that Taiwan’s life expectancy during the Ch’ing rule was about 25 years. And with the Japanese administration, life expectancy began to increase. Together with the increase in life expectancy, mortality rate steadily declined during the Japanese period. In 1906, Taiwanese mortality rate was 3.47%. It decreased to 33.3% in 1920, 25.2% in 1925, 19.9% in 1930, and 20.4% in 1940.⁹

Finally, a recent study on Taiwanese body height also indicated that an economic structure change had occurred when Japan began to rule in Taiwan. Olds (2000) shows that Taiwanese body height born after 1895 was significantly higher than those born in late Ch’ing. More explicitly, “the average male born between 1908 and 1910 grew to be 2.62 centimeters taller than the average male born in the period 1887–1889.” The same phenomenon had occurred to female. Both the life expectancy data and the study on body height are consistent with the national income statistics.

⁹See Chen (1979), p. 155.

2.3 Income Distribution

The discussion so far is on per capita GDP and growth. Another question receiving great attention is the income distribution between Taiwanese and Japanese during the Japanese era. It has been shown above that Taiwan's per capita GDP growth rate was significantly higher since 1895. This does not necessarily imply, however, that per capita income of the Taiwanese obtained the same high growth rate. Some previous studies, such as Ho (1978, 1984), had argued that the Taiwanese people did not benefit much from the economic development, especially before the end of 1920s. We need to know income distribution between Japanese and Taiwanese to answer the question.

Some studies had tried to estimate Taiwanese per capita real consumption, real wage, and food availability in calories during the colonial period.¹⁰ There are some difficulties with these approaches. One difficulty, for example, is that the nominal wage sample data usually are not comprehensive enough to generate a good statistics to represent the whole labor force. Nevertheless, it is still possible to construct time series statistics of real wage for Taiwanese workers. During the colonial period, more than half of the whole Taiwanese population were in agricultural sector. The labor market in a traditional agricultural economy is quite different from that of a modern society, and so it is not clear if change of real wage in some sectors is a useful indication of welfare change for the Taiwanese as a whole.¹¹

Another approach to study the change of Taiwanese per capita income is to directly compute income distribution between Taiwanese and Japanese. There are at least two works on this problem, and their conclusions are briefly discussed below.

Income Distribution of 1930 and 1940

Kimura (1989, 1997) directly estimated income distribution between Taiwanese and Japanese in 1930 and 1940. The estimation was done on agriculture, manufacturing, and service sectors, and in each sector, incomes of Taiwanese, Japanese, foreigner, and government are computed. According to his estimation, Taiwanese share of national income was 70.8% in 1930. The share slightly increased to 71.9% in 1940.

¹⁰See the survey by Ho (1984) and Chang and Yeh (2001).

¹¹See Wu (2000) for a discussion on the related issues.

Table 3: Taiwanese Share in National Income

	1912	1916	1917	1918	1919	1929	1938	1939	1940	1941
%	69.6	60.8	62.4	66.7	69.2	69.9	65.9	65.6	64.5	65.0

Sources: Yen (1997), p. 42. The original paper construct two series, reflecting two assumptions about labor share in national income. This table shows only the series that are closer to the estimates by Kimura (1997).

Time Series of Income Distribution

Yen (1997) was another study on income distribution during the colonial period. She compiled four sets of data during different years that gave information on ownership of capital. She also compiled the data that show percentage of Taiwanese and Japanese labor during the colonial period. By assuming that capital and labor share were some constants, it is then straightforward to compute Taiwanese share in national income for each year when data of ownership of capital are available. Her estimates covered 10 years from 1912 to 1941, and the results are shown in Table 3.

One difficulty with Yen's study is that it is impossible to check the consistency of the four data sets used in her estimation. It turns out, however, that her results are close to Kimura (1997). For example, Taiwanese share in national income in 1929 was 69.9% according to Yen's study, while Kimura's estimate of 1930 was 70.8%. Yen's estimate for 1940 was 64.5%, which was somewhat lower than 71.9% as estimated by Kimura.

As shown in Table 1, Taiwan's per capita GDP in 1938 was 1,236 dollars. In the same year, the percentage of Taiwanese in total population was 93.8%. Using Kimura's estimate of income distribution in 1940, Taiwanese per capita income was 1011.8 dollars in 1938, which was 172% of China's per capita GDP. This ratio shows clearly the importance of economic growth. It is reasonable to assume that in 1895, Taiwan's per capita GDP would be the almost the same as China's average. If Taiwan did not become a colony of Japan, and continued to be a province of China, its per capita GDP in 1938 might not be too different from 589 dollars. Instead, the successful development efforts of the Japanese had transformed the economy, and significantly increased the welfare of Taiwanese.

3 Colonial Policies

The previous two sections show the economic changes in Taiwan during the Japanese period. Ten years before the Japanese started to rule Taiwan, Governor Liu Mingchuan had tried to modernize Taiwan's economy, when he was designated as the first Governor of Taiwan province in 1885. Some of his policies were similar to those later implemented by the Japanese colonial government.¹² Unfortunately, many of the policies failed to produce effects on the economy. It would be illuminating to compare the self-strengthening program in late Ch'ing with the Japanese development policies. If we can understand how the Japanese succeeded and why the Ch'ing government failed, we would have a better understanding of the mechanism of economic development.

Bauer and Yamey (1957) and Bauer (1971) argued that the key to development is not government plans, but to let market forces to work. As long as a favorable environment was created for market forces to work, opportunities for profit would induce private sector to work hard, and economy will develop. This does not mean, however, that government should do nothing. On the contrary, whether development will succeed depends crucially on if government has done its job right. Specifically, the government should maintain law and order, protect private property, enforce contracts, organize basic transport and health services, and introduce modern financial and legal institutions (Bauer, 1971, p. 149). In this section, a preliminary comparison of the self-strengthening program of late Ch'ing and the development efforts of the Japanese colonial government suggests that Taiwan's development experience is consistent with the above argument.

3.1 Law, Order, and Property Right

During the Ch'ing rule, Taiwan was notorious for the frequency of uprisings, some of them lasted for years. There were also frequent conflicts between the aborigines living in the mountain area and the residents in the plains. The maintenance of law and order did not seem to improve much during and after the self-strengthening program in late Ch'ing. For example, in 1888 a severe rebellion had erupted in central

¹²For a discussion on the policies and efforts of Liu Ming-ch'uan, see Speidel (1976) and Chu (1963).

Taiwan, when Governor Liu Ming-ch'uan was engaged in land reform.¹³ When the Japanese landed Taiwan in 1895, they did not expect that in the following years, they would have faced so much strong resistance from local people. The Japanese colonial government was able to maintain law and order for the most part of Taiwan only in early 1900s.¹⁴

During Ch'ing rule, most of the land was owned by two owners, an absentee landlord and a resident landowner. The absentee landlord was responsible for paying the land tax, and received rent from the resident landowner, and the latter owned the right to sell or rent the land.¹⁵ It is well-known that a large portion of the cultivated land was not registered, and no tax was paid for the land. Government officials were aware of the fact, but preferred not to do anything on it. During the land reform in 1898–1904, all lands were registered, the absentee landlords were obliged to exchange their rights for interest-bearing bonds, and the resident landowners were guaranteed title to their property.¹⁶ The land reform clarified property rights, enhanced government tax revenues, and made it easier for Japanese firms to purchase large amount of lands in Taiwan.

Governor Liu Ming-ch'uan also attempted a land reform in 1886. The reform can be regarded as successful in that land tax revenue was increased tremendously. However, although the land owners in northern Taiwan cooperated with the land reform, the story was quite different in central and southern Taiwan where Liu had less power. And it resulted in a uprising in central Taiwan in 1888.¹⁷ From the land area statistics compiled later by the Japanese government, it is also clear that land measurement and recording in Liu's land reform were incomplete.

¹³See also Davidson (1903, pp. 245–46) for a description about how Governor Liu Ming-chuan avoided visiting southern area of Taiwan due to the hostility arising from a tax increase. Davidson also documented the horrible events how shipwrecks near the coast of Taiwan would be cruelly plundered by local people.

¹⁴In 1901, when Taiwan Sugar Company built its first sugar plant in Kaoshiung, the plant was attacked by local bandits. The sugar plant later had to be protected by resident policemen for some time.

¹⁵A land reform at the end of the Ch'ing rule made resident landowner to be responsible for tax payment. See *Taiwan Private Law* (1993), vol. 1, p. 179.

¹⁶In 1895, the official registered land area was 361,417 chias. After the Japanese finished a extensive land survey in 1903, the land area increased to 534,157 chias.

¹⁷See Speidel (1976), p. 454, for a brief discussion.

3.2 Government Investment

Before 1895, the island of Taiwan contained numerous isolated towns and villages with almost no communication. These towns maintained closer trade ties with mainland Chinese cities across the Strait than they did with each other. When rice was harvested, hundreds of coolie were hired to transport bags of rice with their shoulders and backs to the nearby market.¹⁸ Sugar transportation faced a similar difficulty. To reduce transportation cost, most of the sugar factories were located on a riverside.

Upon arriving in Taiwan, the Japanese military at once set to road building. Taiwan's first railway connecting Keelung and Hsinchu was built by the Ch'ing government and completed in 1893. It turned out to be unusable, however, and was completely rebuilt by the Japanese. The big project of constructing the railway connecting Keelung and Kaoshiung, sponsored by the colonial government, began in 1899 and was completed in 1907. Upon the completion of the railway, the transportation system on the western coast changed immediately. Export products were first transported to either Keelung or Kaoshiung by railway, and then shipped by big steam ships. The railway system was later extended to a round-the-island network.

Before 1895, different villages might use different measurement systems and metal currencies. The Japanese government unified the measure system, and established the Bank of Taiwan in 1899, which started issuing paper money, and also provided funds for private and public investments.

Mizoguchi and Yūzō (1984) compared Taiwan and Korea's capital formation during the colonial period, and found that Taiwan's investment to GNE ratio was significantly higher than Korea. Figure 2 shows Taiwan's investment to GNE ratio and government investment share in total investment. In early colonial period, total investment to GNE ratio was low, but the government investment share in total investment was very high.¹⁹ This was the period when the colonial government was actively engaged in infrastructure construction. In the 1910s, government investment share in total investment declined, while total investment to GNE ratio gradually picked up. This means that investment growth was higher than GNE growth, and private

¹⁸See *Economic Survey Reports (1905)* (1905), vol. 1, p. 33–34.

¹⁹Before 1903, the ratio was above 90%. We suspect that such an unimaginable figure was due to the fact that the earlier statistics was not able to correctly compute all the private investment.

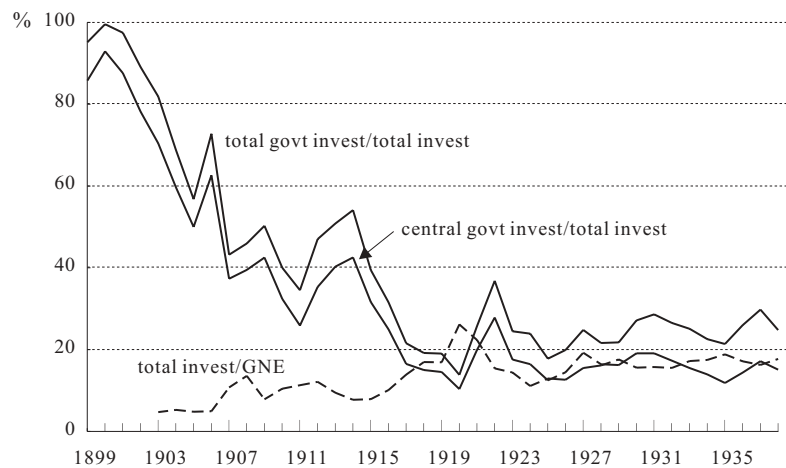


Figure 2: Government Investment Share in Total Investment

Source: Mizoguchi and Umemura (1988).

investment share was increasing. Figure 2 suggests that government investment in infrastructure during the earlier colonial period has been successful in boosting up private investment later.

The construction of big infrastructure projects required a lot of funds. Before 1904, the colonial government expenditures was heavily financed by direct budget transfer from Japan's central government. Direct budget transfer was terminated in 1904, but the colonial government continued to receive financial support up to early 1910s through the so-called "sugar consumption tax" transfer. The tax was supposed to be collected by the central government, but was instead collected by the colonial government. Without financial support from the central government, the colonial government could also resort to debt financing for the infrastructure project.

As shown in Figure 3, however, until the end of 1900s domestic saving was lower than domestic investment. This implied that if the government wanted to proceed with the investment project, it had to borrow from outside Taiwan. For the colonial government, this posed little difficulty because it could borrow in Japan's financial market. And in fact, the colonial government did issue short-term and long-term public debt to finance various projects.

In contrast, Governor Liu Ming-chuan faced a much more difficult situation. Although the Ch'ing empire gave extra fund to support Taiwan's self-strengthening

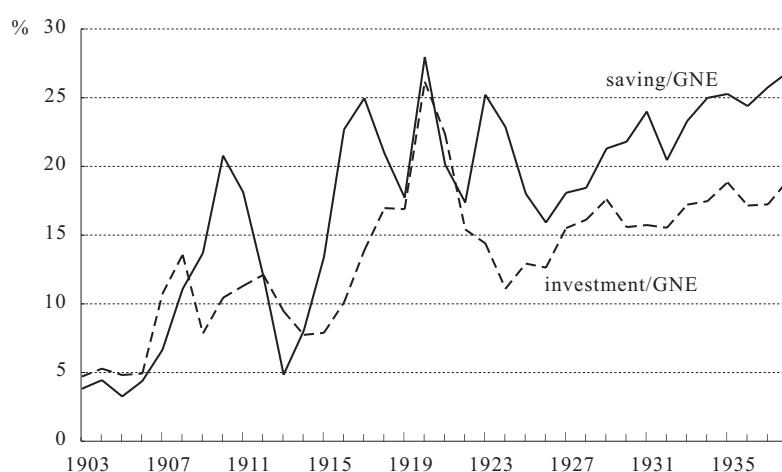


Figure 3: Saving and Investment to GNE ratio

Note: national saving was computed by summing up gross investment and current account balance.

Source: current account balance, Yamamoto (1992); investment GNE, Mizoguchi and Umemura (1988).

program, it was not enough to cover all the expenditures. During the Japanese period, the colonial government could easily borrow in Japan's financial market. But it is doubtful that during late Ch'ing period, Taiwan was able to borrow from the China's financial market or even the international financial market, and we did not find such a record. Facing the budget constraint, Governor Liu introduced a new tax on sugar export, and received strong resistance especially in southern Taiwan.²⁰

3.3 Rice and Sugar

Toward the end of Ch'ing rule, tea was the most important export from Taiwan. In the 1900s, several big sugar companies were established in Taiwan, and the value of sugar production quickly exceeded that of tea. In the mid-1920s, a new breed of rice, called Ponlai, was developed. From then on, Ponlai rice and sugar were the two primary exports.

The colonial government played an important role in the raising of Taiwan's agriculture productivity. For example, chemical fertilizer was introduced to sugarcane farmers in 1903 by a government institution, which also provided financial support. Both quality improvement of the traditional rice breed and the development

²⁰See Davidson (1903), p. 245.

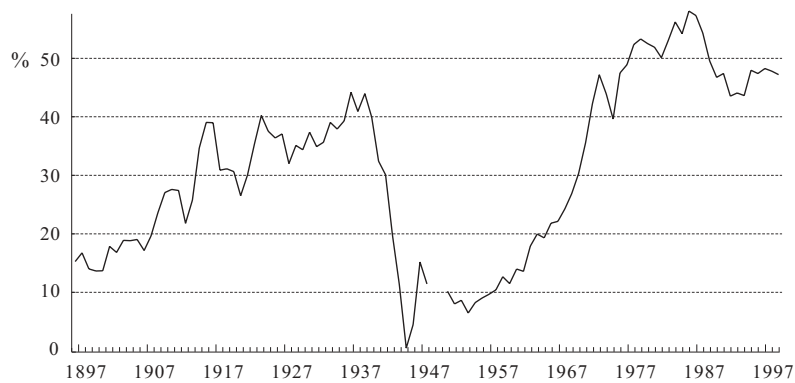


Figure 4: Commodity export to GDP Ratio

Note: 1897–1948, export from *Taiwan Trade Statistics for the Last Fifty Three Years* (1950). 1903–36, GDP from GNE estimate in Mizoguchi and Umemura (1988); 1937–50, GDP from Kuo et al. (1997), For 1897–1902, GDP was estimated indirectly by assuming that annual nominal GDP growth rate was 4.0%. After World War II, GDP estimate from official national income statistics.

of the new Ponlai rice breed were conducted by government research institutes. The Japanese organized farmers' associations as an extension of colonial administration, and to disseminate knowledge of improved farming methods.

The colonial government also sponsored irrigation projects. The most prominent project was the Chia-nan irrigation system, located in Tainan. The project was sponsored mainly by the government, and constructed in the 1920s. Before the project, paddy land area consisted of 35% of total cultivated land in Tainan. After the project was completed, the ratio increased to 70% in 1937.²¹ The productivity of paddy land was much higher than dry land, and the irrigation project greatly enhanced agricultural production.

After 1895, Taiwan was an integral part of the Japanese empire, and most of its exports were sold to Japan. As shown in Figure 4, the ratio of commodity exports to GDP was about 15% in 1900, and it steadily increased to over 40% in 1940. During World War II, the ratio declined to almost nothing, but rose again in the early 1950s.

²¹In 1920–40, Taiwan's paddy land area increased by 167,482 chias, in which the increment in Tainan area was 109,507 chias, or 65.4% of the total increase.

4 Post-colonial Development

At the end of the World War II, Taiwan was transferred to China. The Nationalist government decided that all the Japanese were required to leave Taiwan, and confiscated all the Japanese properties left behind. From 1945 to 1949, Taiwan's wholesale price index rose by more than ten thousand times. Like any historical hyperinflation, inflation was caused by unlimited money supply increase, and the money supply increase was in turn due to the heavy economic control policy adopted by the Nationalist government.

4.1 U.S. Aid to Taiwan

The Nationalist government retreated to Taipei in December 1949, and the tension across the Taiwan Strait reached a new height. In 1950, 90 percent of the central government budget was defense spending. The fate of Taiwan was permanently changed when the Korean War broke out on June 25, 1950. The U.S. government immediately decided to give economic and military aid to Taiwan.

The Nationalist government carried out a land reform in 1949–53. The first step was to reduce all farm rent from an average of about 50% to a maximum of 37.5% of the normal harvest value. In 1953, it was decreed that private owners had to sell all of their lands over 3 hectares to the government. The lands were then sold to its tenants. Government officials claimed that land reform had raised agricultural productivity, but researchers have not found conclusive evidence. It is clear, however, that the reform induced wealth redistribution because land owners were forced to sell their lands at a price below the market level. Tenants undoubtedly were benefited from the reform.

In 1951–65, U.S. economic aid to Taiwan totaled US\$1.465 billion dollars. To the U.S. government, the purpose of giving out foreign aid was for domestic security. Hence in the beginning, the U.S. aid to Taiwan was designed to stabilize the economy and to support U.S. security.²² In the second half of the 1950s, however, the focus of the aid program gradually changed to economic development. During the 1950s, the industrial sector was dominated by public enterprises taken over from Japanese

²²See the discussion in Jacoby (1966), p. 31.

Table 4: Components of GDP

	1951	1971	1981	1990	2000
Agriculture	32.3%	13.1%	7.3%	4.2%	2.1%
Industry	21.3%	38.9%	45.5%	41.2%	32.4%
Service	46.4%	48.0%	47.2%	54.6%	65.5%

companies, and the Nationalist government emphasized regulation and control in its economic policy. The final phase of the aid program specifically encouraged the development of private enterprises and promoted the notion of the market mechanism. This had helped to change Taiwan into a more market-oriented economy.²³

4.2 Fast Growth

In 1960–99, Taiwan’s average per capita real GDP growth was 6.19%, which is the second highest in a data set with 53 countries.²⁴ The average growth rate for the 53 countries was 2.04%. In other words, Taiwan’s per capita real GDP rose by 10 times from 1960 to 1999. Fast growth is accompanied by dramatic change in industrial structures. As shown in Table 4, The ratio of value-added of Agriculture to GDP declined from 32.3% in 1951 to 2.1% in 2000. The ratio of Industry increased from 21.3% in 1951, to 45.5% in 1981, and then decreased to 32.4% in 2000.

It has been argued that the GDP growth during the post-War period was due to quick accumulation of fixed capital and a quick increase in labor input.²⁵ An important contribution to labor input increase was that more women entered the labor market. The female labor participation rate was 35.4% in 1971, and in the year 2000 it rose to 46.0%. With the increase in labor and capital inputs found to be the reason for high economic growth, the next question is why labor and capital inputs increased at such a high rate? Several arguments have been proposed.²⁶ Many people emphasize that export-orientation and human capital accumulation are important. Some have argued that the government plays a critical role, and industrial policies have been ef-

²³See Jacoby (1966), p. 34, 129–49.

²⁴The highest is South Korea. The data include almost all the countries that GDP estimates are available during the period. Data source are Penn World Table 5.6., from <http://www.worldbank.org/research/growth>.

²⁵See, e.g., Young (1994).

²⁶Kuznets (1979) tries to explain why the growth rate was high in the 1950s.

fective. On the other hand, there are arguments that the high growth rate is due not to government intervention, but to the market-oriented, competitive environment. To most economists, the growth miracle remains an puzzle.

Taiwan's per capita GDP was about 15% of the U.S. in 1905. The ratio tumbled during World War II, and the immigration of about one million people from the mainland in 1949 also lowered the ratio. The per capita GDP ratio to the U.S. was 12.7% in 1960. But due to the high growth rate, it rose to 60% in 1999. Economic growth brings welfare improvement. A useful indicator is longer life expectancy. From Table 2 above, life expectancy for males in 1956 was 60.2 years, and for female, 64.2 years . In 1999, this has been extended to 72.6 years and 78.3 years, respectively.

5 Pre-colonial Stagnation of Korea

The four sections above discuss Taiwan's development under the Japanese colonial government. We now turn our attention to the development of Korea. We begin by presenting evidence showing long term deterioration in living standards before 1900. Shocks are then identified to account for the subsequent recovery.

Plotting real wages and rents observed in different rural areas over different periods, one is conveyed the impression that factor incomes fell as a matter of trend during the eighteenth and nineteenth centuries (Figures 5 and 6). This may be illusory, rather than real, given the limited number of time series data available and the low level of factor market integration, which implies factor prices were to a significant extent affected by regional shocks.

Additional evidence exists to confirm real wages and rents did fall over the two centuries however. Real paddy field price (nominal paddy field price divided by rice price) fell during the eighteenth (Figure 7). Real slave price (nominal slave price deflated by rice price) fell until the early nineteenth century, when the dynastic government emancipated public slaves, dealing a major blow to slavery and shooting up slave prices. From the raised level, slave prices resumed to fall during the rest of the nineteenth century (Figure 8).

The simultaneous decline in the two key factor prices in traditional Korea indicates falling marginal productivity of land and labor, which in turn implies declining

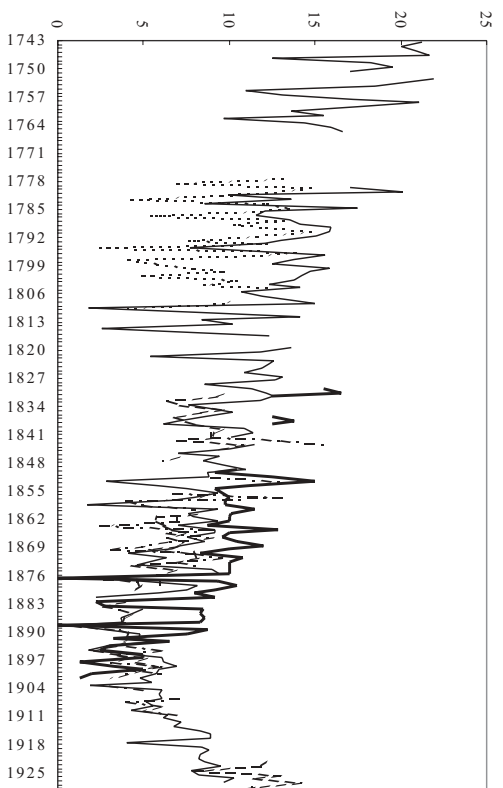


Figure 5: Sharecropping Rents from Rice Paddy, 1743–1938 (du per durak)

Source: Rhee et al. (2001).

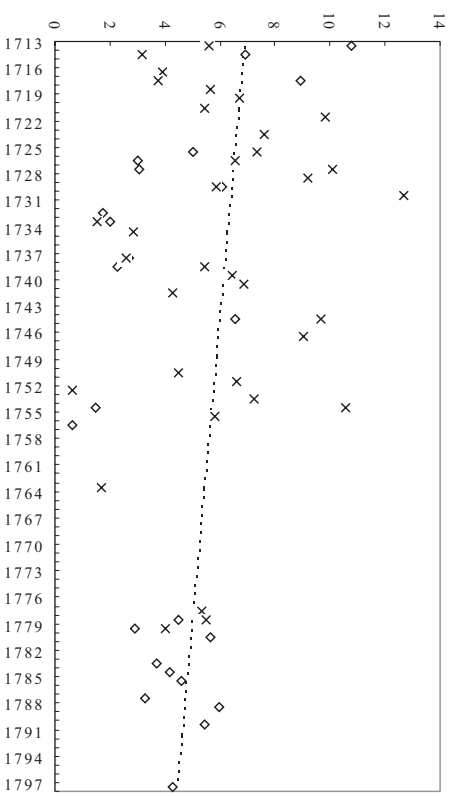


Figure 6: Rice Paddy Field Prices in terms of the Amount of Rice

Source: Kim and Lee (1999), Chun (1999).

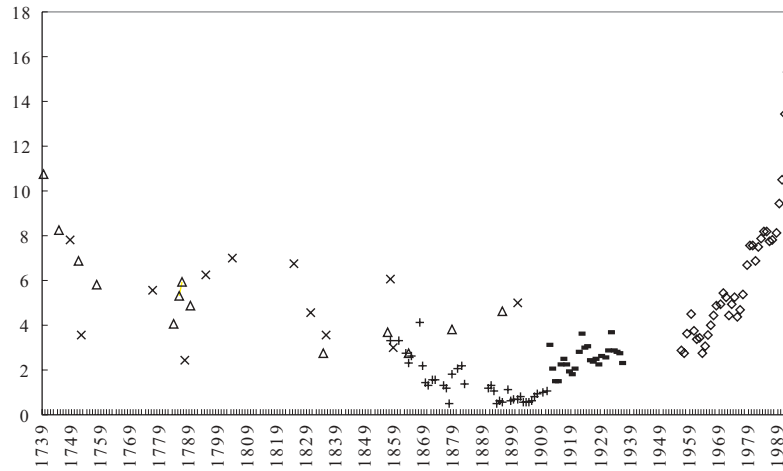


Figure 7: Rice Wages in Korea (toe per day)

Source: 1) two different eighteenth and nineteenth century rice wage series for construction worker calculated using data from Yoon (1998);
 2) rice wages paid by a landholding family in southeastern Korea from 1853 to 1910 compiled by Lee (2001);
 3) rice wages calculated using nominal agricultural wage data compiled by Odaka (1988);
 4) post-WWII South Korean wage series was obtained from Hwang (1996).

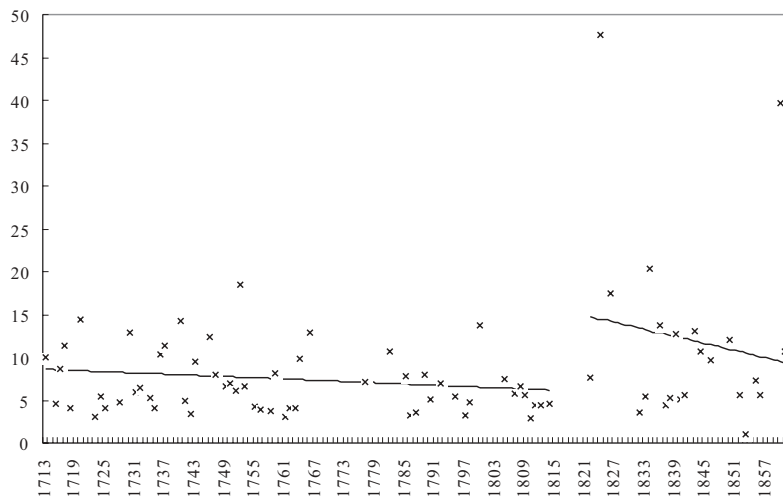


Figure 8: Slave Prices in Terms of the Amount of Rice

Sources: Chung (1983).

level of total factor productivity. Three pieces of evidence point to rice growing sector as the origin of the productivity regress. Production was being diversified out of rice towards dry farming and non-agricultural activities. Second, rice prices rose relatively to dry farm product prices. Finally, dry farm prices in terms of amount rice remained stable over the two centuries.

Rice farming productivity fell, because irrigation system decayed. The number of working reservoirs suffered sustained decrease, because reservoirs were often left unrepaired after flood damages. In the early dynastic period, the required repair work used to be carried out by corvee mobilized through bureaucratic system of control, which virtually collapsed in the wake of the seventeenth century wars with Japan and China. Not only was the pre-1600 regime never fully restored, but also the central control was further undermined during the nineteenth century, when several powerful landowning families took turns to control monarchs for private interests.

6 Transition to Modern Economic Growth

Wages and rents started to rebound from around 1900 (Figures 5 and 6), as new types of rice seed varieties and farming technology were brought into Korea by immigrants from Japan. The number of Japanese immigrants surged, as Japan defeated China and Russia in the scramble for Korea in 1894 and 1905, respectively, and finally annexed Korea as a part of its empire. The upturn in living standards was sustained and accelerated by the Rice Production Development Program (1920–33), launched by the colonial government in response to the Rice Riot of 1918. The most important contribution of the Program was to expand irrigation, which was supplemented by further diffusion of new rice seed varieties and increased use of chemical fertilizer. Rents rose far more rapidly than wages in colonial Korea, as labor supply expanded quickly with falling mortality causing population explosion. Mortality declined, because the colonial government promoted health campaign and introduced modern medical technology. While population grew rapidly in colonial Korea, per capita output rose, with income distribution becoming increasingly unequal. Modern economic growth was in progress in colonial Korea.

The Rice Program was only a part of broader scheme of developmental policy

Table 5: Growth Accounting for Colonial Korea, 1918/20–35/7

	growth rates	factor shares	contribution to growth
output	2.8%		
labor	1.4%	0.63	$1.4\% * 0.63 = 0.88\%$
capital	4.8%	0.31	$4.8\% * 0.31 = 1.49\%$
land	0.2%	0.06	$0.2\% * 0.06 = 0.01\%$
TFP			$2.8\% - 0.88\% - 1.49\% - 0.01\% = 0.42\%$

Notes: growth rates were calculated using three year averages.

Source: Mizoguchi and Umemura (1988). Mizoguchi's capital stock series was corrected for geographical undercoverage.

supporting the modern economic growth. The cadastral survey of the 1910s modernized system of land property rights in Korea. An extensive network of transportation and communication was built, leading to rapid integration of regional market for commodities and productive factors. Modern schools were built to replace traditional schools teaching Chinese classics. These projects caused expansion of public spending, which were financed partly by raising tax rates, but more importantly by transfer from the Japanese government. One remaining element of the colonial growth was the industrialization during the 1930s, which was partly spillover from Japan's early and vigorous recovery from the Great Depression and partly promoted as preparation for invasion into China.

Growth accounting results indicate the colonial growth was driven mainly by capital accumulation. Table 5 shows that around 85% of the colonial growth was due to increased use of labor and capital, and capital accumulation contributed to the colonial growth more than three times as much as productivity advance. Sectoral growth accounting assigns an even greater role for capital accumulation. Ban (1979, pp. 101–3) shows that total factor productivity in agriculture declined 0.7% per year from 1920–30 to be followed by a decade of improvement at the annual rate of 0.77%. The consequence was that the level of agricultural productivity on the eve of WWII did not differ significantly from that at the beginning of the Rice Program was launched.

Kang and Ramachandran (1999) found a somewhat larger role for productivity growth in southern Korean agriculture, producing a large majority of the colonial rural output: total factor productivity grew 0.3% per year from 1919–27 (explain-

Table 6: Growth Accounting for Non-agriculture, 1918/20–35/7

	growth rates	factor shares	contribution to growth
output	6.0%		
labor	3.3%	0.55	$3.3\% * 0.55 = 1.8\%$
capital	8.3%	0.45	$8.3\% * 0.45 = 3.7\%$
TFP			$6.0\% - 1.8\% - 3.7\% = 0.5\%$

Notes: growth rates were calculated using three-year averages.

Source: Mizoguchi and Umemura (1988).

ing 23.1% of the agricultural growth) and 0.5% per year from 1928–37 (explaining 11.5% of the agricultural growth). Both calculations however found 1) that increased capital input, chemical fertilizer in particular, the dominant factor accounting for the agricultural growth in colonial Korea, and 2) that productivity advance was faster in the 1930s than in the preceding decade. In non-agriculture, capital accumulation explained 3.7% of the 6.0% annual growth of non-agricultural value added output, which compares with the 0.5% contribution made by productivity advance (Table 6).

The rapid capital accumulation was financed to a great extent by capital imports from Japan. Colonial Korea's trade was predominantly with Japan, and the trade generated substantial amount of current account deficits. Table 7 shows that the current account deficits (foreign savings) accounted for 41% of gross fixed capital formation from 1919–38. Another important feature of the capital formation in interwar Korea was that more than 63% (= 54% + 9%) of the investment was carried out by the colonial government. To build railways, roads, and harbors, the colonial government introduced new taxes and raised existing taxes throughout the colonial period. Had the government not taken an increasing portion of incomes, individuals would have saved larger shares of their incomes. However, given the low level of income in colonial Korea, the hypothetical increase in the private savings ratio is likely to have been modest and substantially smaller than the saving imposed by the colonial government. The forced savings however was not large enough to finance planned investment projects. Thus the colonial government was driven to rely on the unilateral transfer from the Japanese government and to raise debts in the Japanese capital market. The unilateral transfer accounted for 9% of the interwar capital formation

Table 7: Financing the Capital Formation in Korea, 1919–38 (%)

Domestic		Foreign	
Private	Public	Private	Public
5%	54%	32%	9%

Source: Mizoguchi and Umemura (1988).

(22% of capital inflows) from 1919–38. Domestic private savings accounted for only 5% of the capital formation in interwar Korea.

All in all, the transition to modern economic growth in interwar Korea was achieved almost entirely by the colonial government. Not only did it play an important role in raising agricultural productivity by implementing the Rice Development Program, but also it accounted for almost two thirds of capital formation, which was the driving force for non-agricultural output growth.

7 Post-colonial Growth

A series of sizable political shocks buffeted the Korean peninsula in the 1940s and 1950s, which included the Second World War, independence, political division, and the Korean War. But much of the colonial capital stock and technology survived these shocks to become the basis for the post-1960 development in the two Koreas. For instance, Ban’s (1974) estimate indicates that although the Korean War damaged many houses, factories, and social infrastructure, much of the irrigation and other production facilities in the countryside survived the hostilities: the South Korean agricultural capital stock estimated at 1934 prices was 32 million yen in 1938, which fell to 31 million yen in 1954. Agricultural productivity had ups and downs during the turbulent years from the outbreak of WWII and the conclusion of the Korean War, but the level of total factor productivity in 1953 was roughly the same as that in 1938 (Ban, 1979, p. 102).

On the top of capital and technology, South Korea took over the institutions set up by the colonial rulers, which went far to determine the nature and pace of the economic growth in South Korea. South Korea’s system of modern land property right has its origins in the Cadastral Survey carried out during the first decade of the

colonial rule. It was after 1910 that regional commodity and labor markets became integrated, which reduced price and wage differentials to levels roughly equal to those observed in present-day South Korea (Cha, 2000). Japanese rulers allowed or even encouraged Korean entrepreneurship (Eckert (19??) and McNamara (19??)). Park (1999) has found that modern factory labor force has first emerged in colonial Korea.

One particularly important institution South Korea inherited was the developmental state. As was the case with the colonial growth, the South Korean growth was powered mainly by capital accumulation, which was accelerated by public policy (Kim and Lau, 1994; Young, 1994). In both colonial and South Korea, the government could do four things to raise the aggregate savings ratio. First, it could force people to save more by raising tax ratio and then using the increased tax revenue to finance public investment. Cha (1998) has shown that the increasingly heavier taxation had beneficial effect upon growth in colonial growth by promoting capital accumulation. Table 8 shows that during the first decade of the high growth South Korean government accounted for as much as 26% of capital formation out of tax revenue, a ratio only about half of that for the interwar period, but still high compared to other developing countries. Second, the strong state could tap foreign savings by ensuring political stability. Since Korea was forced open to international trade in 1876, capital inflows remained modest to surge in 1905, when the Japanese victory over Russia assure the Japanese supremacy over Korea, removing the political risk Japanese investors could incur by investing in Korea. Similarly, once the military government were recognized as durable and its developmental policies as sustainable, foreign capital flows into South Korea began to rise rapidly (Woo (1991, 84, 100)). Third, the state promoted capital accumulation by securing public transfer. The colonial government, an autonomous entity accountable neither to the cabinet nor to the parliament in Tokyo, lobbied the Japanese government for funds to finance development projects in colonial Korea.

As the aid from the U.S. declined in the early 1960s, the South Korean government normalized diplomatic relations in 1965 with Japan in return for substantial amount of “reparation” payment. The Vietnam War provided an unexpected and precious opportunity for the South Korean government to reverse the declining transfer from

Table 8: Sources of Finance in South Korean Capital Formation, 1962–80 (%)

1962–70		
Private	Public	Foreign
46%	26%	28%
1971–80		
Private	Public	Foreign
66%	15%	19%

Source: Bank of Korea.

the U.S. Finally, the government implemented policy measures to increase private foreign capital inflows. Both in the 1930s and after 1960, the government offered tax and other incentives etc in 1930s to attract foreign direct investment. And the South Korean government accelerated capital inflows by issuing guarantees on foreign debt contracted by private firms. Finally, the government promoted export industries, as booming exports would facilitate foreign borrowing by reducing the chances of defaulting on debts.

8 Concluding Remarks

In the history of world's economic development, some economy develops earlier, some later. Even today, there are countries whose people are living near subsistence level. For most of the countries, the transformation from a stagnant economy into a growing economy is a gradual and long process. In longer period of time many things would change, and this makes it more difficult to identify those elements that are most important for economic development. In this paper, we argue that the economic development of Taiwan and Korea during the early 20th century are special in that its economic transformation were accomplished within a relatively short period of time. The Japanese colonial governments had published extensive statistical data to document the economic development of Taiwan and Korea. All these had made Taiwan and Korea as two valuable cases for understanding the mechanism of economic

development.

In this paper, we use national income and other statistics to document the economic development of Taiwan and Korea. We argue that the Japanese colonial administrations had implemented successful development policies. From various indicators, Taiwan's development during the Japanese era was probably more successful than Korea. In the case of Taiwan, why the Japanese succeeded and Governor Liu Ming-chuan failed? Why Taiwan's development was relatively better than Korea? These are important questions deserving further studies.

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