Historical Overview of Educational and Economic Development in Thailand, Japan, and Korea

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Abstract

This paper compares among Thailand, Japan and Korea in terms of long-term changes in their natural resource endowments, economic and educational development in order to shed light on the process in which differences in natural resource endowments may have resulted in different patterns of economic growth involving different institutional changes. It shows that, although Thailand and Japan have had several factors in common since the middle of the 19th century, Thailand lagged substantially behind Japan in entering the epoch of modern economic growth. Unlike Thailand, Korea suffered from political and economic hardships under Japanese colonialism (1910-1945) and the Korean War (1950-1953), but it has overtaken Thailand in educational and economic development in the past 50 years. The paper hypothesizes that Thailand's slower economic progress has been due to its slower educational development induced by abundant land resource endowments.

1 Introduction

Why Thailand lagged behind Japan in entering the "epoch of modern economic growth" in the definition of Simon Kuznets (1966) in spite of their similar initial conditions in the mid-19th century has been one of major puzzles in the modern history of East Asia[2]. This paper aims to shed light on this question from the aspect of interactions between education and natural resource endowments.

The basic hypothesis proposed in this paper is that Thailand, which was traditionally endowed with abundant natural resources relative to Japan, has felt it less compelling to increase productivities of the resources for surviving in international competition and, hence has had smaller incentives to invest in

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[2] Since the middle of the 19th century, Thailand and Japan have shared some important characteristics: (a) both were opened to trade with western nations at around the same time; Thailand signed the Bowring Treaty with Great Britain in 1855 and Japan signed the first commercial treaty with the United States in 1858, (b) both have adopted the monarchy system, (c) both faced serious threats to their sovereignty from western powers in the 19th century but were able to maintain independence and avoided colonization, and (d) both began to promote modern education in the 1870s (Ingram, 1955; Feeny, 1982, 1998; Dhiravagin, 1981).

education as a key variable for promoting agricultural intensification and industrialization beyond the scope of traditional rice farming. Korea[3], in addition to Japan and Thailand, is included in the comparison as it represents the case characterized by meager natural resource endowments similar to Japan and has achieved better educational and economic development than Thailand after World War II.

The paper tries to provide evidence in support of the above hypothesis by comparing among Thailand, Japan and Korea in terms of their natural resource endowments, educational and economic development using long-term time-series data on macroeconomic statistics such as gross domestic product (GDP) and labor force as well as data on educational investment and the educational stock of Thailand (Douangngeune, 2005), Japan and Korea (Godo and Hayami, 1999; Godo, 2004). The data on natural resource endowments, agricultural productivity growth, and industrialization as well as information on institutional changes collected from historical documents are also used. Econometric test of this hypothesis based on pooled time-series data of the three countries under studies can be found in Douangngeune, Hayami and Godo (2004, 2005). However, due to space limitation, that paper could not provide extensive discussions on institutional changes underlying different educational and economic changes in the three countries. This paper intentionally omits the econometric results in order to give space for more elaborative descriptions of policy changes.

Following this introductory section, Section 2 provides theoretical framework. Sections 3 and 4 compare among the three countries in terms of their natural resource endowments and economic development, respectively. Section 5 provides a brief summary of the process of human capital accumulation in Thailand before comparing them with the cases of Japan and Korea. Section 6 provides some conclusions and policy implication.

2. Theoretical framework

This paper is built upon three premises. The first is the human capital theory, in which emphasizes the importance of education for economic development because it enhances people's ability to receive, decode, and understand information (Schultz, 1961, 1975; Becker, 1962). This information processing ability is important not only for workers to perform a certain task more effectively using a given technology, but also for facilitating development and adoption of new technologies (Nelson and Phelps, 1966; Levine and Kawada, 1980; Easterlin, 1981; Romer, 1990; Abramovitż, 1989; Acemoglu, 1996).

The second hypothesis is the induced innovation hypothesis (Hayami and Ruttan, 1970, 1971; Hayami, 2001a). Educational development is a complicated process with its scale and speed affected by

[3] Korea in this paper refers to the entire Korean peninsula until the end of World War II and the Republic of Korea in the South thereafter.

various factors including social environment and resource endowments. Hayami (2001a) argues that economic development in a particular country is an outcome of the interaction between the cultural-institutional and economic variables of that country. Economic variables consist of production factors such as natural resources, labor and capital, and production technology. The choice of production technology is influenced by factor endowments. According to the induced innovation hypothesis, when natural resources are abundant ready to be exploited by traditional technologies, incentives to invest in education and research for the sake of developing new technologies may be small. This argument supports the hypothesis that abundant natural resource endowments work as a negative incentive on public and private investments in education (Ascher, 1999; Gylfason, 2001; Birdsall, Pinckney and Salot, 2001). Therefore, although educational development is very important for economic growth, countries with different natural resource endowments may have different timings of accelerating investment in education for supporting productivity improvements in agriculture and industry.

Entering international trade at the same time under different endowments of natural resources, Thailand and Japan experienced different patterns of economic growth involving different institutional changes in the late 19th and the early 20th centuries. Throughout those years, rice cultivation based on traditional technologies was the major source of food and income for Thailand (Ingram, 1955; Feeny, 1982) and its educational development objective in the late 19th century was not beyond the purpose of training a limited number of top elite for staffing government offices under the king (Sukorntarangsi, 1967). Mass education had not been promoted until the early 1920s and an overall economic development policy had not been initiated until the early 1960s.

Unlike Thailand, under a strong population pressure on limited land resources, Japan and Korea have had to promote modern economic growth based on productivity improvements in agriculture and industry since the early stage of their modern economic growth. Meiji Japan invested heavily in building modern economic institutions including education and research in support of modern economic growth. It began to promote mass education in the early 1870s.

The third concept is the vent-for-surplus development theory of Hla Myint (1965, 1971). According to this theory, a resource-abundant country's participation in international trade based on the exploitation of natural resources cannot lead to sustainable economic growth unless the incomes thus generated are effectively mobilized for investment in physical and institutional infrastructure including education and research. In fact, such effective use of the incomes generated from the exploitation of natural resources has been identified as the basis for a successful shift in the economic growth momentum in Canada, the United States and Australia from natural resource exploitation to agricultural intensification and industrialization (Innis, 1933; North, 1955; Watkins, 1963).

It should be noted that, Hla Myint developed his theory for explaining the process of exploiting abundant land resources in Southeast Asia for exports under control of the colonial powers without bringing about significant increases in the per-capita incomes of local people. According to him, the colonial powers intentionally suppressed education and training of local people for the sake of maintaining the supply of cheap unskilled labor for mines and plantations run by white settlers.

However, why was independent Thailand not able to utilize opportunities created by international trade to shift itself from resource-based development to modern economic growth based on agricultural intensification and industrialization early enough like the cases of the United States, Canada, and Australia? Different policy choices induced by different value systems may have been an important explanation of the difference between Thailand and the new continental countries. Deprivation of tariff autonomy under the unequal treaty imposed by Britain could have made it difficult for Thailand to protect domestic industries in a way similar to the new continental countries. Other explanations could also be possible. However, detailed investigations of these issues would be outside the scope of this paper.

Nevertheless, the fact that one major difference between Thailand and Japan pertains to different endowments of land resources when they opened to trade with the West. To survive international competition under a severe population pressure on limited land resources, Japan had to invest in education for supporting productivity improvements in agriculture and industry. On the other hand, availability of the abundant land resources that could easily be brought to cultivation with the use of traditional technologies would have made it less compelling for Thailand to invest in education as a support for agricultural intensification and industrialization. The rest of this paper will seek to provide evidence in support of the proposed hypothesis.

3 Natural resource endowments

This paper uses land areas as measures of natural resource endowments considering the importance of land resources in the agricultural sector of the three countries under study. Japan has been subject to strong population pressure on limited land resources even since the middle of the Tokugawa period (Hayami, 2001a). Korea is also well known for its land resource scarcity (Song, 1997). In contrast, Thailand had been endowed with abundant land resources until only two decades ago (Siamwalla, 1991, 1997). To provide a quantitative overview on their relative land resource endowments, Table 1 reports (a) territorial land area per capita, (b) arable land area per capita and (c) rice planting area per agricultural worker of these three countries.

In Section (a), it can be observed that, on average, one Japanese was endowed with roughly 1 hectare of land area within its territory in 1890. The population growth in the subsequent period reduced the per-capita territorial land area in Japan to 0.4 hectare in 1960 and 0.3 hectare in 1995. Korea's per-capita

territorial land area data are reported only for the post-World War II period due to the difficulty in preparing comparable data for the territory of the Republic of Korea before Korea was divided between North and South. In spite of this data limitation, it can be observed that territorial land area per capita in Korea has been very similar to that in Japan. In 1960, territorial land area per capita in Korea was approximately 0.4 hectare, and it declined to about 0.2 hectare in 1995. In contrast, one Thai was endowed with as much as 7 hectares in 1910. Although its rapid population expansion quickly drove down territorial land area per capita, the population density of Thailand reached the 1890 level of Japan only in 1995.

In Section (b), the data on arable land area per capita of Thailand, Japan, and Korea are compared. Arable land area is defined as total cultivated land area under both annual and perennial crops. Thailand's arable land area per capita has been higher than that of Japan and Korea in all the years[4]. In 1920, one Thai had as much as 0.3 hectare whereas one Japanese and one Korean had only about 0.1 hectare. In 1960, one Thai had 0.3 hectare while one Japanese and one Korean had 0.07 and 0.08 hectare, respectively. A striking contrast is that, while the per-capita arable land area in Japan and Korea monotonically declined over time, it increased in Thailand before 1980. It was only from the late 1970s, when the land frontiers for cultivation in Thailand began to be closed (Siamwalla, 1991, 1997) that per-capita arable land area started to decline. The monotonic decline in the per-capita endowment of arable land area in Japan and Korea suggests that their cultivation frontiers had already been closed prior to the beginning of their participation in international trade.

The scarcity of natural resources of Japan and Korea relative to Thailand can also be observed in the data on rice planting area per agricultural worker (rice planting area per worker; where a worker is defined as an economically active person engaged in agriculture), which are reported in Section (c) of Table 1. Throughout the period of 1950-1995, Thailand had the highest rice planting area per worker among the three countries. In the 1950s, Thailand experienced a slower expansion in rice planting area than in the number of agricultural workers. Such a slow expansion of rice planting area was due to its poor infrastructure, particularly road networks and irrigation facilities. From 1960, the Thai government began to invest in building these types of infrastructure, leading to an increase in rice planting area per worker from 1960 to 1980 (Warr, 1993; Siamwalla, 1991, 1997). Korea experienced a monotonic decline in its rice planting area per worker since the early 20th century. Although rice planting area per worker in Japan

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[4] Although the Republic of Korea was established only after the end of the Korean War in 1953, Hwan Ban (1979: 313-335) prepares the data on arable land area including rice planting area, as well as agricultural workers and rice yield in the pre-World War II period for this country by using pre-war Korea's provincial statistics of agriculture. Therefore, pre-war Korea's data on arable land area and rice yield per hectare reported in Tables 4 and 5 pertain to the geographical area of the Republic of Korea in the South.

increased in 1890-1995, its increases were due to decreases in the number of agricultural workers rather than to increases in rice planting area itself (Hayami and Yamada, 1991: 251 and 253).

4. Economic development

Under different land resource endowments, Thailand followed an economic growth path different from Japan and Korea. The difference can be observed in Figure 1 in terms of changes in real GDP per-capita, where GDP is measured in 1990 US dollars in terms of purchasing power parity. The figure is drawn in semi-logarithmic scale so that the slope of each curve represents the growth rate of real GDP per capita in the respective country. Although both Thailand and Japan began trade with the West in the 1850s, by 1890 real GDP per capita in Japan had reached about twice that of Thailand. During 1890-1940, Japan was able to achieve a per-capita real GDP growth of approximately 2.1 percent per year. Meanwhile, Thailand's per-capita real GDP grew at a mere 0.2 percent per year. From 1910 to 1930, Thailand and Korea had very similar per-capita real GDP levels. But, while per-capita real GDP in Thailand declined during 1930-1940, it increased in Korea at approximately 4.9 percent per year.

Corresponding to its different per-capita real GDP growth path from Japan and Korea in the pre-World War II period, Thailand's per-capita real GDP began to rise from a much lower base than that of Japan and Korea in the late 1950s. Japan entered the so-called Japanese economic miracle in the 1950s, which lasted until the 1970s. During 1950-1960 and 1960-1980, per-capita real GDP in Japan grew at 7.5 and 6.3 percent per year, respectively. During 1950-1960, it grew at only 1.2 percent per year in Thailand. From 1960 to 1995, Thailand also experienced a slower growth of per-capita real GDP compared with Korea.

Differences between Thailand, Japan, and Korea in their per-capita real GDP growth paths were reflected in their differences in agricultural intensification and industrialization, which can be observed in Table 2 in terms of changes in average rice yield per hectare planted, the non-agricultural sector's share in GDP, and the industrial products' share in total merchandise exports in these three countries.

Due to its land resource scarcity, after the Meiji Restoration in 1868, which united more than 250 hitherto autonomous fiefs into one nation state under the control of the Emperor, Japan had to invest in agricultural research and land infrastructure such as irrigation and drainage facilities to improve agricultural productivity to meet increasing domestic food demands as well as for exports while trying to promote industrial development under the famous national slogan *fukoku kyohei* (to build a wealthy nation and a strong army). In 1871-1873, the government sent a study team named after Lord Iwakura " the Iwakura mission" to observe economic and political systems in Europe and the United States (Hayami et al., 1980). The mission report pointed, among others, to the importance of the systematic application of science to the problems of agricultural production as the main source of productivity growth in agriculture. Responding to

this report, the government established agricultural education institutions such as colleges and universities for training agricultural specialists, whose scientific knowledge was combined with farmers' practical experiences through agricultural research and extension activities in selecting and promoting the cultivation of high-yielding crop as well as cocoon varieties (Hayami et al., 1980). The development and diffusion of high-yielding rice varieties together with investment in irrigation and drainage facilities resulted in an increase in average rice yield per hectare of cultivated land area from approximately 2.2 tones per hectare in 1890 to 6.3 tones per hectare in 1995 as illustrated in Section (a) of Table 2.

Unlike Japan, Thailand developed no significant research program for increasing rice yield throughout the late 19th and early 20th centuries. The majority of Thai farmers had relied on such traditional rice planting techniques as seed broadcasting which gave lower yields per hectare than transplanting of seedlings until the 1930s (Feeny, 1982). The Chao Phraya river irrigation scheme proposed in 1902 had not been constructed until the late 1950s. Thailand's response to an increasing foreign demand for its rice by opening new land area for cultivation in the Chao Phraya river delta in those years was associated with a gradual decline in average rice yield per hectare, because cultivation frontiers moved to less productive areas. This decline in the average rice yield per hectare must have been an important factor underlying the decline in its per-capita real GDP in the 1930s through the 1950s since rice was the major commodity for Thailand in those years. Thailand has experienced gradual increases in average rice yield per hectare since 1940, but the yield levels in the recent two decades were not significantly higher than those in the 1920s and 1930s. In the 1990s, Thailand's average rice yield per hectare was about the same as that of Japan in the 1890s.

Korea was under colonial control by Japan from 1910 until the end of World War II. Over that period, Japan's aim was to use Korea as a source of food and raw material supply as well as a market for its industrial products. In 1910-1930, average rice yield per hectare in Korea was about comparable to that of independent Thailand. It began to increase rapidly from 1930 because of the change in Japan's colonial policy induced by a rice shortage in mainland Japan. In the 1910s, the increase in rice yield per hectare in Japan became insufficient to meet the expansion in domestic demand for rice corresponding to progress in industrialization, resulting in the so-called "rice riot" in 1918 (Hayami and Ruttan, 1971: 182-214). To overcome this difficulty, Japan attempted to transfer its rice production technology to its colonial territories, Korea and Taiwan. Japan began to invest in research to improve rice varieties and in the construction of irrigation and drainage facilities in Korea under "the Program for Increasing Rice Production", which was launched in 1920. Under this program, major rice yield increases were observed in Korea in the 1930s.

While the rapid rice yield increase in Korea during the 1930s resulted from the agricultural research and land infrastructure development provided by the Japanese colonial government for the sake of its own interest in maintaining a stable supply of rice for the population in mainland Japan, independent Korea after World War II continued to promote agricultural research and expand agricultural extension services,

resulting in sustained improvements in average rice yield per hectare. Such continued efforts can also be explained by Korea's desire to avoid food crisis while trying to industrialize under increasing population pressure on limited land resources. In 1980, Korea's average rice yield per hectare reached the same level as that of Japan. Since then, both Japan and Korea have achieved almost the same rate of growth in average rice yield per hectare.

Japan's agricultural land productivity improvement since the late 19th century has been crucial for its rapid industrial development. Foreign exchange earned from the exports of primary commodities such as silk and tea supported the imports of capital goods and technologies for industrial development in the early period (Hayami et al., 1980). Rice yield increases also supported industrialization by ensuring an adequate food supply at a stable price, which helped to maintain the nominal industrial wage rate at a low level while avoiding a drain of foreign exchange from large-scale food imports. At the time of the Meiji Restoration, the Japanese economy was dominated by the agricultural sector. But, at the turn of the 20th century, Japan was on a solid track to industrialization (Ohkawa and Rosovsky, 1973; Yasuba, 1981). In 1900, the non-agricultural sector accounted for 66 percent of GDP and approximately 57 percent of the total merchandise exports were industrial products (see sections (b) and (c) of Table 2). The non-agricultural sector continued to expand in the subsequent years, and in 1940 it accounted for about 87 percent of GDP. In 1930, industrial products' share in total merchandise exports was approximately 70 percent. Industrialization in Japan continued to progress in the post World War II period, with the non-agricultural sector's share in GDP and industrial products' share in total merchandise exports reaching 98 and 99 percent, respectively, in 1995.

Although Thailand began to trade with Western nations at around the same time as Japan, it remained a predominantly agricultural economy until the 1970s. Unlike Japan, Thailand did not have an industrial development policy until 1960 (Warr, 1993; Muscat, 1994; Siamwalla, 1997). In 1960, the non-agricultural sector's share in GDP was only 64 percent, and industrial products' share in total merchandise exports was merely 11 percent compared with the corresponding figures in Japan of 87 and 92 percent, respectively. The low share of industrial products in total merchandise exports in Thailand indicates that the majority of industrial output was traded in the domestic market. However, in the subsequent decades, these shares increased sharply, making Thailand part of the so-called "East Asian economic miracle" (World Bank, 1993). In 1995, the non-agricultural sector's share in GDP and industrial products' share in total merchandise exports reached 89 and 75 percent, respectively.

Nonetheless, Thailand lagged behind Korea in industrialization in the post-World War II period. In spite of the fact that Korea had to endure Japanese colonization in 1910-1945 and damage from the Korean War in 1950-1953, by 1960 Korea's non-agricultural sector's share in GDP had reached approximately 65 percent, which was not significantly different from that of Thailand, and its industrial products' share in total merchandise exports had reached as high as 72 percent, much higher than that of Thailand. This fact shows

that Korea's comparative advantage lay in industry. Thereafter, Korea's industrialization continued to progress at a faster rate than that of Thailand. In 1995, Korea's non-agricultural sector's share in GDP reached 93 percent and industrial products' share in total merchandise exports reached 96 percent as compared with 89 and 75 percent, respectively, in Thailand.

The difference in the progress in industrialization between Thailand and Korea in the post-World War II period was reflected in the difference of their socio-economic development policies. Both Thailand and Korea began to adopt comprehensive economic development plans in the forms of five-year socio-economic development plans in the early 1960s. Nonetheless, while Korea began to promote export-oriented industrialization from the start (Lee, 2003; Harvie and Lee, 2003), Thailand did not adopt this approach until the late 1970s (Tambunlertchai, 1993; Warr, 1993; Muscat, 1994). Throughout the 1960s and the 1970s, the Korean government provided various supports to domestic industries such as direct credits, tax remission, search for export-markets, and technical know-how (Krueger, 1982; Kim and Romer, 1981). Meanwhile, Thailand carried out an import-substitution industrialization policy, in which imports of industrial products were restricted to protect domestic manufacturers (Tambunlertchai, 1993). According to Siamwalla (1997), Thailand could afford the import-substitution industrialization policy without sacrificing rapid economic growth in the 1960s and the 1970s because it still had abundant land resources that could be easily brought to agricultural production.

5 Educational development

The main purpose of this section is to discuss changes in policies and institutions in Thailand, Japan, and Korea that may have influenced the speed of accumulation of their educational stocks. Before proceeding to such discussions, it is informative to provide a summary of the process of human capital accumulation in Thailand.

5.1 Changes in human capital in Thailand

The process of human capital accumulation in Thailand can be observed in Table 3 in terms of changes in total population, the working-age population (the 15-64 year-old population), the average number of years of schooling per person in the working-age population (average schooling), and school enrollment ratio in the school-age population (the 6-20 year-old population). Thailand experienced rapid population expansion, increasing more than eleven-fold at the average rate of 2.3 percent per year from 1890 to 1995. The working-age population grew even faster at the average rate of 2.6 percent per year, resulting in an increase in the share of the working-age population from approximately 54 percent in 1890 to about 68 percent in 1995. The growth rates of both the total population and the working-age population were

particularly high in 1910-1980. From 1980 to 1995, while the growth rate of total population significantly decreased, that of the working-age population remained as high as 2.8 percent per year.

School enrollment ratio in the school-age population, which is considered as a proxy for current investment in education, grew from 0.2 percent in 1890 to 62.2 percent in 1995. The ratio increased rapidly before World War II. However, because it grew from a very low base, it reached only about 26 percent in 1940. The stock of education as measured by average schooling increased from 1.2 years per person in 1943 to 7.0 years per person in 1995 at the average rate of 3.4 percent per year. It grew particularly rapidly from 1943 to 1960 at the average rate of 5.1 percent per year compared with 2.7 percent per year from 1960 to 1995.

Figure 2 plots average schooling by levels of education as well as average schooling for all the levels inclusive in the semi-logarithmic scale. The growth pattern of average schooling in the primary education level is analogous to that of average schooling for all the levels inclusive. It grew from approximately 1.2 years in 1943 to 6.0 years in 1995 at an annual compound growth rate of approximately 3.1 percent per year. Average schooling at the secondary education level grew from approximately 0.03 year in 1943 to 0.8 year in 1995 and that at the tertiary education level rose from approximately 0.02 year in 1960 to 0.3 year in 1995. The rapid growth of average schooling in the secondary and tertiary education levels started in the late 1950s and the 1970s, respectively. In the 1990s, average schooling at the tertiary education level grew rapidly while that at the secondary education level began to level off.

5.2. Thailand compared with Japan

Thailand and Japan began to promote modern education in the early 1870s (Sukontarangsi, 1967; Sinlarat, 1973; Klinngam, 1988; Levine and Kawada, 1980). Nonetheless, Thailand has achieved much poorer educational development, which is believed to have been the major determinant of Thailand's poorer economic growth performance relative to Japan (Haddad and Demsky, 1994; Feeny, 1998; World Bank, 1998, 2003a, 2003b).

King Mongkut of Thailand signed the Bowring Treaty with Great Britain in 1855 in order to promote international trade for the sake of avoiding colonization by Western powers (Ingram, 1955; Feeny, 1982). The treaty created a large foreign demand for agricultural products, particularly rice from Thailand to feed industrial workers in Europe and plantation workers in other Southeast Asian countries, such as Malaysia, Indonesia, and the Philippines (Manarungsan, 1989; Jansen, 1997; Hayami, 2001b). Perceiving this opportunity, Thailand turned to specialize in rice production by expanding the production area particularly in the Chao Phraya river delta for exports in exchange for manufacturing products from Europe and tropical cash crops from other Southeast Asian countries (Ingram, 1955; Hayami, 2001b).

However, during King Mongkut's reign, the importance of education for modern economic growth was not felt. The sole purpose of education was to teach Thai citizens basic skills in reading and writing of the national language and the teaching was mainly conducted at temples. During the reign of King Chulalongkorn (1868-1910), training top elite for government administration was the main purpose of Thailand's education policy (Sukontarangsi, 1967). The king established the first public school in 1871 at the Grand Palace in Bangkok mainly for training the sons and daughters of the nobility and government officials (Sukontarangsi, 1967; Sinlarat, 1973; Klinngam, 1988). Although the king also recognized the importance of an educated labor force for economic modernization, the promotion of mass education was intermittent in the late 19th century. In 1879, following the suggestion of a foreign advisor, one government school (Suan Anan school) was established aiming to enroll not only the children of the nobility but also those of the commoners (Watson, 1980). But, the school was short-lived. In 1888, the government sent an official mission to study the Japanese education system. In the 1890s, the government also studied the education systems in Burma, India, and Europe. However, in the 1900s, it was still not clear what form of education Thailand should take. It was only in 1921 the Compulsory Primary Education Act was enacted. Sukorntarangsi (1967) notes further that, the implementation of the Compulsory Primary Educational Act had not been effective until the early 1930s. The Act required 5 grades of primary education be compulsory. However, the final two grades of primary education remained to be optional in the 1920s and early 1930s (Sukorntarangsi, 1967).

In Japan, the signing of the first commercial treaty with the United States in 1858 marked its opening to international trade (Levine and Kawada, 1980). By this time, Japan had already become a resource-scarce country (Hayami, 2001a). Thus, with the rapid increase of foreign contacts, unlike Thailand, Japan could not export the needed amounts of primary products to earn sufficient foreign exchange to import industrial products. It had to quickly develop a modern economic framework in order to achieve economic growth and avoid colonial subjugation. To achieve this end, Japan felt the need to develop educational and other institutions conducive to modern economic growth based on borrowed technologies (Levine and Kawada, 1980). This spirit of development was commonly shared among the leaders of the Meiji government (1868-1912). In 1869 and 1871, two study commissions were sent abroad in order to study the education systems in Europe and the United States. Their studies led to the promulgation of the School System Rule in 1872, which specified the design of the national education system (Godo and Hayami, 1999, 2002). This system was developed based on the French and American education systems, and it was piloted during 1870-1890 (Levine and Kawada, 1980). The system aimed to make primary education compulsory for all children, and the idea was reinforced by the Primary School Order in 1886.

The above discussions seem to imply that Thailand and Japan had different objectives in their educational development in the late 19th century. While Japan's objective at that time was to rapidly establish an educated labor force to support agricultural intensification and industrial development (Levine and

Kawada, 1980), Thailand's objective was to train manpower for government offices (Sukorntarangsi, 1967; Watson, 1980). Due to these different objectives, educational development in Thailand during the early part of the Chulalongkorn reign progressed very slowly, while it proceeded at a rapid rate in Meiji Japan. In 1886 (15 years after the establishment of the first public school) there were only 35 public schools with 81 teachers and 1994 students in Thailand (Sukontarangsi, 1967). In contrast, in Japan there were 24,303 primary schools, 116 middle schools and 110 colleges in 1875 (Ichimura, 1998). By the 1890s, Japan had already been able to develop an appropriate system for rapid educational development.

Thailand's lag behind Japan in educational development can be observed clearly in Table 4 in terms of school enrollment ratio in the total school-age population (the 6-20 years-old population) and, also, by different levels of education. The data for Korea are also included in the table for discussions in the following section. In the table, it can be observed that in 1890 the enrollment ratio of the total school-age population in Thailand was close to zero percent while it was already 26 percent in Japan. In the same year, primary school enrollment ratio in Japan reached 46 percent, whereas it was less than 0.2 percent in Thailand. Japan achieved a nearly 100 percent primary school enrollment ratio in 1950, whereas Thailand would only achieve this ratio in the 1990s. The secondary school enrollment ratio in Japan also increased rapidly in the period of 1890-1940, but in Thailand it began to spurt in the 1950s resulted from changes in the school education system. The tertiary enrollment ratio in Japan increased rapidly in the 1920s, followed by slower but steady progress in the following years, except in the 1940s due to World War II. The ratio in Thailand roughly doubled every 10 years between the 1900s and 1995. Yet, in 1995, it remained much lower than in Japan. However, it is worth noting that Thailand invested heavily in tertiary education in the 1990s in order to support the implementation of its structural adjustment program (Muscat, 1994). As a result, the enrollment ratio in this level increased significantly from 5.9 percent in 1990 to 16.1 percent in 1995.

Thailand lagged behind Japan in the promulgation of the Compulsory Primary Education Act for approximately 50 years. This lag in the development of educational institutions was reflected in a similar time lag in school enrollment ratios reported in Table 4. For example, Thailand achieved Japan's 1900 school enrollment ratio in the school-age population in 1950. A similar phenomenon can also be observed in school enrollment ratios at the primary and secondary education levels.

The spurts of school enrollment ratios in Japan corresponded with its industrial development. In the first three decades of the 20th century, Japan was well underway in the development of its light industries, and in the 1930s, it was on the path to develop heavy industries (including munitions production) (Hunter, 2000). To support such a sequence of industrialization drives, providing educational opportunities among the masses was the key policy element of Japan. Correspondingly, its secondary and tertiary enrollment ratios increased rapidly from 2.5 and 0.3 percent in 1900 to 46.9 and 8.0 percent in 1940, respectively. The tertiary

enrollment ratio increased particularly rapidly in the 1920s as preparation for heavy industrialization drive in the following decade.

In sum, although Thailand and Japan began to introduce modern education at around the same time, the purpose of education in the former drastically diverged from that in the latter in the late 19th century. Thailand's main objective of education during that time was to develop personnel to staff government offices under the king, but Japan's educational development was part of its overall strategy to promote modern economic growth based on productivity improvements in agriculture and industry. Thailand did not only fail to establish a sufficient educational base but also failed to carry out appropriate socio-economic development policies to promote modern economic growth in the late 19th and early 20th centuries. In the tradition of the induced innovation hypothesis (Hayami and Ruttan, 1970, 1971), this divergence in policy objectives between Thailand and Japan may have been due to their difference in land resource endowments. This implies that land resource abundance, as suggested by Sachs and Warner (1995) and Gylfason (2001), gave the Thai government and the private sector little incentive to invest in education to support modern economic growth. Japan opened trade with the West under strong population pressure on limited land resources. The only way Japan could survive international competition was to develop the industrial sector based on imported technologies and to improve agricultural productivity in support of the expanding industrial sector. To achieve this end, building a sufficient educational base was a necessary condition.

However, it is important to note that Thailand experienced impressive increases in the school enrollment ratio in the school-age population, which resulted mainly from rapid increases in the enrollment ratio at the primary education level during 1890-1940. From 1898 the Thai government began to have a school education system and had modified the system several times thereafter. In the 1910s, the government changed its educational development objective from educating a small number of top elite for government offices to educating a large number of middle elite in support of economic production. It promulgated the Compulsory Primary Education Act in 1921. These changes constituted the major driving force of rapid increases in the school enrollment ratio in the school-age population in the 1890s through 1930s.

5.3 Thailand compared with Korea

In the previous section, it was found that educational development in Thailand lagged so far behind that in Japan in spite of the fact that both countries began to promote the development of modern education at the same time. Thailand also achieved poorer educational development than Korea from 1930 to 1995 despite the participation of Korea in international trade as an independent nation began only from the end of World War II. Korea also suffered from the Korean War in the early 1950s.

The differences in educational development between Thailand and Korea can be observed in Table 4. At the time of Korea's annexation to Japan in 1910, the school enrollment ratio in the school-age

population in Korea was 7.6 percent, almost twice the ratio in Thailand. However, from 1910 to 1930, the ratio in Thailand increased at a faster rate than that in Korea. In Thailand, it increased from 3.5 percent in 1910 to 17.6 percent in 1930, while in Korea, it increased from 7.6 to 16.0 percent over the same time period. Thailand's faster increase in the school enrollment ratio in the school-age population in 1910-1930 was due to its faster increase in the primary school enrollment ratio.

Such differential educational expansions were driven by two opposite policy factors. On the one hand, as previously described, the 1910s represent the period in which Thailand shifted its educational development objective from educating a small number of intellectuals for staffing government offices to educating a large number of individuals in support of economic production (Sukorntarangsi, 1967; Watson, 1980). On the other hand, in the first two decades after Korea's annexation to Japan, the Japanese colonial government's objective was to use Korea as a source of food and raw material supply and a market for Japan's industrial goods (Hayami and Ruttan, 1971; Hwan Ban, 1979; Hunter, 2000). The colonial government's intervention in educational development in Korea in those years was not beyond the purpose of replacing Korean cultural values with those of the Japanese (McKinn et al., 1980).

However, Thailand's experience of a faster increase in the school enrollment ratio than Korea ended in 1930. From 1930 to 1940, Korea experienced a surge in the school enrollment ratio in the school-age population. This change reflected a major change in the colonial policy of Japan in response to the Manchurian Incidence in 1932 to the direction of upgrading manpower in Korea to be utilized for Japan's aggression towards China. The 1930s also represent the period in which Japan began to promote heavy industrialization (Hunter, 2000). In this heavy industrialization drive, Japan tried to shift some of its light industries such as food processing and textiles to Korea. To make this shift possible, Japan invested in education in Korea, resulting in a rapid increase in Korea's school enrollment ratio in that decade.

Japan's control over the political and economic affairs of Korea was terminated at the end of World War II. In the late 1940s and the 1950s, the Korean government carried out an import-substitution industrialization policy and perceived the importance of an educated labor force for economic development. As well as promoting school enrollment among the school-age population, the government also initiated a national campaign for literacy in order to increase the literacy rate among adults (Lee, 2003). Following the launch of the export-oriented industrialization policy in the early 1960s, an educated labor force became critically important for Korea to be successful in importing foreign capital and technologies to produce exportable industrial products. Therefore, Korea continued to invest heavily in education in the past several decades. From 1960, Thailand also regarded educational development as part of its overall socio-economic development strategy. But, educational development in Thailand in the past several decades was less impressive. In 1995, school enrollment ratio in the school-age population in Thailand reached only about

62.2 percent while it reached 86.0 percent in Korea, which was the same as the level in Japan in the same year.

Thailand's lag behind Korea in educational development from 1940 to 1995 was particularly acute in the secondary and tertiary education levels because Thailand spent less attention to the development of these levels. Throughout this period, only the primary education level was compulsory in Thailand. From the end of the Japanese occupation, Korea spent great effort on promoting educational development including secondary and tertiary education (Kim, 2000; Lee, 2003). In 1940, the secondary and tertiary enrollment ratios in Korea were 2.0 and 0.2 percent, respectively, and those in Thailand were 1.7 and 0.2 percent. But in 1995, the respective ratios in Korea were 97.3 and 33.9 percent, while those in Thailand were 36.2 and 16.1 percent.

Why did Thailand experience poorer educational development than Korea over the past several decades? One of the most important differences between Thailand and Korea was their natural resource endowments. Japan's withdrawal from political involvement in Korea at the end of World War II marked the beginning of Korea's participation in international trade as an independent nation. After independence, Korea did not only face a great geo-political problem culminating in the Korean War in 1950-1953, but it also faced economic challenges generated by its increased involvement in international trade. Poorly endowed with natural resources, Korea's rational option seems to have rested upon first the promotion of light labor-intensive industries for exports and later the advancement to heavy industries based on imported capital and technologies. A vital need for such industrialization would have been an important incentive for Korea's heavier investment in education (particularly in secondary and tertiary education) relative to Thailand in the post-war period.

Thailand's lag behind Japan and Korea in educational investment as reflected in changes in school enrollment ratios resulted in its slower accumulation of educational stock measured by average schooling as shown in Figure 3. In 1955, the levels of average schooling in Thailand and Korea were very similar and were much lower than that in Japan. Thereafter, Thailand experienced slower average annual growth in average schooling than Korea. In 1995, average schooling in Thailand reached approximately 7.0 years per person as compared with 9.8 years in Korea and 11.9 years in Japan.

5.4 Conclusion

It was observed in this paper that Thailand was much more favorably endowed with land resources than Japan and Korea. Correspondingly, it responded differently from Japan and Korea to the competitive pressures of international trade. Thailand specialized in the production of primary commodities, particularly rice, through the exploitation of hitherto unused land resources with the use of traditional technologies along Hla Myint's vent-for-surplus model throughout the late 19th century and early 20th century. Such a pattern of

resource exploitation was associated with low agricultural land productivity and slow industrial development. In contrast, Japan and Korea intensified agricultural production based on the systematic application of science to the problems of economic production in order to avoid a subsistence crisis while trying to develop their industrial sector whose outputs became the major source of their foreign exchange earnings.

To support modern economic growth based on productivity improvements in agriculture and industry, it became unavoidable for Japan and Korea to invest heavily in education since the early stage of their opening to international trade. In the late 1860s and the early 1870s, Japan studied extensively the education systems in advanced countries and introduced compulsory education. By the 1890s, Japan had been able to develop the appropriate system for rapid educational development. Thailand also began to promote modern education as early as Japan, but its educational development in the late 19th century was largely confined to training a small number of top elite for government offices under the king. Mass education was not promoted until the early 1920s.

It seems reasonable to identify Thailand's lag in educational development compared with Japan and Korea as one major reason to explain why it lagged behind in entering the epoch of modern economic growth based on agricultural intensification and industrialization. It is likely that underlying Thailand's lag in educational development was its land abundance that made its leaders feel less compelling to promote mass education for the sake of adopting modern agricultural and industrial technologies. Its slower educational development induced by its more abundant land resource endowments appears to be the major factor to explain its slower economic development compared with Japan and Korea.

However, Thailand did not entirely neglect investment in education and other infrastructure for modern economic growth during its vent-for-surplus development stage. Though much slower than in Japan, by the 1970s, Thailand's stock of education as measured by the average number of years of schooling per person in the working-age population had reached the level of Japan in the 1920s, which could well be sufficient for supporting the spurt of labor-intensive industries. It is most likely that accumulated investment in education since the vent-for-surplus stage had prepared an important condition for the Thailand's joining in the East Asian Miracle in recent three decades, although the formal testing of this hypothesis is outside the realm of this paper. Yet, it is also very likely that, if Thailand had used its incomes obtained from the exploitation of natural resources more efficiently during the vent-for-surplus stage, its entry to epoch of modern economic growth would not have lagged behind Japan for so long. Thailand's experience in the late 19th and the early 20th centuries seem to imply that, today's developing countries endowed with abundant natural resources will not be able to achieve sustainable economic growth unless they effectively mobilize incomes generated from the exploitation of their abundant natural resources for investment in education, among others, for supporting agricultural intensification and industrialization.

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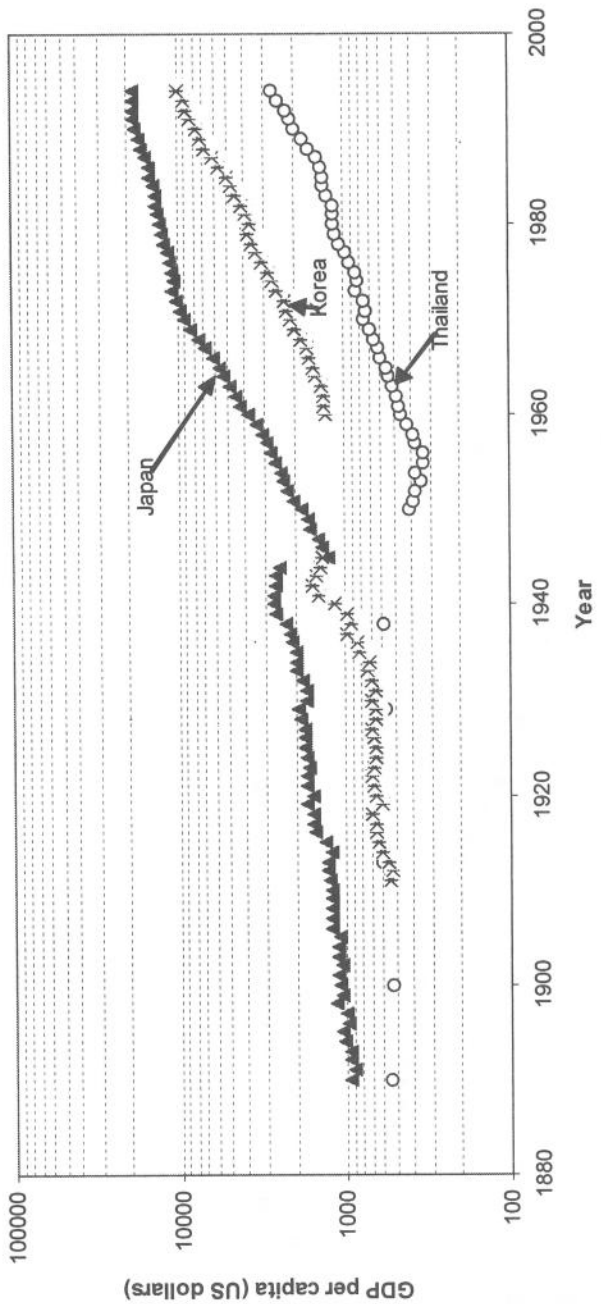

Figure 1 GDP per capita in Thailand, Japan and Korea (semi-logarithmic scale)

Sources: The data for Thailand are own estimates, and those for Japan and Korea are taken from Godo and Hayami (1999) and Godo (2004), respectively.

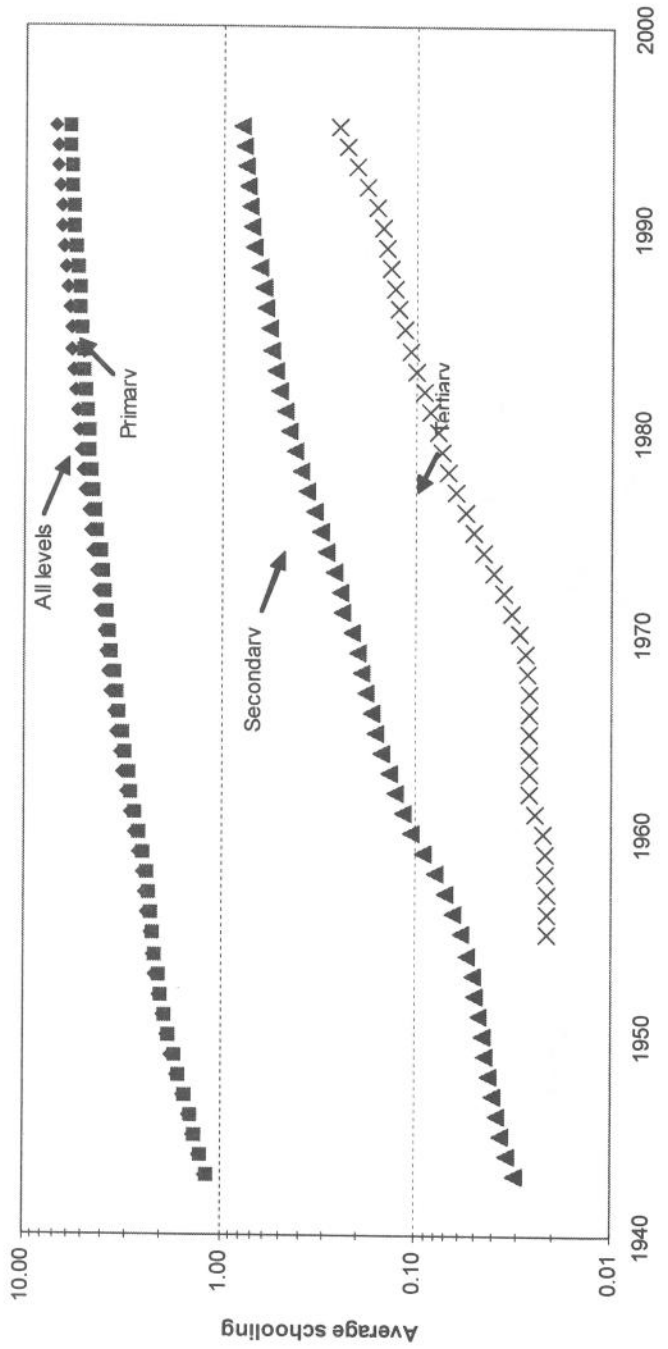

Figure 2 Average schooling by education level in Thailand (semi-logarithmic scale)

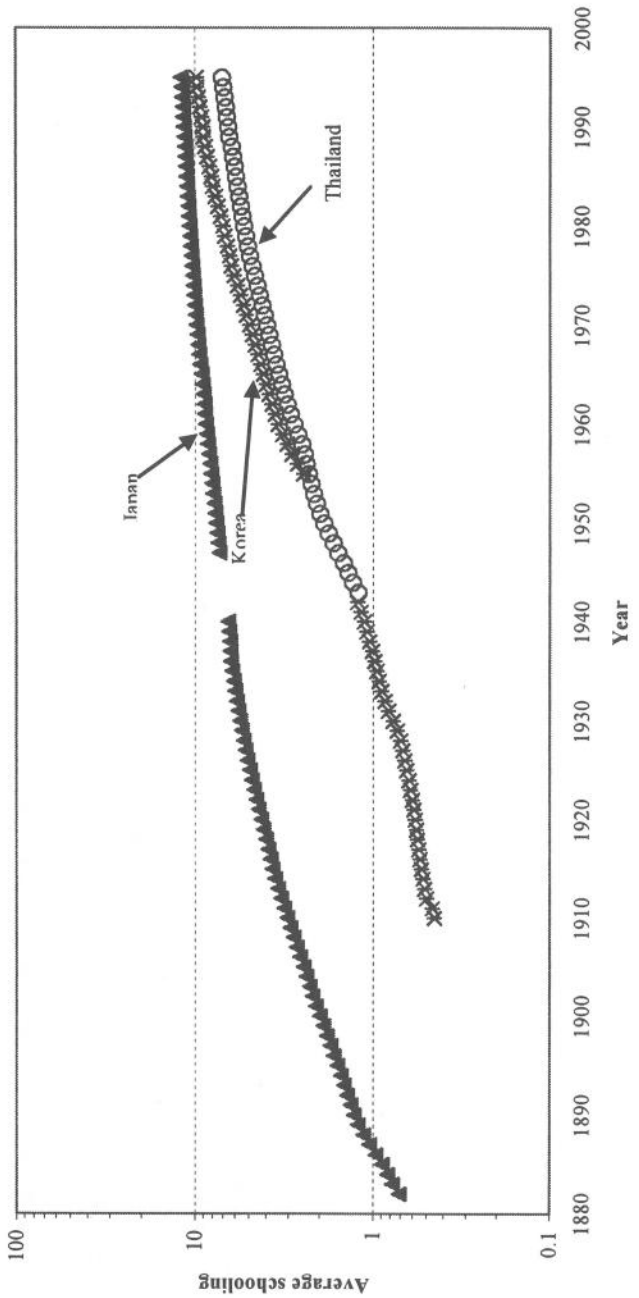

Figure 3 Average schooling in Thailand, Japan and Korea (semi-logarithmic scale)

Sources: The data for Thailand are own estimates, those for Japan and Korea are taken from Godo and Hayami (1999) and Godo (2004), respectively.

Table 1 Natural Resource Endowments of Thailand, Korea and Japan

	(a) Territorial land area per capita (ha/person)			(b) Arable land area per capita (ha/person)			(c) Rice area per worker (ha/person)		
Year	Thailand	Korea	Japan	Thailand	Korea	Japan	Thailand	Korea	Japan
1890			0.94			0.12			0.23
1900			0.85			0.12			0.23
1910	7.20		0.76			0.11			0.24
1911				0.22					
1918					0.13			0.72	
1920	5.92		0.67	0.28	0.13	0.11		0.70	0.26
1930	4.76		0.58		0.11	0.09		0.68	0.27
1940	3.83		0.51	0.27	0.09	0.08		0.66	0.28
1950	2.77		0.45	0.32		0.07	0.91	0.69	0.25
1960	2.17	0.39	0.40	0.32	0.08	0.07	0.75	0.54	0.33
1970	1.61	0.31	0.36	0.35	0.07	0.06	0.80	0.63	0.49
1980	1.24	0.26	0.32	0.37	0.06	0.05	0.83	0.29	0.68
1990	1.03	0.23	0.30	0.34	0.05	0.04	0.76	0.43	0.67
1995	0.97	0.22	0.30	0.32	0.05	0.03	0.90	0.44	0.80

Sources: (a) Territorial land areas are 57.40 million hectares for Thailand, 9.85 million hectares for Korea, and 37.47 million hectares for Japan. The population data: Thailand from Warr (1993), World Bank (2001), and Heston et al. (2002); Korea from Godo (2004); and Japan from Godo and Hayami (1999).

(b) The arable land area data are: Thailand in 1950-1995 from Shintani (2003) and in 1911-1940 from Ingram (1955); Korea from Hwan Ban (1979), Francks (1999), and FAO (1998); and Japan from Hayami and Yamada (1991) and FAO (1998).

(c) The rice area and agricultural laborers are: Thailand from Shintani (2003); Korea from Hwan Ban (1979), Francks (1999), and FAO (1998); and Japan from Hayami and Yamada (1991) and MAFF (2000).

Table 2 Rice yield per hectare planted, non-agricultural sector's share in GDP and industrial products' share in merchandise exports in Thailand, Japan and Korea

Year	(a) Rice yield per area planted (tons/ha)			(b) Non-agricultural sector's share in GDP (%)			(c) Industrial products' share in merchandise exports (%)		
	Thailand	Korea	Japan	Thailand	Korea	Japan	Thailand	Korea	Japan
1890			2.2			57			
1900			2.3			66			57
1910		1.3	2.6			73			61
1920		1.4	2.9			76			50
1925	1.7	1.5	2.8			79			58
1930		1.5	2.9			80			70
1935	1.5	1.6	3.0			83			
1940		2.0	3.1			87			
1945	1.2		2.9						
1950	1.2	3.1	4.0						
1960	1.6	3.9	4.9	64	65	87	11	72	92
1970	1.8	4.6	5.6	74	74	94	23	83	95
1980	1.8	6.0	6.0	77	86	96	42	91	98
1990	1.7	6.2	6.3	87	91	97	66	95	99
1995	2.2	6.1	6.3	89	93	98	75	96	99

Note: Industrial products include manufactured and mining products

Sources: (a) The rice yield per hectare data are: Thailand before and after 1950 from Ingram (1955) and Shintani (2003), respectively; Korea from Hayami and Kikuchi (1985) and FAO (1998); and Japan: from Hayami et al. (1980) and FAO (1998). (b) The data on non-agricultural sector's share in GDP since 1960 for all the three countries are from World Bank (2001), and Japan's data prior to 1960 are from Ohkawa and Rosovsky (1973).

(c) The data on industrial products' share in total merchandise exports since 1960 for all the three countries are from World Bank (2001), and Japan's data prior to 1960 are from Ohkawa and Rosovsky (1973) and Japan Statistics Association (1988).

Table 3 Growth of Human Capital in Thailand

Year	Population			Average schooling[a]	Enrollment ratio in school-age pop. (6-20 year-old)
	Total	Working-age (15-64 year-old)	Working-age pop./Total pop.		
	million persons		%	years/person	%
1890	5.2	2.8	53.8		0.2
1900	5.9	3.2	54.2		0.8
1910	6.8	3.7	54.4		3.5
1920	8.3	4.5	54.2		7.5
1930	11.1	6.0	54.1		17.6
1940[b]	15.8	8.5	53.8	1.2	25.7
1950	20.8	11.2	53.8	1.9	38.6
1960	26.3	14.2	54.0	2.8	44.5
1970	35.8	17.8	49.7	3.9	49.4
1980	47.0	26.1	55.5	5.3	55.8
1990	56.1	36.1	64.3	6.5	55.2
1995	59.2	39.5	66.7	7.0	62.2
	----------Growth rate (%/year)----------				
Whole period					
1890-1995	2.3	2.6			
Before 1960					
1890-1960[c]	2.3	2.3		5.1	

1890-1910	1.4		1.4									
1910-1960	2.7		2.7									
After 1960												
1960-1995	2.3		3.0				2.7					
1960-1980	2.9		3.1					3.2				
1980-1995	1.6		2.8					1.9				

[a] Average number of years of schooling per person in the working-age population. [b] Average schooling is the 1943 figure.

[c] For average schooling, this is the annual growth rate in 1943-1960.

Table 4 The school enrollment ratio among the school age and by educational level in Thailand, Korea, and Japan

	School-age population (6-20 years old)			Primary level (Grades 1-8)			Secondary level (Grades 9-12)			Tertiary level (Grades 13-18)		
Year	Thailand	Korea[a]	Japan	Thailand	Korea[a]	Japan	Thailand	Korea[a]	Japan	Thailand	Korea[a]	Japan
	----------%----------			----------%----------			----------%----------			----------%----------		
1890	0.15		26.00	0.24		46.24			0.30	0.00		0.13
1900	0.83		38.02			64.22			2.54	0.01		0.30
1910	3.49	7.59	43.04	5.63		71.53	0.08		6.89	0.02		0.74
1920	7.54	11.22	50.95	12.06	13.69	80.45	0.45	0.16	14.66	0.04	0.03	0.94
1930	17.65	15.97	58.42	28.34	19.11	87.75	0.76	0.86	27.08	0.09	0.07	5.00
1940	25.65	37.73	62.39	40.96	45.47	84.38	1.69	1.96	46.88	0.16	0.21	7.97
1950	38.55		69.83	61.65		100.12	1.95		51.91	0.54		3.68
1960	46.11	55.91	75.35	70.89	82.71	100.56	10.47	24.58	65.14	0.57	4.66	7.78

1970	48.59	67.72	78.46	74.36	91.58	99.77	13.06	40.40	85.66	1.58	5.06	13.35
1980	55.48	77.37	87.28	85.53	102.07	97.96	26.38	75.08	96.32	3.43	12.13	23.52
1990	55.12	80.36	85.35	85.35	99.5	101.67	27.34	92.34	95.81	5.90	22.19	22.85
1995	62.22	86.00	86.41	91.06	100.30	101.40	36.25	97.34	96.25	16.11	33.90	27.12

Sources: The data for Thailand are own estimates, and those for Japan and Korea are taken from Godo and Hayami (1999) and Godo (2004), respectively.

[a] Data of whole Korea before World War II and of South Korea (The Republic of Korea) thereafter.