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**Infrastructure Development for the Economic Development in
Developing Countries: Lessons from Korea and Japan**

Byoungki KIM

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Graduate School of International
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Kobe University

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Byoungki KIM*

Abstract

Infrastructure is indispensable to achieve the main development targets in developing countries, such as urbanization, industrialization, export promotion, equitable income distribution, and sustainable economic development. Late developing countries can benefit from previous development experience provided they choose the right model¹. However, the relationship between infrastructure and economic growth is still frequently debated. This paper will examine the experience of Korea and Japan in infrastructure development for economic growth to acquire some valuable lessons that infrastructure development contributes to economic development in developing countries.

1. Introduction

The lack of infrastructure is hindering the economic growth in many developing countries². Infrastructure investment has the effects of contributing to increase the productivity and it is expected to contribute to future economic growth in developing countries where infrastructure is still insufficient. Therefore, infrastructure development is one of the most integral parts of the public policies in developing countries. Supporting infrastructure development in developing countries by advanced countries is extremely important field. This can be inferred from the fact that many international organizations such as World Bank and OECD are actively promoting the improvement of infrastructure by providing various support programs to developing countries. However, the precise relationship between infrastructure and economic growth is still frequently debated.

Good infrastructure helps to raise productivity and lower costs in the directly productive activities of the economy, but it has to be expanded fast enough to meet the demand for infrastructure in the early stage of development. Construction expense for infrastructure such as energy and transportation sector is enormous and construction period is also long. Prediction of demand pattern and investment allocation, which are the key factors of infrastructure development planning, must be based on a long term economic development trend and land use planning, which predicts the country's temporal and spatial demographics and economic structure.

Postwar, Japan and Korea had received a large amount of concessional loans and grants from the US and international organizations for rebuilding economic infrastructures. These valuable experiences give

* Graduate School of International Cooperation Studies, Kobe University
e-mail: kim_byoungki@hotmail.com

¹ Il Sakong (1993) emphasized that the late developers can draw valuable lessons from the Korea's experience in developing its infrastructure for the economic development.

² World Bank (1994) estimated the relationship between infrastructure and economic growth in many case studies including China and India.

them a comparative advantage in providing cooperation of infrastructure development to developing countries. These days Japan and Korea are providing a great share of ODA for the infrastructure development in developing countries. Construction of power stations, paved roads, bridges, and telecommunication are main supporting field of both countries. The large share of support for the economic infrastructure by Korea is frequently criticized.

This paper will examine Korea's experience in developing its infrastructure for the economic growth and its role in development cooperation to developing countries. First, the patterns of infrastructure demand in the electricity, transportation, and communication sectors which are key infrastructures in national development will be analyzed at each phase of economic development from the 1910s to 1990s. Second, public investment for infrastructure development in Korea and Japan will be analyzed for the same period. Third, the relationship between infrastructure development and economic growth in Korea will be examined with reviewing Japan's experience. In addition, public investment to infrastructure and income distribution will be discussed. Finally, strategic viewpoints on future cooperation for infrastructure development to developing countries will be discussed.

2. Empirical studies on infrastructure development

2.1 Definition of infrastructure

Infrastructure is referred to as social overhead capital by many development economists. Hirshman (1958) provided appropriate definition of infrastructure for the discussion³. Social overhead capital encompasses activities that share technical features such as economies of scale and economic features like spillovers from users to non-users. The social capital acts as a priming to expand private sector investment, and in contrast, social capital becomes relatively lacking along with the expansion of private capital and productive activities. When that happens, the private sector's indirect production costs gradually increase and private sector capital input declines. At this stage, demand for social capital investment recurs and such investment is expended.

Social overhead capital contributes to enhancing productivity and assists in the realization of the potential ability of human capital, and creates situations in which that potential can fully function. It also contributes directly and indirectly to improving the safety and quality of people's lives. Within the scope of infrastructure, electric power, ports, roads, and telecommunications are often used as the services and intermediate goods that are essential for the productive processes of private sector. In this paper, infrastructure will be referred to as social overhead capital and electricity, transportation, and communication will be regarded as economic infrastructure.

³ Hirshman proposed the concept of social overhead capital, which supplements direct productive capital, and commented the relationship between direct productive capital of the private sector and social overhead capital, which is mainly built by public bodies. Definition of infrastructure is also discussed in detail in Yoshida (2000).

2.2 Empirical studies on infrastructure development and economic growth

Ruttan (1989) discussed the reason why advanced countries provide ODA to developing countries. He asserted that there are two arguments one is based on the economic and strategic self-interest of the donor country. The second one is based on the ethical or moral responsibility of the residents of wealthy countries toward the residents of poor countries. Many studies provide surveys of why infrastructure is important in economic development and evaluate recent empirical results estimating the contribution of public capital and infrastructure to economic growth. They suggest that the impact of infrastructure investment on economic growth represents high rate of return.

Easterly and Rebelo (1993) verified whether or not changes in the level of various policy variables permanently increased the economic growth rate, and clarified whether or not investments related to information and telecommunications raised the economic growth rate. They found that public infrastructure investment is a large fraction of both total and public investment, and infrastructure in transportation and communication is consistently correlated with economic growth. The rate of return in these sectors is 63% and elasticity of change in output with respect to a 1% change in the level of infrastructure is 0.16.

World Bank (1994) emphasized that there is a close relationship between infrastructure and economic growth. This is seen in the lack of infrastructure development hindering the economic growth in China and in many case studies, such as those on the direct and indirect economic impact of infrastructure in farming sector in India. In the case of China, the coverage of intercity transport networks is one of the thinnest in the world. China's transportation investments amounted to only 1.3% of GNP annually during 1981-90, a period of rapid growth in transportation demand. Since the onset of China's open door policy in 1979, economic growth averaging 9% a year has resulted in an unprecedented expansion in intercity traffic with growth averaging 8% a year for freight and 12% a year for passengers.

This traffic growth has imposed tremendous strains on the transportation infrastructure, as manifested by the growth of bottlenecks in the railway network, the severe rationing of transportation capacity on railway lines, and the poor quality of service experienced by shippers and passengers. A conservative estimate is that the annual economic costs of not having adequate transportation infrastructure in China during the past several years amount to about 1% of China's GNP. This relationship is also shown in cross-section data analyses that indicate positive relationship between the levels of infrastructure, such as the development of electricity, telecommunications, roads and other facilities and that of economy.

Yoshida (2000) presented a positive analysis from various angles of the correlations between economic growth and the infrastructure in Japan, such as the energy, electricity, and transportation sectors over the last century in order to derive lessons that can be useful to developing countries. He divided Japan's economic development phase into five with major characteristics, and discussed the patterns of demand and investment in infrastructure over one century.

He found that the growth rate of demand in infrastructure was much higher than that of per capita GNP in the early stage of development, and public investment in infrastructure was big. And he also found

that infrastructure investment in rural area had a trend to correct the regional income disparities. He insisted that the lessons learned from Japan's development experience are a major intellectual asset for developing countries. And he emphasized that developing countries expect Japan and Korea, former developing countries, to take reasonable leadership in international aid.

Yoshino and Nakahigashi (2000) estimated the productivity effect of social capital stock by industry, sector and region, and clarified the relationship between social capital stock and economic development. As a result, (1) by industry, the productivity effect of social capital stock is large in the tertiary industry, (2) by sector, the productivity effect of social capital stock is large in information and telecommunication, and environment sectors, and (3) by region, the effect is large in regions with large urban areas. To see the result of their analysis from the view point of the development of developing countries, relationship between social capital and economic growth is examined from statistical data.

Canning (1998) provided a data set on physical infrastructure stocks, such as roads, paved roads, railway lines, electricity generating capacity, telephones, and telephone main lines. The data contains a description of annual database of physical infrastructure stocks constructed for a cross section of 152 countries for the period 1950-95. According to this estimation, telephone and paved roads are generally most promoting economic growth, but in some countries these are oversupplied or undersupplied. On the other hand, this indicates that the electric power is generally undersupplied. Also, Shah (1992) estimated a cost function including infrastructure such as, transportation, communication, and electric power in Mexico and showed that public infrastructure has a small but positive multiplier effect on output. The rate of return is 5-7%, and elasticity in output with respect to a 1% change in the level of infrastructure is 0.05.

There are also negative results that infrastructure investment does not contribute to economic growth. Deverajan, Swaroop and Zou (1996) drew analytical conclusions about developing countries based on the endogenous growth theory in order to verify which type of government expenditures promote economic growth. They estimated the relationship between the composition of public expenditure and economic growth using data from 43 developing countries over 20 years. This estimation showed that an increase in the share of current expenditure has positive and statistically significant effects on economic growth. In contrast, the relationship between the capital component of public expenditure and per capita growth is negative. The major conclusion is that infrastructure has a negative effect on the economic growth rate because infrastructure in developing countries is oversupplied compared to the economic scale.

Mosley (1985) insisted that it is obviously important that aid go not only to the poorest countries but also to the poorest people within recipient countries. And the greater part of the aid budget that is devoted to rural development and the social infrastructure, rather than to industrial development, fundamental research, railways, urban housing, etc., the greater proportion of aid which goes directly to the poor. Kocherlakota and Yi (1996) presented evidence supporting endogenous growth models using time series data for the US, together with various policy variables including the infrastructure to show that there is no policy variable that permanently raises the economic growth rate.

This paper is aimed to acquire some useful lessons that infrastructure development contributes to economic growth in developing countries based on the experience of Korea, and to suggest future ODA policy toward developing countries.

3. Infrastructure development and economic development

In this part, infrastructure development by each economic development phase in Korea from 1910s to 1990s will be discussed. First, government investment and the patterns of demand for infrastructure sector under the Japanese colonial rule will be reviewed, and then the period of 1950s-90s will be examined.

3.1 Infrastructure development under the Japanese colonial rule

The Japanese government invested a great share of government expenditure in infrastructure sectors, especially for the transportation and energy sectors during 1911-38. Construction of railways, roads, ports, and power stations in north region of Korea was not dispensable to rule colonial region and to attack mainland China. The Japanese government extended railway through the construction of new lines and improvement of existing lines in 1921, and also began to develop the electric power in north region of Korea from 1931.

Gyeongin line (1900) and Gyeongbu line (1904) were already completed before the Japanese colonial period, and Honam line (1914), Hamgyeong line (1928), Haesan line (1937), Pyeongwon line (1939), Jungang line (1942) were constructed under the Japanese colonial rule. These railways and roads were very important not only for invasion of mainland China but also for export of rice, cereals, and natural resources to Japan⁴

Japanese government also actively invested government expenditure in the energy development, 12 hydroelectric power stations and one thermal power station were built during the colonial period. Bujeongang (1929), Jangjingang (1937), Bosunggang (1937), Heocheongang (1941), Supung (1943), Choengpyoung (1943), Hwachoeng (1944) hydroelectric power station and Seoul thermal power station⁵(1930) were built to supply electric power to a large-scale munition industrial complex under the Japanese colonial rule. These power stations played a very important role to increase the production and to improve the productivity in both industrial sector and traditional sector. The growth of mining and manufacturing sector was rapid and the average growth rate of national income in the period of 1911-38 was 3.6%.

Table 1 shows that the share of government expenditure to transportation and communication sectors including roads and ports is extremely big, it exceeds 60% of total expenditure. And demand for the

⁴ Kimura in Mizoguchi (1988) emphasized that infrastructure investment under the Japanese colonial rule was helpful to set up the middle and small sized companies in Korea. But many economists in Korea insisted that infrastructure investment during the Japanese colonial rule hindered industrialization and economic growth, such as Lee (2002), Park (2003), Seo (1996).

⁵ Soeoul thermal power station was called Danganri thermal power station till 1969.

infrastructure also increased gradually as supply of infrastructure increased⁶. The growth rate of demand for infrastructure exceeds that of national income largely, the annual average growth rate of private consumer's expenditure to the transportation and communication was 12% while that of real national income was 3.6%. Active investment to infrastructure by government stimulated the demand for infrastructure in this period.

Table 2 is showing the growth rate of industries and wages of urban and rural area. The growth rate of manufacturing and mining sector was much higher than that of agricultural sector. The wage for the factory workers was more than twice as high as the wage for agricultural workers. Rapid growth in manufacturing and mining industry was possible because of the intensive investment to the transportation and energy sectors in urban area. And steady growth of national income was achievable through the rapid growth in manufacturing and mining industry under the Japanese colonial rule. However, concentrating investment in urban area deteriorated income distribution between urban and rural areas. Development of transportation and energy sector during this period had a positive effect on the industrialization and urbanization in the Korean peninsula, and it enabled steady economic growth. But the income disparity among the regions deteriorated as infrastructure investment concentrated in the main metropolitan area.

Table 1 Government expenditure under the Japanese colonial rule (%)

	Transportation and communication	Roads and ports	Agriculture, Fishery, forestry	Other industries	General services
1911-15	56.7	21.8	4.4	0.7	13.5
1916-20	53.5	14.9	3.7	3.5	24.5
1921-25	48.9	12.3	13.8	1.1	23.9
1926-30	48.2	11.0	21.4	0.8	18.6
1931-35	53.5	11.0	24.7	0.3	10.7
1936-38	67.0	9.9	12.8	2.3	8.0
1911-38	53.8	13.7	13.5	1.4	17.1

Table 2 Growth rate of GNP and wage

	Growth Rate (net, %)				Wages (Sen per day)		
	GNP	Agriculture	Manufacturing and Mining	Commerce and Services	(1) Agriculture	(2) Factory	(1)/(2) %
1911-15	4.3	3.9	18.7	4.7	32.9	71.8	45.9
1916-20	27.4	30.0	23.1	30.0	69.2	130.0	51.3
1921-25	0.1	-0.7	3.2	2.5	100.1	202.1	49.5
1926-30	-5.9	-11.5	1.8	2.0	81.5	202.7	40.2
1931-35	9.3	11.5	17.9	4.0	81.7	191.0	43.2
1936-38	13.4	12.7	23.1	10.8	-	-	-
1911-38	7.8	7.4	13.9	9.0	-	-	-

Source: Computed from Mizoguchi (1988)

Note: Figures are 5 years average at current price. Figures are including North Korea.

⁶ Terazaki in Mizoguchi (1988) calculated the share of consumption for transportation and communication in the total expenditure. It gradually increased from 1.3% in 1913 to 2.4% in 1936.

3.2 Infrastructure development after the Korean War

Considering from the growth accounting model, Denison (1976), economic growth is possible through the input of labor, capital, and improvement of productivities. In 1990s, some economists, Krugman (1994) and Young (1995)⁷, criticized that rapid economic growth of Korea was possible only by input of labor and capital not by technology progress. They claimed that investment to technological progress, social development, and human development related to productivity improvement is much important for economic growth than physical input in developing countries in the long run.

Nurkse (1953) emphasized that balanced investment to all industry is efficient for economic growth in developing countries. Contrarily, Hirshman (1958) insisted that balanced investment policy is impossible because developing countries are always suffering from the shortage of capital. Therefore, it is important to decide the priorities of investment in industries and sectors, and to concentrate investment on social overhead capital in the early stage of development.

Concentrating investment in infrastructure is extremely important for the attainment of the main development targets, namely industrialization, urbanization, and trade promotion to get over the shortage of development capital in developing countries. To decide the priorities of investment in infrastructure sectors is also important. Good infrastructure helps to raise productivity and lower costs in the directly productive activities of the economy. Chenery (1979) asserted that insufficient capital for infrastructure development could be supplemented with foreign capital such as foreign aid, loan, and foreign direct investment. Korea had received a large amount of foreign aid and invested a big proportion of it in the infrastructure development⁸.

(1) The phase for reconstruction of infrastructure (1953-61)

Korea faced serious constraints such as overpopulated, poor resources, poor infrastructure, and limited market size in 1950s. The Korean War that followed 1950-53 was devastating, it destroyed almost two-thirds of the nation's productive capacity. Il Sakong (1993) estimated that total industrial production in 1953 was to be not much more than one-third of the production level of 1940. Nominal per capita GNP in 1953 was 67 US dollar. Widespread unemployment, underemployment, and absolute poverty plagued the country. Savings were negligible, and dwindling foreign aid, mostly from the US, primarily financed what little investment there was. Exports were almost non-existent because Korea, unlike some resource-rich developing countries, did not have resource-based exportable goods. Worst of all, there was no significant industrial base, as agriculture dominated the economy.

⁷ Both of them estimated total factor productivity (TFP) growth for Korea. They insisted that the level of productivity growth in manufacturing and other industry was low. Young estimated productivity growth in the subsectors of other industry and services, finding average total factor productivity growth rates of 5.2% in electricity, gas, and water, 3.4% in transportation, storage and communication during the 1966-90.

⁸ Most of aid goods by US was consisted of cereal, rice, and garment. Korean government sold them and invested the capital to infrastructure development.

The major objectives of economic policy during this phase were to reconstruct the infrastructure and industrial facilities that had been destroyed by the war and to develop the energy source. The Korean government constructed the industrial railways to supply mineral products such as coal and cement to the key industries while restoring railways and roads destroyed by the Korean War. Masan (1956) thermal power station, Goeysan (1957) and Soemjingang (1961) hydroelectric power station were constructed in this period to supply electric power to industrial sectors.

The industry for the basic consumer goods production was completed during the reconstruction period of the late 1950s. Import substitution for light industrial goods was implemented, Mason and Kim (1980) characterized this period as easy import substitution. Traditional sectors developed on the basis of past accumulations and the manufacturing sector expanded gradually with the beginning of infrastructure development to support it. The Korean economy began a solid recovery immediately following the devastating war. Even though the nation's economic development was not the top priority of the Korean political leadership in the 1950s, the Korean economy by the early 1960s was fully recovered from the devastating Korean War.

The share of central government expenditure to agriculture and non-mineral resources was 38.6% in 1953 and 37.6% in 1958. However, the share for transportation and communication increased quickly to 32.0% in 1958 from 9.3% in 1953. GDP in real terms grew at about 4.1% per year in this phase. Population working in the agriculture sector began to decline slightly, the ratio of population working in the agriculture sector declined to 56.3% in 1961 from 61.8% in 1955. And the share of agriculture, forestry and fishing sector in GDP declined to 39.1% in 1961 from 47.3% in 1953.

The foreign aid was very important for Korean economic development in this phase. It was the major source for financing the national's balance of payments deficits throughout the 1950s and the early 1960s. Foreign aid greatly contributed in two main dimensions: as a supplement to domestic savings which made a higher rate of capital formation; and as a supplement to imports that permitted a higher rate of production from the existing capacity. Thus, foreign aid was useful to relate investment and imports. According to Il Sakong(1993), more than 70% of imports were financed by foreign aid during the reconstruction period of 1953-60.

Main objectives of foreign aid provided by US were (1) to prevent starvation and diseases, (2) to increase agricultural output, (3) and to provide essential consumer goods. Consequently, over 70% of foreign aid consisted of imports of commodities in finished form. The share of investment goods imported for economic rehabilitation was rather low⁹. The Korean government itself provided substantial funds to invest in basic industries and infrastructure. This fund was generated by selling aid goods to domestic users, and it accounted for more than 50% of government revenue in 1957. The relative importance of foreign aid diminished rapidly during the early 1960s as Korea started to rely heavily on foreign borrowing.

⁹ Many empirical studies in both Korea and US criticized the US aid program that there was little effect on economic growth directly because aid related to productivities improvement was little.

Table 3 shows that US project aid from July 1953 to December 1974 was concentrated heavily in the areas of transportation, manufacturing, and electric power. Agriculture, education, health, other social services received relatively minor allocations, generally amounting in each case to less than 5% of the total project aid. The economic assistance by US project aid contributed to the modernization of the Korean economy throughout 1950s-60s.

Table 3 Distribution of US project aid by sectors (million US dollars)

	Grant Aid	Development Loans	Total	
			Amount	%
Agriculture	36	0	36	4
Mining	14	9	23	3
Manufacturing	84	123	207	26
Electric power	66	87	153	19
Telecommunication	14	11	25	3
Transportation	186	40	226	28
Health & sanitation	25	7	32	4
Education	21	4	25	3
Social welfare	22	-	22	3
Other	53	-	53	7
Total	521	281	802	100

Source: Mason and Kim (1980)

(2) The phase for light industrial goods export (62-71)

The First Five-year Economic Development Plan was launched in 1962. Main objectives of the economic policy in this phase were income increment in agricultural sector, infrastructure development, and other social overhead capital development. A big proportion of government expenditure was invested in the construction of infrastructure through this plan. The average annual growth rate of gross domestic investment to GDP was 19.9%, and the share of public sector of gross domestic investment in this phase was 38.1%. The share of expenditure for transportation and communication in economic services increased to 36.5% in 1971 from 21.4% in 1962.

This phase may be characterized as the expansion period of Korean transportation network. Over two-thirds of budget for transportation sector was concentrated in the railway during the first plan, but the investment ratio to road section increased rapidly and it reached 47% of budget during the second plan. The government expanded industrial railways and railway network in the metropolitan area, and paved highways in the big cities to connect with main local cities in the beginning of 1960s.

The local railway networks were constructed to supply natural resources to key industry and to promote its export. Korea Highway Corporation was established in 1969 in accordance with the First Five-year Economic Development Plan. Gyeongin (1968), Gyeongbu (1970), Youngdong (1970), and Donghae

(1970) express highway were completed in the Second Five-year Plan. Ulsan and Pohang port were developed to promote export in Ulsan industrial complex and Pohang steel company, and Incheon port was also expanded for the export promotion in this phase. This transportation development enabled rapid movement of freight, and it also enabled regional development¹⁰.

The Plan for Development of Power Resources¹¹ started in 1962, many power stations were constructed. Chuncheon (1964), Soyanggang (1967), Uiam (1968) hydroelectric power station and Youngwol (1965), Gunsan (1967), Incheon (1970) thermal power station were constructed in this phase. Increment of electric power supply promoted industrialization and urbanization in Korea. The rapid growth of light industry in this phase can be explained by expansion of transportation and energy sector investment. This is because public investment was accumulated as social capital stock and provided a direct influence on production activities, and at the same time it created a spreading effect by indirectly promoting investment activity and employment in the private sector.

The government introduced export promotion schemes actively in the early 1960s by providing various new fiscal and financial subsidies, correcting the overvalued local currency, allowing exporters to import export-related raw materials and capital equipment freely. Encouragement for exports of traditional products was combined with the import substitution of non-durable consumer goods in this phase. Capital accumulation in the private sector was still sluggish, but the accumulation of capital in the infrastructure sector expanded rapidly. The manufacturing sector continued to expand, and as labor demand in the industrial sector increased, real wages for labor began to rise. Growth rate of manufacturing sector was much higher than that of GDP, it was 18.4%. The productivity of the agricultural sector began to rise due to the introduction of new agriculture practices and infrastructure improvement. At the same time, the labor intensive light industrial sector began to expand, and export of light industrial manufactured goods, such as food stuffs, textiles, garments, footwear, and electronic products began to rise.

The government actively used public enterprises for investment to the social overhead capital from the early 1960s, either by establishing new public enterprises or expanding existing ones¹². It was inevitable in the early stage of development because of the insufficiency of experience in private sector. The public enterprise sector in 1972 consisted of slightly over one hundred enterprises producing 9% of GNP or 13% of non-agricultural GNP. Electricity, communication, and steel were the main business for the public enterprises.

¹⁰ 60.6% of transportation expense was invested in the railway sector and 17.2% was in the road sector in the First Five-year Economic Development Plan. However, the share of transportation expense to road sector increased rapidly from the Second Economic Development Plan, it occupied over 50%.

¹¹ The periods of Plan for Development of Power Resources are the same with the period of Five-year Economic Development Plan. Demand for electricity increased sharply and it made manufacturing sector grow rapidly in this phase.

¹² For example, Korea Coal Corporation was established in 1950, as a 100% government-owned coal company to mine and supply coal as national energy resources. Korea Electric Power Corporation was established in 1961 for the purpose of supplying stable electric power and contribution to the national development.

The Korea Development Bank (KDB) was founded in 1954 for the purpose of supplying and managing major industrial capital to help development of industries and the national economy. KDB restored industrial facilities destroyed during the Korean War and prior support to the key industries such as electricity, coal, and cement for the construction of economical independence in 1950s. And it supplied fund to energy sector, heavy and chemical industries, and export-oriented industries, meeting the government's Five-year Economic Development Plans in 1960s and 1970s.

(3) The phase for heavy chemical industrial goods export (72-89)

Infrastructure development and rural development were important objectives of economic policy in this phase. The First Program for National Land Development started in 1972. The main targets of land development policy were focused on the construction of industrial complexes and transportation network, and development of rural areas. And in the early 1970s, heavy and chemical industry promotion policy was launched. The government directly channeled a large proportion of the nation's financial resources into well-established big business groups in targeted sectors.

In this phase many government-owned companies were established to support the heavy and chemical industry. Korea Heavy Industry Corporation¹³ was established in 1980, it has been playing a major role in the development of Korea's national economy by supplying industrial facilities to domestic heavy industry. Demand for iron and steel suddenly increased by rapid economic growth in the late 1970s. Pohang Steel Company (POSCO)¹⁴ was completed in 1981 to effectively handle the increasing domestic demand for crude iron and steel production. Korea Electricity and Telecommunication Corporation was established in 1981 for the purpose of supplying telecommunication facilities.

Many large-scale industrial complexes, Daegu, Kwangju, Busan, Sungnam, were built in this phase. Free trade areas, Masan¹⁵ and Iri, were also constructed in the early 1970s to promote export. To support the productive activities in the large-scale industrial complexes and free trade areas the government threw energy into the expansion of infrastructure. Many nuclear power stations, hydroelectric power stations, and thermal power stations were constructed to supply enough energy. And many express highways were constructed for the fast movement of freight. Gory, Woelsung, Uljin, Younggwang nuclear power station and Guma, Olympic, Jungbu, Jungang express highway were constructed after 1970. Telecommunication facilities were also spread quickly to support productive activities in this phase.

¹³ Hyundai Yanghaeng (formerly Korea Heavy Industry) founded in 1962 and it renamed as Doosan Heavy Industries Construction Co., Ltd in 2001.

¹⁴ The first production line manufacturing 1million tons of crude steel was completed in 1973, and 9.1million-ton production line for crude steel was established in 1983 after four expansions. The implementation of sustainable and efficient facilities and the increase in productivity of crude steel pushed POSCO to the world steel industry in 1998.

¹⁵ The cost for infrastructure equipment in Masan free trade area was over 12 billion won at current price. A big share of the expenditure was invested for the port, roads, electric power, and communication facilities in Masan free trade area.

The Korean economy recorded a remarkable performance and experienced rapid structural changes throughout the 1970s and 1980s. The share of public investment in gross domestic investment in 1979 was 35.2%. A big proportion of government expenditure was invested in the construction of economic and social infrastructures. A large difference in sector growth rates during the 1960s and 1970s profoundly affected the structure of production in Korea. In terms of current prices, the share of industrial sector including manufacturing, construction, and utilities almost doubled from 18% of GDP in 1960-62 to 35% by the middle of 1970s. Manufacturing, which accounted for only 11% of GDP in the early 1960s, contributed 29% by the middle of 1970s. In contrast, the share of the primary sector fell sharply from over 45% in 1962 to 26% in 1976.

In international trade, the import substitution for durable consumer and capital goods began in the early 1970s. The import substitution of durable goods, capital goods, and intermediate goods became internationally competitive, resulting in export of such goods in the late 1970s. The share of heavy industrial product export in total export increased from 21.3% in 1972 to 55.3% in 1989. On the contrary, non-durable consumer goods became uncompetitive and imports began to increase. Annual average growth rate of GDP was 7.1%, and export grew at 27.1% during this phase. The share of light industrial products export in total export began to decrease and that of heavy industrial manufactured and intermediate goods in total export began to increase rapidly.

3.3 The patterns of demand for infrastructure

Recognizing that Korea lacked social overhead capital after the Korean War compared with other advanced countries, the government promoted the expansion of public investment actively through the Five-year Economic Development Plans. During the 1960s-70s, high level of investment was sustained by substantial increases in both domestic and foreign savings. The rates of return on investment were high, and a large share of profits was reinvested. Korea experienced a remarkable economic growth in a short period. This shortened period of economic development phases is well known as “compressed development phases” due to the late comers’ advantage¹⁶. Rapid economic growth was able through active government investment in the economic infrastructure.

The investment in the power stations, highways, and communication facilities needs a long run period as well as enormous cost of construction. Therefore, the prediction of long-term demand for infrastructure is very important. The pattern of demand for infrastructure is reflected by the economic structure change and demographic change. Industry’s share of GDP in Korea increased about 10 percentage points per decade during the 1960s and 1970s. In 1960 industry’s share of GDP was 20.1%, in 1970 it was 29.2%, and by 1980 it reached 41.3%. After 1980, however, the industrialization process slowed, reaching 43% in 1987. The annual average growth rate of population was 2.9% in the early 1960s, and 1.6% in the 1970s and it

¹⁶ Il Sakong (1993) discussed the advantages of Korea as a late developer.

decreased rapidly to 0.9% in the 1980s.

Table 4 shows the phase of economic development with the average annual growth rates of GDP per capita and gross investment, and demand for transportation, electricity, communication. It indicates the enormous investment in infrastructure sector to meet the demand for the infrastructure needed to support the compressed development phases, which can also be described as higher economic growth rates. The annual average growth rate of infrastructure demand exceeds that of GDP per capita in almost every period.

The demand for transportation tends to have a different pattern from that of electricity and communication¹⁷. The provision of roads, railways, and ports rises less than proportionately with population and income level. This may mean that additional demand does not require additional supply. This result suggests that these forms of infrastructure may serve to link places together, with traffic flows that are generally below their capacity levels, and are consistent with the idea that they provide transportation services which are, to some extent, of a non-rival, public goods nature. Transportation, electricity, and telephone demand have significantly affected subsequent growth rate of GDP per capita.

The patterns of average annual growth rate of infrastructure demands from 1954 are plotted in Figure 1. From this figure, we can see the growth rate of infrastructure demand was much higher than that of GDP per capita. It means that government investment in infrastructure is important to meet the demand for it in the early stage of development. The empirical evidence of investment in infrastructure and economic development can provide important implications to developing countries. Infrastructure development, especially, roads, electric power, and communication sectors are extremely important for the rapid economic growth in the early phase of development in developing countries. And infrastructure has to expand fast enough to meet the demand for infrastructure in the early stage of development.

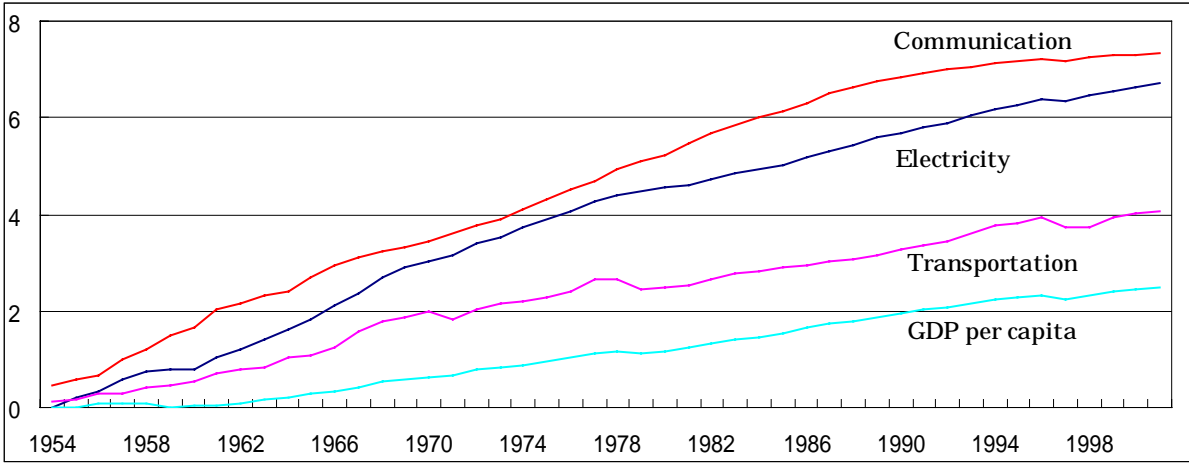
Table 4 Growth rate of GDP per capita, investment, and infrastructure demand (%)

Development phase	GDP per capita	Gross investment rate of GDP	Transportation	Electricity	Communication
1954-1961	1.2	11.2	7.6	11.5	23.5
1962-1971	6.0	19.9	14.5	22.4	17.9
1972-1989	6.5	29.7	6.1	13.3	17.8
1990-2001	5.1	33.6	7.6	9.5	4.9
Total	5.2	22.9	8.8	15.5	19.0

Source: Computed from Il Sakong (1993) and Korea national statistical office
 Note: Average annual growth rate in each period. Transportation represents cargo traffic includes road, railway, water, and air, and communication represents telephone.

¹⁷ Canning (1998) reported that transportation infrastructure appears to increase less than proportionately with population, and increases with income only after a middle-income threshold has been reached.

Figure 1 The patterns of demand for infrastructure and GDP per capita



Source: Derived from Il Sakong (1993) and Korea national statistical office
 Note: Accumulative annual growth rates from 1954

4. The effect of infrastructure investment on economic growth and income distribution

According to Yoshino and Nakahigashi (2000), the economic effects of infrastructure can be broadly divided into two types. One is the demand creation effect in other economic activities which is induced by investment itself. The construction of infrastructure increases local demand in other sectors, creating jobs and stimulating the economy in the region, and thereby increasing total regional production. On the other hand, the infrastructure investment brings about effects as a stock. There are the effects that, through the improved services provided by infrastructure stock, indirectly production costs of the private sector will be reduced and their productivity will increase, thereby production in the areas will be raised¹⁸.

The government investment in major infrastructure sector will be reviewed here. And then the effect of government expenditure for infrastructure development on economic growth and income distribution will be also analyzed.

4.1 The investment in infrastructure and economic growth

As can be seen from table 4, the growth rate of gross investment in each development phase is much higher compared with the growth rate of GDP per capita and that of infrastructure. The public investment in the government’s annual budget and the nation’s total investment were important for economic growth. More than one-third of the government annual budget was allocated for investment purposes, and it was equivalent to more than 27.4% of gross domestic fixed capital formation for the period of 1962-80. And the share of public sector investment in total investment averaged about 35.8%. The social overhead capital sector received close to two-thirds of total fiscal funds for public investment and loans for the same period.

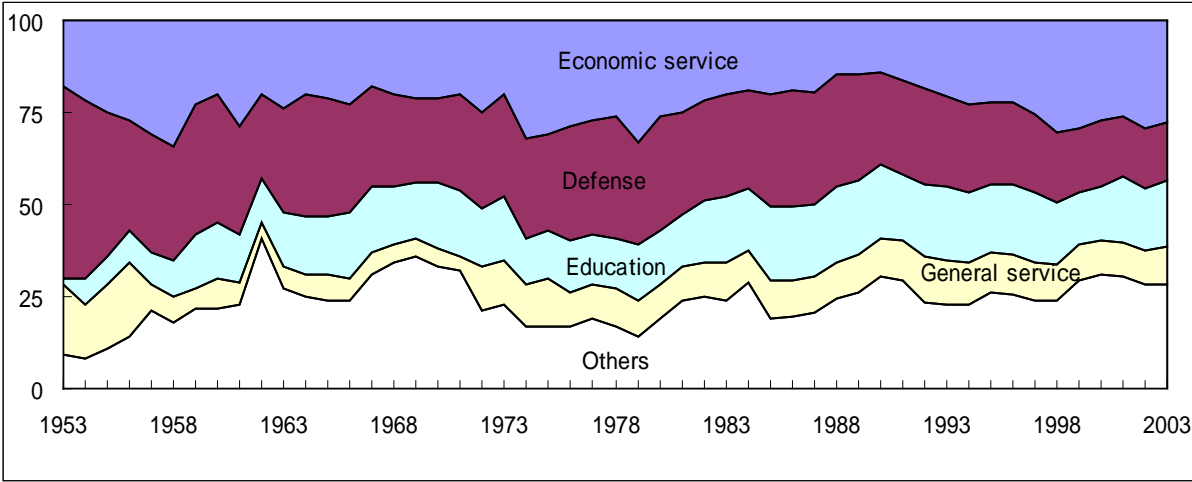
The composition of government expenditure for public investment and loans in terms of sectoral

¹⁸ Yoshino and Nakahigashi called it the production effect of the infrastructure investment.

distribution can be seen in figure 2. It shows that investment to economic services rise from the latter of 1950s. Soon after the Korean War, the share of expenditure for defense was very high, and it was equivalent to more than half of total expenditure. However, the share of defense decreased from the middle of 1950s, and then expenditure for economic and social service increased. As the Five-year Economic Development Plan started, the expenditure to the economic service increased gradually.

Table 5 shows that the government investment in infrastructure area such as transportation and communication increased rapidly in the early stage of development. And it also shows that the agriculture, fishery and forestry sectors received a substantial proportion of government funds. This was primarily for enhancing productivity through the construction of farming roads, bridges, reservoirs and dams. A downward trend in allocations to the mining, manufacturing and construction sector is noticeable. During the earlier stages of development, the private sector was not prepared to undertake big projects involving large scale investment and considerable risk. However, as the economy developed, the necessity of government’s direct involvement in these sectors decreased. The downward trend is, therefore, a reflection of the Korean government’s pragmatic and flexible approach to determining the appropriate level of involvement in investment activities.

Figure 2 Functional classification of general government expenditure (%)



Source: Derived from Roy Bahl (1986) page 266-67 and ADB

Table 5 Composition of economic service expenditure (%)

	1953	1958	1965	1970	1975	1980	1985	1990	1995	2000
Agricultural and non-mineral resources	38.6	37.6	32.1	27.1	15.3	36.0	38.2	35.7	29.4	17.1
Fuel and power	5.1	2.1	4.4	9.2	14.8	16.0	9.3	4.1	1.9	9.2
Mining, manufacturing, and constructions	47.0	27.0	18.7	15.7	6.3	3.0	6.1	2.0	0.6	0.0
Transportation and Communications	9.3	32.0	37.2	41.1	40.2	29.0	25.8	32.2	49.2	55.0
Other economic services	-	1.4	7.4	6.9	23.3	17.0	20.6	26.0	19.0	18.7

Source: Derived from Roy Bahl (1986) page 161 and ADB

Total domestic freight more than tripled in the period of 1963-75 by the construction of the transportation network. Freight moved by highway increased rapidly, the share of total freight transported by road rose from 45.3% to over 60.8%, while the share of freight moved by railway declined. Just as significantly, the average distance hauled for a highway cargo almost doubled. During 1954-63 period, US aid provide 18.9% of the funds invested in highway construction, with the bulk of the aid going to paving and a lesser share to the building of bridge¹⁹. Beginning with the first Five-year Plan, increasing attention was paid to paving non-urban roads and the share of national inter-city roads paved had reached 44% by 1975. The construction of expressway to link major cities and regions of Korea was begun in 1969, and the sudden ability to move freight and passengers at high speed from many parts of the country to urban centers revolutionized cash-crop farming for the areas most directly affected.

Supply of electric power increased quickly by the Plan for the Development of Power Resources from 1962. Stable and sufficient electric power supply greatly contributed to improving the productivities in manufacturing and mining industry. Electric power has also increased the productivity in farm household. Many surveys estimated the relationship between fixed capital increment by infrastructure investment and GDP per capita. Lee (2002), Kim and Hong (1997), Kim (1998), Il Sakong (1993), Mizoguchi (1988) have obtained the result that infrastructure investment had a strong positive effect on GDP per capita. Infrastructure investment stimulated the economy in the region and it increased production through increasing productivity.

4.2 The investment in infrastructure and income distribution

Chenery (1974) pointed out that the income disparity would be improved by the tricking effect and spill over effect when economic growth continues for a long period. Kuznets (1955) also argued that countries with low levels of development have relatively equal distributions of wealth. As a country develops, it acquires more capital, which leads to the owners of this capital having more wealth and income and introducing inequality. Eventually, through a variety of possible redistribution mechanisms such as trickle down effects and social welfare programs, more developed countries move back to lower levels of inequality.

The urban poor often benefit most directly from good infrastructure services. And a region close to urban centers receives infrastructure services easily such as electric power and paved roads. Paved roads and expressways have been the major catalyst in reducing rural isolation, and electric power has increased the productivity in farm household. Rising urban demand had its major impact on farmers living near major cities, but in the late 1960s and 1970s road network was expanded dramatically bringing most of the nation's rural areas within economical reach of the cities. Infrastructure development in rural areas has a considerable impact on the regional distribution of rural income. Urbanization and the development of an

¹⁹ Referred from Ban (1980) page 154, table 62 US assistance to Korean road investment.

extensive road network in the 1960s and 1970s have led to the rapid growth of vegetable production and other cash crops destined for urban markets. The major beneficiaries of this trend located near enough to roads and cities to have access to urban markets.

Farm output and real farm income in Korea have increased considerably since the first Five-year Plan in 1962. Land and climate, and population have by themselves determined the basic patterns of Korea's regional farm production and income for much of the twentieth century but, since the early 1960s, urbanization and industrialization have increased very rapidly, and the degree to which rural areas have been in contact with this modern development has significantly affected their farm economies.

Since the beginning of the rural electrification program in 1965, the share of farm households in Korea with electric power has increased from 12% to over 60%. In terms of total per capita output by region, during the period of 1938-75, Kyonggi province, the closest region to Seoul, has since the Japanese colonial period, enjoyed a considerably higher per capita product than other regions²⁰. There was a large difference in total per capita output between Kyonggi and other provinces in 1938, but it gradually improved with provision of roads network and electric power.

As in most countries, in Korea there has been a substantial and persistent gap between urban and rural incomes. We can see from table 2, the wage in rural area was below the half of that in the urban area in 1911-35. And table 6 shows that income distribution between the rural and urban household was equitable in the 1960s, but it deteriorated from the later half of the 1970s. Rural income in 1980 was only half of that in the urban areas on a per capita basis. But the gap narrowed in the later half of the 1980s through the expansion of government investment for the rural development before the income distribution deteriorated again in the 1990s.

Table 6 Income distribution (1,000 won, current price)

	Rural Income		Urban Income		Ratios (%)	
	(1) per household	(2) per capita	(3) per household	(4) per capita	(1)/(3)	(2)/(4)
1963	83	130	80	144	103.3	89.9
1965	107	210	113	156	94.7	134.6
1970	232	251	381	321	60.9	78.2
1975	859	384	723	501	84.1	76.9
1980	2494	488	4133	910	60.3	53.6
1985	5552	807	7440	1256	74.6	64.3
1988	8130	1273	12228	1912	66.5	66.6
1996	23298	2590	44364	4640	52.5	55.8

Source: Computed from Mason and Kim (1980) page 428 and Korea statistics office

Note: Per capita incomes are market price at 1980

²⁰ Referred from Ban (1980) page 137, table 56 total per capita output by region, 1938-75.

Gini coefficient moved up from 1960s and income disparity peaked in 1976 and then decreased continuously just like the Kuznets U curve hypothesis. This examination indicates that concentrated infrastructure development in urban area has a trend to improve the income disparity in overall nation but to deteriorate the income disparity between urban and rural area. Therefore, development of road network and electric power in rural area is indispensable to narrow the income gap between urban and rural area.

5. Infrastructure development and economic development in Japan

Demand for and government investment in infrastructure, and the relationship between economic development and infrastructure in Korea have been discussed so far. We could find that demand for infrastructure increased and government expenditure for infrastructure also increased to meet the demand in early stage of development. And we also could confirm that infrastructure development has a positive impact on income distribution in overall nation at later stage of development. However, it is difficult to prove whether the demand patterns and government investment in infrastructure development in Korea are unique or general. By using other countries' case, it should be possible to build a persuasive argument. The case study of Japan in infrastructure development and economic growth will be carried out hereunder, to examine factors of similarity and disparity with the case of Korea.

5.1 Patterns of demand for infrastructure

The rebuilding of economic infrastructure was the key factor in the remarkable recoveries achieved by Europe under the US Marshall Plan and Japan under aid from the US and the World Bank after the end of the War. As shown in table 7, the process of Japan's economic development during the 1887-2001 can be divided into six phases²¹.

The patterns of infrastructure, such as electricity, transportation, and communication in Japan from 1880s to 2001 will be discussed hereunder. The first electricity service in Japan started in 1886. Through the early stages of electricity development led by private sector, it was the period (1890-1920) known as the era of Japan's industrial revolution during which demand for electric power grew rapidly. The power revolution brought by electricity development complemented labor intensive manufacturing industries, and light industry sectors shifted from import substitution to export orientation. This enabled a further growth of the economy through capital accumulation, and absorbed surplus labor in rural areas, as well as raising the real wage rates of labors.

According to Ohkawa (1965), the total cargo traffic increased by an average annual growth rate of 8% for approximately 50 years before the war, and 10% over the 30 years postwar. Then, the slowed economic

²¹ Kohama and Ohkawa (1994) divided the economic development phases of Japan into five. Yoshida (2000) also divided Japan's economic development phases into five, import substitution phase for light industrial goods (1887-1904), export for light industrial goods (1904-19), import substitution for durable consumer and capital goods (1919-38), import substitution for durable consumer and capital goods (1954-65), and export phase for durable consumer and capital goods (1965-75).

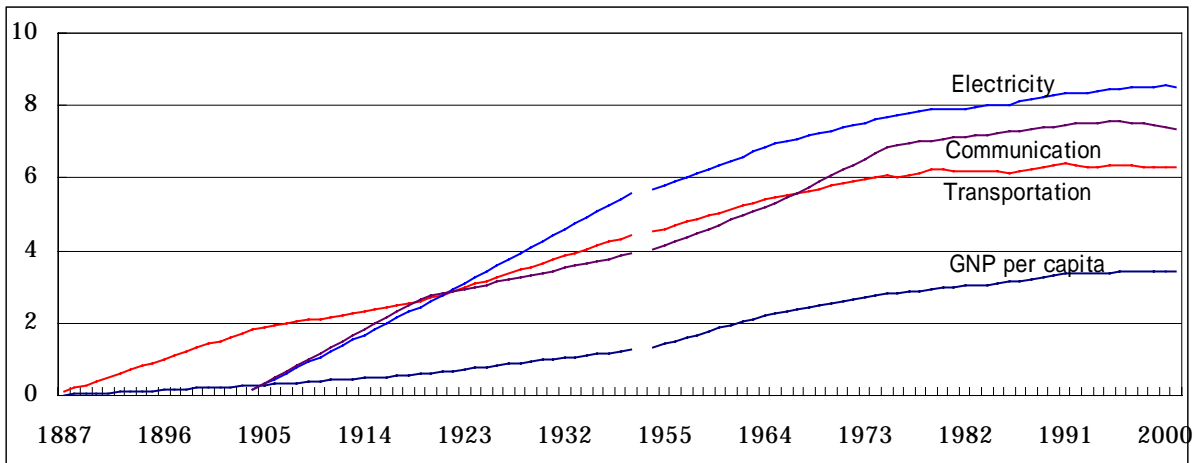
growth and major shifts of economic structure which followed the 1974 oil crisis reduced the growth rate of total cargo traffic. The average annual growth rate of total cargo traffic was only 2.2% in the 1970s-1990s. The government after the Meiji restoration placed a top priority on the development of telegram network to facilitate public order and national defense as well as to establish a centralized state authority. Telephone exchanges were installed under official management between Tokyo and Yokohama in 1890.

Table 7 Growth rate of GNP, investment and infrastructure demand (%)

Development phase	GNP per capita	Gross investment rate of GDP	Transportation	Electricity	Communication
1887-1904	1.5	9.7	10.1	-	-
1904-1919	2.1	14.8	5.1	15.3	16.7
1919-1938	3.5	18.4	9.7	16.5	6.5
1954-1965	8.6	27.0	8.9	11.3	11.6
1965-1975	5.1	33.4	5.6	7.5	15.4
1975-2001	2.4	29.3	0.8	3.2	2.4
Total	3.4	21.7	6.2	10.2	9.0

Source: 1887-1975 derived from Yoshida (2000), Sawamoto (1981), and Ohkawa (1965). 1975-2001 derived from Japan Soumushou.

Figure 3 Growth rate of demand for infrastructure in Japan



Source: Derived from Yoshida (2000), Sawamoto (1981), Ohkaw a(1965), and Japan Soumusho.

Note: Accumulative annual growth rate from 1887

Demographics change and economic structure change have extremely strong effects on infrastructure demand. As shown in table 7, the growth rate of demand for infrastructure is extremely high in the early phase of development, such as import substitution phase for light industrial goods and export phase for light industrial goods. Figure 3 is showing accumulative growth rate of demand for infrastructure in each phase of development. Demand for electric power was growing much higher rate than that of other infrastructure and GNP per capita. The total cargo traffic increased 10.1% by an average annual rate during the 1887-1904. After this period the growth rate of total cargo traffic was decreasing like the case of Korea.

However, the growth rates of electricity and communication sector were continuously high and they effected on subsequent growth of GNP per capita. We could notice that there is a significant relationship between infrastructure and growth rate of GNP per capita in early stage of economic development.

5.2 Government investment in infrastructure and income distribution

Postwar, the investment for breaking infrastructure bottlenecks took priority place to maximize the economic growth as a prime concern. The share of investment in infrastructure in fixed capital formation in 1890s-1960s was over 50%. Especially investment in transportation and communication sector was enormous. Figure 4 and table 8 are showing the trends of investment in infrastructure in the period of 1870s-1960s. The share of infrastructure in government fixed capital formation was extremely high from 1870, and then this trend was continued almost every year. Economic infrastructure such as roads, railways, ports, and telecommunication was major sectors in infrastructure investment in the same period.

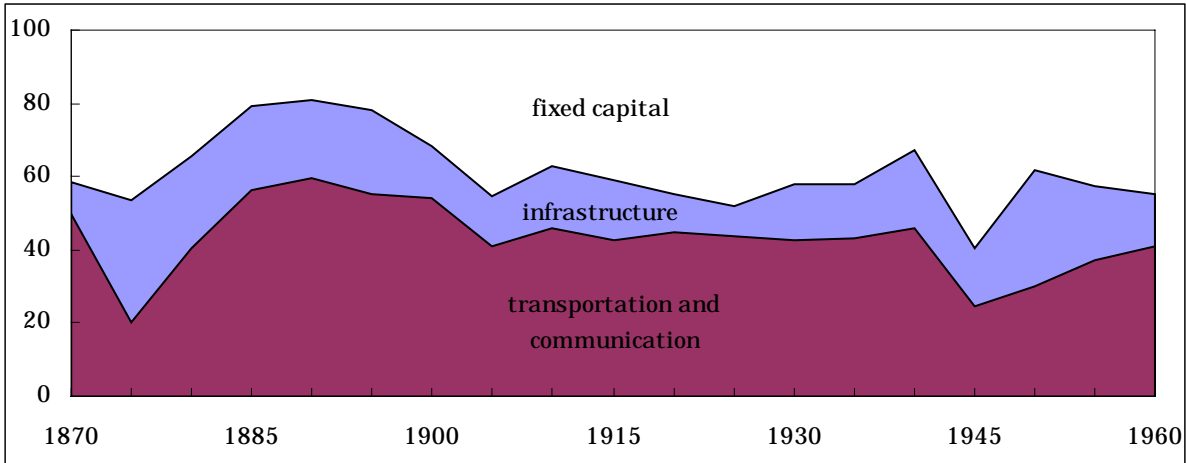
Priority for infrastructure development was evidenced by the way which infrastructure investment was focused on the major metropolitan areas, which were economically dynamic. This biased allocation of resources was completely appropriate, given the need to emphasize economic efficiency above other concerns at a time when financial resources for investment were extremely scarce. For local area development, the first priority in infrastructure investment was given to the conservation and development of nature resources, such as the prevention of natural disasters, increased staple food production and the development of electric power sources. Following the above, infrastructure investment continued for the improvement of urban and industrial areas and for managing water resources. These priorities were matched with the extremely rapid industrialization and urbanization.

The Income Doubling Plan in 1960, advocated development of the major metropolitan areas and their surrounding areas, and focused on infrastructure development to achieve its goals. Infrastructure development for rural areas was regarded as complementary. From the start of the 1960s, the problem of regional income disparities and excessive centralization emerged as political issues. In 1962 the Nationwide Comprehensive Development Plan was approved by the cabinet, and up till now the infrastructure investment has been recognized as an important tool to achieve balanced development of the national land, namely correcting regional income disparities.

The relationship between regional incomes and infrastructure investment in Japan was examined by many surveys. Yoshida (2000) examined it using per capita GDP and the Theil inequality index which indicates the degree of income inequality between eight regions from 1955 to 1985. According to Yoshida, the per capita infrastructure investment in the low income areas was much higher than in the high income areas in 1980. This tendency was most prominent in the 1970s and 1980s. The infrastructure investment was centered on local areas as a means of achieving the inter-regional balanced development in the Nationwide Comprehensive Development Plan in 1962. The level of per capita income in the low income areas was considerably below the maximum disparity line. Thus it can be inferred that more infrastructure

investment in the less developed regions has made a positive contribution to achieving the policy objective of correcting income disparities among the regions. He found that the regional income disparity peaked in 1960 and then declined, before rising again from 1985. Under the Income Doubling Plan in 1960, the purpose was to maximize economic growth and distribute industrial locations fairly among the regions.

Figure 4 Investment for infrastructure in Japan (%)



Source: Derived from Sawamoto (1965)
 Note: Price at 1960, average of every 5 years

Table 8 Infrastructure investment in Japan (%)

	agriculture, forestry, fishing	mining, manufacture	construction	transportation, communication	services	all industry
1888-1900	17.8	19.3	5.5	6.8	50.6	100
1900-1910	20.8	29.2	5.9	17.3	26.8	100
1910-1920	11.0	26.5	2.0	16.5	44.0	100
1920-1930	7.1	42.4	10.5	33.0	7.0	100
1930-1938	4.9	50.5	11.2	8.0	25.4	100
Prewar	9.6	38.4	7.9	15.2	28.9	100
1955-1960	5.9	28.1	13.7	14.8	37.5	100
1960-1970	2.0	33.5	13.9	12.5	38.1	100
1970-1980	-0.3	32.0	7.1	8.5	52.7	100
1980-1987	0.6	36.0	3.8	9.9	49.7	100
Postwar	1.1	33.4	8.8	10.6	46.1	100

Source: Derived from Minami (1992), table 5-3

6. Implication of infrastructure development to developing countries

What lessons can be shared with developing countries on the basis of the Korea’s experience of infrastructure development as reviewed so far? Implications of Korea’s experience of infrastructure development will be discussed in comparison with the case of Japan hereunder.

6.1 Lessons from Korea and Japan's infrastructure development

It is possible to prove that infrastructure development in Korea was important in the early stage of economic development by reviewing the case of Japan. This examination will provide some implications about infrastructure development to developing countries. The growth trends of demand for electricity, transportation, and communication in respective development phase in Korea and Japan are extremely similar. And the correlations between infrastructure development and economic growth are also similar. The effect combined flow effects and stock effects of infrastructure investment positively effected on economic growth. Among the infrastructure, especially transportation and communication has a strong impact on economic growth.

However, income disparities between urban and rural area have a trend to deteriorate when infrastructure investment extremely focused on urban development. The urban poor benefited directly from the good infrastructure services, and a region close to metropolitan area received infrastructure services easily. According to many analyses, more infrastructure investment in the less developed regions has made a positive contribution to achieving the policy objective of correcting income disparities among the regions. And gini coefficient rises in early stage of development but it falls as economy grows.

Korea's annual growth rates of demand for infrastructure exceed those of Japan. This indicates that the enormous investment in Korea's infrastructure sector to meet the demand for the infrastructure needed to support the compressed development phases. And growth rate of demand for infrastructure in the early phase of development was much higher than in the phase of high economic growth. It is very important to predict infrastructure demand in the long run what development phase the country stands at, changing directions of demographics and economic structure. This empirical evidence of infrastructure investment and demand, proved for Korea and Japan, can provide important implications for infrastructure development in developing countries.

6.2 Korea's ODA for infrastructure development

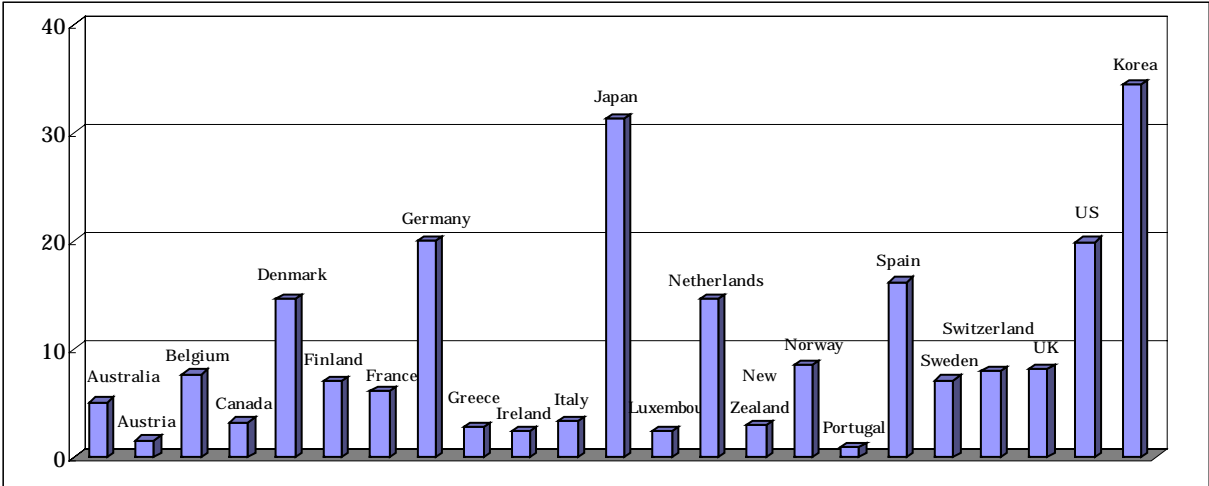
Korea has provided a large share of bilateral ODA for the development of infrastructure while DAC member countries have provided it for the poverty reduction, social development and conservation of environment. Especially, Korea's bilateral ODA was channeled into the transportation, communication, and energy sector which would be expected to have a strong impact on economic growth for developing countries. Support to these sectors is also expected export expansion effect for the Korean company²². The share of transportation, communication, and energy sector was 34.3% in bilateral ODA in 2003.

Japan has also been providing a large share of bilateral ODA for economic infrastructure development. Figure 5 is showing the share of infrastructure sector aid of bilateral ODA in OECD member countries in 2004. It shows that Korea and Japan provide a large proportion of ODA for the economic infrastructure

²² Ruttan (1989) asserted that commercial contacts that made during a period of aid assistance for the development of a nation's transportation and communication network can be expected to continue.

development compared with other OECD countries. Considering the experiences of infrastructure investment in the early stage of economic development of Korea and Japan, aid for economic infrastructure is extremely important to attainment the main development targets in developing countries, such as urbanization, industrialization, equitable income distribution, and sustainable economic development.

Figure 5 ODA for economic infrastructure development in 2004 (%)



Source: Derived from OECD
 Note: The figure of Korea is in 2003.

7. Conclusion

This paper attempted to examine the Korea’s experience in developing its infrastructure for economic growth comparing with the case of Japan in order to derive useful lessons for developing countries. Investment in transportation and energy sector under the Japanese colonial rule had a strong positive impact on the industrialization and urbanization in the Korean peninsula. The Korean government has been investing a great share of expenditure for the infrastructure development in the postwar period. Construction of roads, power stations, and communication created jobs and stimulated the economy of the regions, and thereby increasing total regional production. And infrastructure investment was able to reduce the production costs indirectly and raise their productivity, and it raised the production in the regions.

However, there is no evidence that infrastructure investment corrected the regional income disparities between urban and rural area, manufacturing and agricultural sector in Korea. A great part of central expenditure was concentrated in the major metropolitan areas. And it channeled for the increment of production in mining and manufacturing sector. This biased allocation of resources deteriorated income disparities among the industries and regions.

The Japanese government also actively invested a large share of the central expenditure for the development of infrastructure in the period of 1887-1975. The investment in infrastructure was focused on the major metropolitan areas before the Nationwide Comprehensive Development Plan was implemented.

The biased infrastructure investment brought the problem of regional income disparities and excessive centralization. After 1962, infrastructure investment has been recognized as an important tool to achieve balanced development of the national land, correcting regional income disparities. More infrastructure investment in the less developed regions has made a positive contribution to achieving the correction of income disparities among the regions.

The lessons learned from the experience of infrastructure development in Korea and Japan are extremely important things and could be passed to developing countries. And it gives both Korea and Japan a comparative advantage in development cooperation with developing countries in the future. They can provide persuasive development strategies and models from their own development experiences. These days the role of ODA is very important to realize economic growth of developing countries. Infrastructure development is essential for attainment of the objectives of development policy in developing countries such as sustainable development, equitable distribution of income, and preservation of environment. Therefore, supporting infrastructure development is an extremely important not only for ODA, but also in the private businesses and NGOs.

References

<Japanese>

Ishizaki Tadao (1983), *Distribution of income and wealth in Japan*, Toyo Keizai Shinposha.

Minami Ryoushin (1992), *The Economic Development of Japan*, Toyo Keizai Shinposha.

Mizoguchi Toshiyuki (1988), *Basic economic statistics of former Japanese colonies 1895-1938*, Toyo Keizai Shinposha.

Ohkawa Hitoshi and Hirohisa Kohama (1993), *Theory of Economic Development: Japan's Experience and Developing Countries*, Toyo Keizai Shinposha.

Sawamoto Moriyuki (1981), *One Hundred Years of Public Investment*, Taisei Shuppansha.

<Korean>

Ha Hungu and Kim Choenkon (2000), *The Situation, Problem, and Prospect on Procurement of Capital for the Transportation Investment*, Transportation Development Institute.

Kim Kwangsuk (1998), *The fact of economic growth and prospects for the potential to economic growth in Korea*, World economy institute.

Lee Jongwon (2002), *Korean Economy*, Yulgok Chulpansa.

Park Taeseop (2003), *Korean Economic Development*, Hyungseul Chulpansa.

Soe Kiwon (1996), *Korean Economy*, Yu Pung Chulpansa.

<English>

Anwar Shah (1992), Dynamics of Public Infrastructure, Industrial Productivity and profitability, *The Review of Economics and Statistics*, Vol.74, No.1, pp.28-36.

Ban Sung Hwan, Pal Yong Moon, and Dwight H. Perkins (1980) *Rural Development*, Cambridge, Mass, Harvard University.

Canning David (1998), A Database of World Infrastructure Stocks, 1950-95, *Working Paper*, World Bank.

Chenery, H.B. (1974), *Redistribution with Growth*, London: Oxford University Press.

_____ (1979), *Structural Change and Development Policy*, New York: Oxford University Press.

Denison Edward F and William K Chung (1976), *How Japan's Economy Grew so Fast*, The Brookings Institution.

Devarajan, Swaroop, and Heng-fu Zou(1996), The Composition of Public Expenditure and Economic Growth, *Journal of Monetary Economics*, 37, pp.313-44.

Easterly and Rebelo (1993), Fiscal Policy and Economic Growth, *Journal of Monetary Economics*, 32, pp.417-58.

Gerschenkron A (1962), *Economic Backwardness in Historical perspective: A Book of Essays*, Harvard

- University Press, Belknap Press.
- Hirshman Albert O (1958), *The Strategy of Economic Development*, Westview Press.
- Il Sakong (1993), *Korea in the World Economy*, Institute for International Economics.
- Kazushi Ohkawa and Henry Rosovsky (1973), *Japanese Economic Growth*, Stanford University Press.
- Kim Kwangsuk and Kim Joonkyung (1997), "Korean Economic Development: An Overview," in D. Cha, K. S. Kim, and D. Perkins(eds.), *The Korean Economy 1945~95: Performance and Visison for the 21st Century*, KDI.
- Krugman Paul (1994), The Myth of Asia's Miracle, *Foreign Affairs*, Nov/Dec.
- Kuznets Simon (1955), Economic Growth and Income Inequality, *American Economic Review*, 45, pp.1-28.
- Mason Edward S, Kim Mahn Je, Dwight H. Perkins, Kwang Suk Kim and David C. Cole (1980), *The Economic and Social Modernization of the Republic of Korea*, Harvard University Press.
- Mosley Paul (1985), The Political Economy of Foreign Aid: A model of the Market for a Public Goods, *Economic Development and Cultural Change*, Vol.33, No.2, pp.373-93.
- Naoyuki Yoshino and Masaki Nakahigashi (2000), Economic Effects of Infrastructure; Japan's Experience after World War , *JBIC Review*, No.3. pp.3-19.
- Narayana R. Kocherlakota and Kei-Mu Yi (1996), A Simple Time Series Test of Endogenous vs. Exogenous Growth Models, *The Review of Economics and Statistics*, Vol.78, No.1, pp.126-34.
- Nurkse, R., (1953), *Problem of Capital Formation in Underdeveloped Countries*, Blackwell.
- Roy Bahl, Chuk Kyo Kim and Chong Kee Park (1986), *Public Finances during the Korean Modernization Process*, Harvard University Press.
- Takeshi Shinohara (2000), IT Revolution and eODA, *JBIC Review*.
- Tsuneaki Yoshida (2000), Japan's Experience in Infrastructure Development and Development Cooperation, *JIBC Review*, No.3 Dec, pp.62-92.
- Vernon W. Ruttan (1989), Why Foreign Economic Assistance?, *Economic Development and Cultural Change*, Vol.37, No.2, pp.411-24.
- World Bank (1994), *World Development Report*, Oxford University Press.
- Young Alwyn (1995), The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience, *The Quarterly Journal of Economics*, Aug.