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COUNTRY SURVEY: Republic of Korea

***Trends in Technology Transfer Policy and
Effects on Technological Capacity Building****

* This document has not been edited.

I. Introduction

Over the past three decades, Korea has made a phenomenal economic achievement. Since 1962 when the First Five-Year Economic Development Plan was launched, the Korean economy has been growing at an average annual rate of 9 percent, raising the GNP per capita from \$87 in 1962 to \$5,600 in 1990. Korea has indeed undergone a remarkable transition over a short period of time from a stagnant agrarian economy to a newly industrialized one leading the economic dynamism of the Asia/Pacific Region.

As late as in 1961, Korea was a typical agricultural economy deriving more than 36 percent of its income from agriculture, forestry and fisheries, with a manufacturing industry accounting for only 12 percent of its production. But the Korean economy has gone through a tremendous shift since then, and evolved as one of the fastest growing economies of the world, and as one of the major producers and exporters of manufactured goods.

Korea's achievement is all the more remarkable because the success has been made out of virtually nothing. Korea was left with a distorted socio-economic base when it obtained independence from Japanese rule in 1945. The industrial base, mostly in the northern part which Korea inherited from Japan was to serve Japan's economic and political purposes, and could not function as a base for Korea to build its own economy. The political vacuum and social disorder after the independence from Japanese rule, the division of the nation into South and North by the cold-war political arrangement, and the Korean war

that ensued were enough to shatter Korea as a nation and flatten its economy. General Helmick, who served as Deputy Governor of the US Military Administration in Korea from 1945 to 1948, diagnosed that Korea would not be able to transform its bull-cart economy into an industrial one, and this diagnosis was shared by virtually all of the political leaders and economic experts of the time.(Seo, 1993) In a word, Korea's future then appeared more than bleak.

Korea is also put in extremely unfavorable environments, both geo-politically and geo-economically. Geo-economically, Korea is one of the most densely populated countries in the world, with a population of 70 million living on a small land of 220 thousand square kilometers, 75 percent of which is non-arable mountains. Korea's population however is still short of the critical level required to form a market which is large enough to support domestic industrial activities. Geo-politically, Korea borders with super-powers of the world: in the North with China and Russia, in the South with Japan, and across the Pacific with the United States. These four powers have been the sources of political, economic changes in the Korean Peninsula, and have been repeating confrontation and cooperation with each other on the issues of this small country. Depending on the power relations among those countries, Korea had been colonized or decolonized, and suffered or prospered.

The question, we may ask now, is how Korea has been able to overcome all those hardships and constraints and accomplish such a remarkable success. A unanimous diagnosis among economists is that Korea could succeed mainly due to the well-educated, hard-working

labor force and its efforts for scientific and technological development. As a matter of fact, Korea, being endowed with virtually no natural resources, has had no choice but depending on its human resources and science and technology for its economic growth. Korea's development strategy can thus be put in a phrase --"bold introduction of advanced technologies from foreign sources for assimilation and improvement while promoting the development of a domestic capacity for technological development." As many put it, industrialization in Korea has been a process of learning or industrialization on the basis of learning rather than of invention or innovation. (Amsden, 1989; Kim 1991) Together with many other late-comers, Korea, as a learner jumped into the mature markets dominated by inventors, and contested with the advanced economies using its lower wages, higher subsidies, as well as intense efforts to improve borrowed production technologies. In other words, Korea began its industrialization on the basis of simple technologies at their mature stage and built up comparative advantage in labor-intensive mature industries by rapidly learning and acquiring production know-hows. Of course, the success of this strategy was possible due to a combination of factors -- well-educated but low-wage workers, appropriate state policies, entrepreneurial efforts, and favorable international economic environments.

But, turning into the 1980s, international techno-economic environments have been changing in a way unfavorable to the newly industrialized economies including Korea. The United States and European countries began to move towards protectionistic policies in both trade and technology transfer, while mounting pressure on the late-comers to liberalize their trade and industrial policies. At the same

time, with the emergence of the New NIES (Malaysia, Thailand, Indonesia, etc.), Korea, if not all the NICs, has been losing its comparative advantage in low-wage based, labor-intensive commodity markets. Furthermore, in the face of increasing pressures on Korea for strengthened protection of intellectual property rights, Korea can no longer rely upon imitative reverse engineering of foreign products as a means of learning and acquiring technologies. To respond to these changes, and to sustain and strengthen its growth momentum, Korea needs to make a major shift in its industrial and technological policies.

This paper will critically review the industrial development and technology transfer policies of Korea, analyze how Korean industries responded to such policies, and discuss how the government is shifting its policies and strategies in the face of the changing international environment.

II. Industrial Development and Technology Transfer Policies of Korea: 1960s-1980s

As has been noted, industrial development in Korea has been a process of learning based on borrowed foreign technologies. Thus the role of foreign technologies in the industrialization of Korea has been critical, and Korea's economic growth would not have been possible without foreign technologies. As such, technology transfer policy in Korea has been closely linked to industrial development strategy which has been and still is at the core of the national development plans. The modes and contents of technology transfer have been directly and indirectly affected by the industrial development policy, and the current industrial structure is also partly attributable to the past technology transfer policies. It is therefore quite natural that technology transfer policy of Korea has been adjusted in response to industrial development and industrial development strategies.

What follows is a review of the industrial development policies and corresponding technology transfer development policies in Korea during the past three decades.

1. 1960s (1962-1971):

This was the period when Korea succeeded in freeing its people from wide-spread, chronic poverty and laying a foundation for economic development. It was in 1962 that Korea launched its First Five-Year Economic Development Plan. This and subsequent second development plan initiated an outward-looking development strategy targeting at

building up light consumer-goods industries for import substitution and expanding exports of industrial goods to obtain foreign exchanges needed for industrialization. Other important objectives of the plan were to build basic industrial infrastructure such as electricity and transportation, and to develop several key material-supplying industries including fertilizers, cements, petroleum refineries and chemical fibres.

To promote exports, the government provided incentives including exemption of import duties for intermediate goods, parts and components to be used for producing export products, reduction of corporate tax for exporters, and preferential financing for export activities. To expand import-substitution industries, the government encouraged foreign loans and foreign direct investment on the basis of the Foreign Capital Inducement Law of 1962. But Korea later ran into serious foreign exchange shortage, and revised the Law in 1966 in a much restrictive way.

At the outset of the economic development, Korea, lacking technological capability, had to rely on foreign technologies. However, beginning in the second five-year development plan period, Korea adopted a restrictive technology policy, especially in direct foreign investment and foreign licensing. The government opted for this rather contradictory policy because Korea faced serious shortage of foreign exchanges in the early stage of its industrialization drive (Korea Development Bank, 1991), and perhaps more importantly, because in the early stage of the development technology was not a critical binding element and the mature technologies needed could easily be acquired through mechanisms other than FDI or FL, say, reverse engineering,

etc. (Kim, 1991) Instead, Korea relied much more on technology transfer through turn-key plant procurement in the early years of the development. Chemical, cement, steel, and paper industries were developed in the 1960s and early 1970s through import of turn-key plants.

But Korean firms assimilated imported technologies rapidly enough to undertake subsequent expansions and upgrading with minimum technological help from foreigners. For capital goods required to expand production base, the government policy preferred foreign capital goods to building up of domestic capital goods industry as a means to strengthen international competitiveness of export-oriented industries. Such a policy resulted in massive imports of foreign capital goods, which became a major source of learning through reverse engineering by Korean firms. (Kim and Kim, 1985)

As mentioned earlier, the government relied more on long-term foreign loans than on FDI for industrial investment. The government, as de facto owner of all the commercial banks, allocated large scale foreign loans to selected big firms to secure the economies of scale in mature industries which were selected as strategic industries, leading to the creation of large business conglomerates or Chaebols. The government gave them large import-substitution projects for which those Chaebols imported technologies on turn-key basis with government-guaranteed long-term loans.

In sum, technology transfer policy of Korea in the early phase of development was biased in favor of informal technology acquisition

through imports of turn-key plants and capital goods rather than formal modes such as FDI and FL which are the dominant means of technology acquisition in other developing countries. This is the unique feature of technology transfer policy of Korea which makes Korea different from others in the way of obtaining and learning industrial technologies and know-hows.

But this rather unconventional strategy would not have been successful without the high-quality human resource Korea had. To mobilize and utilize its human resources in setting-up industrial base and in assimilating foreign technologies, the government enacted the "Professional Engineers Act." As an effort to secure shop-floor workers, "the Basic Vocational Training Act" was enacted in 1965 and such institutions as two-year technical colleges, national vocational schools, and retraining centers were established and expanded.

2. 1970s (1972-1981)

After succeeding in developing labor-intensive industries for import-substitution and export expansion in its initial decades of industrialization drive, the Korean government turned its eyes to more capital- and technology-intensive heavy machinery and chemical industries. During the 1970s, the world experienced two oil shocks and the general prospects of maintaining a stable supply of raw materials from the international commodity markets deteriorated. This environmental change worked as a serious factor for Korea which lacks natural resources and hinged upon foreign sources for technologies and raw materials. On the political side, the so-called Nixon Doctrine

was put into practice in the early 1970s and there was a partial withdrawal of the US forces from Korea, increasing Korea's defence burden. In response, the government decided to develop defence industry which was in those days mostly heavy machinery-oriented. These two important environmental factors were behind the government's decision to develop heavy machineries and chemical industries in the third and fourth five-year development plan period.

To facilitate the industrial development, import protection was reinforced for the strategic industries, decreasing import liberalization ratio from 61.7 percent in 1968 to 50.5 percent in 1976. In the case of the strategic industries (industrial machinery, electronics, automobiles, ship-building, and metals), the import liberalization ratio declined from 55.9 percent down to 35.4 percent during the same period. In addition to the protective measures, more incentives were provided to the strategic industries in the form of preferential financing and tax exemptions. The National Investment Fund was also created in 1974 to expand financial support to the strategic industries.

The drive for the development of heavy machineries and chemical industries created enormous demand for technologies which were in no way available from domestic sources. In response, the government eased to a great extent its restrictive legal measures. The government prepared a "Guideline on Foreign Direct Investment" and the "Principles on Foreign Ownership." The new guideline eased the conditions on FDI approval and especially encouraged joint ventures with higher technology transfer effects. In a word, the government streamlined to a certain extent the FDI approval procedure on the one hand, but at the same time tightened its regulations on the operational aspects of FDI

firms. For this, the Foreign Capital Inducement Law was revised in 1973.

But around the end of the 1970s, when demand for foreign technologies increased and foreign exchange situation improved, the government took a series of measures to gradually liberalize FDI and technology imports. As the first step of the series, the government categorized technology imports into three categories: cases subject to automatic approval, cases subject to quasi-automatic approval, and cases subject to inspection prior to approval. The classification was made on the basis of the nature and price of technology, and other conditions of contract.

Further measures of liberalization followed this. In 1979, the cases subject to automatic approval were expanded to include all the cases previously in the category of quasi-automatic approval and some of the case subject to inspection. And the conditions for automatic approval were much eased. One year after this, the policy was revised again such that all the cases of technology import be granted automatic approval only if the contract period does not exceed 10 years and the royalty is within 10 percent of sales. FDI was also rapidly liberalized, and many new industries were opened to foreign investors and approval procedure was also much simplified. But these liberalization measures failed in significantly inducing foreign investments and technologies because of the general economic slowdown both in Korea and around the world, and also partly because of the bad publicity about the investment climate in Korea. (Koo, 1986)

3. 1980s (1982-1990)

Unfortunately or perhaps inevitably, the government's protection of and assistance to the strategic industries resulted in imbalances and distortions in the economy toward the end of 1970s. The promotion of capital-intensive heavy machineries and chemical industries through government-led credit allocation worked to increasing money supply in the economy, which in turn caused inflation and wage hikes. The excessive government involvement also brought about a concentration of credit in heavy and chemical industries and also in several large firms which again led to high concentration of market shares in a small number of large firms. And the massive investment in heavy and chemical industries left many of the plants with severe problem of overcapacity.

Because of all these, the Korean economy faced severe structural difficulties in the beginning of the 1980s. Making things worse, the political changes and turmoils following the death of President Park created considerable socio-economic unrests. To overcome the extremely adverse internal and external environments, the Korean government reexamined its role in economic development. And a series of institutional reforms were undertaken to promote the role of market and reduce government intervention. The reforms included liberalization of trade and FDI to promote competitive environment and to ensure more efficient allocation of resources, and the strategic industry-targeting policy was much devaluated. Consequently, the import liberalization ratio was raised to 84.8 percent in 1984 from 50.5 percent in 1976.

In the field of FDI, the government substantially loosened its regulations to improve foreign investment environment in Korea. The Foreign Capital Inducement Law was revised in this vein in 1983. In 1984 a new "Guidelines for Direct Foreign Investment in Korea" was announced. The new law contained two important changes. One was the introduction of a negative list system. Under the old positive list system, foreign direct investment was allowed only in those industries listed on the positive list. The new negative list system was a reflection of government's intention to eventually open all the domestic industries to foreign investment. In 1984, the negative list included 297 of 957 five digit KSIC (Korea Standard Industrial Classification) industries. In the case of manufacturing, only 77 out of 520 industries were listed negative. The liberalization continued on and by the end of 1980s the foreign investment liberalization ratio rose to 92.5 percent, with 483 out of 522 manufacturing industries open to foreign investors.

Along with FDI, foreign licensing was also liberalized to a great extent during this decade. In 1982, the government simplified the approval procedure by delegating the authority of approval to individual ministries to which the applications were made. The procedure was further simplified in 1984 by changing the approval system into a notification system, under which government approval is not required. In 1986, the government allowed the imports of trade-marks, while reducing tax deductions on royalty payments. Thus, in a formal sense, Korea completely liberalized technology imports through the series of measures taken during the 1980s.

III. Technology Transfer in Korea: Structure and Trends

I. Korean Firms' Behavior in Technology Transfer

The outward-looking development strategy Korea adopted and pursued from the initial stage of its industrialization worked to increasing demand for technology on the side of private firms. To survive and win the international competition, Korean firms had to make enormous efforts to gain technological capability. They did this, in the early stage of development by learning by doing and reverse engineering. (Kim, 1981)

But as noted earlier, since technology transfer policy of Korea was restrictive, especially in formal modes of technology transfer, Korean firms acquired foreign technologies more through informal channels, such as turn-key plant importation financed through government guaranteed foreign loans, importation of capital goods, and foreign OEM production arrangements.

Thus, foreign direct investment and foreign licensing played not so important roles in technology transfer in Korea as in other developing countries.

The modes of technology transfer individual Korean firms chose in the 1960s and 1970s varied across firms depending on the nature of the industries they belong to. In the case of ship-building and machineries industries which produce differentiated products, they relied more on formal transfer of technology, mostly in the form of foreign licensing and consultancy. Thus these industries accounted for a major share of foreign licensing through the 1970s. But small firms had to resort to imitative reverse engineering of foreign products and processes. (Kim and Lee, 1989)

In contrast, chemical, cement, paper, and steel industries which employ highly capital-intensive continuous processes for production, acquired technologies through technical training and assistances provided by suppliers of turn-key plants. In this case, informal mode of technology transfer was much more important than formal ones.

Inbetween these two contrasting groups of industries are electronics and automobile industries which use assembly system for mass production of standardized products. Firms in these industries acquired technologies through a mixture of formal and informal channels. They depended on foreign licensing for technology acquisition, but to a lesser extent than the first group of industries, and at the same time they obtained technologies through technical assistance agreements with foreign suppliers of "packaged" technology which included assembly processes, product specification, production know-how, component parts, etc. (Kim, Lee and Lee, 1987)

Turning into the 1980s, the government reduced its involvement in industrial development, promoting the role of market and competitive environment for more efficient allocation of resources. A major part of the measures taken in this vein was liberalization of economic activities. Also, as industrialization proceeded, technology required became more complex and sophisticated, and thus they could no longer rely on reverse engineering of foreign products. Though the domestic regulations were removed, technology inflow did not increase significantly, and with the changes in the international environment, the technologies Korea needed could no longer be obtained from foreign sources as easily as before. This motivated Korean firms to seek to globalize their production and R&D activities and to tie up with foreign firms.

2. Trends and structure of Technology Transfer: 1962-1990

A. Foreign Licensing

During the period of 1962-1990, Korea imported 6,944 cases of technologies from foreign sources, but technology imports in the first two decades accounted for only 28 percent of the total (or 1977 cases), reflecting the effect of restrictive policy on technology imports. In 1978, when the first of the series of liberalization measures was taken, technology import increased by 26.8% and since then technology imports increased at an annual rate of about 20 percent for some years.

Of the total technology imports, heavy and chemical industries accounted for more than 86 percent and light industries 4 percent. By individual industry, machinery industry imported 1790 cases of technology during the period of 1962-90 or 25.8 percent of the total and second to it was electronics and electric industry which imported 1733 cases of technologies. In the 1970s when heavy machineries and chemical industries were promoted, machinery industry accounted for 31.2 percent of the total technology imports, while chemical industry's share remained at 18.4 percent, because it depended more on the import of turn-key plants. This is consistent with the discussion in the previous section on Korean firms' behavior in technology acquisition.

Korea paid a total of 4,925.5 million US dollars for the technologies imported during the period of 1962-90. Of the total payments, 83.1 percent were for the technologies purchased during the latter half of the 1980s (1984-1990), reflecting increased quantity of technology imports due to liberalization and also increased price of technology due to the shift of the demand towards higher-quality technologies.

As discussed earlier, technology imports of Korea during the past three decades were concentrated in a few industries: machineries (25.8 percent), electronics and electric equipments (23.6 percent), and chemicals (17.2 percent) accounted for more than 66 percent of the total cases of technology imported, and also in terms of royalty payment, the above three industries share exceeded 70 percent.

A very similar structure is also observed in the origins of technology imports. Of the total cases of technology imported during the period of 1962-1990, 3536 cases or 59.9 percent came from Japan and 1826 cases or 26.3 percent from the United States. This shows how heavily Korea depends on Japan and the United States for technology. The concentration of Korea's technology imports in Japan and the United States appears more acute if we look at the royalty payment records. During the period of 1962-1990, Korea paid 2,291.3 million US dollars or 46.5 percent of the total to the United States and 1,538.6 million US dollars to Japan or 31.2 percent of the total. These two countries' share in Korea's royalty payment was more than 76 percent.

This exceedingly high dependence of Korea on Japan and the United States seems to be a natural consequence of Korea's trade and technological relations with those countries. The United States and Japan have been the largest markets for Korean exports by importing over 50 percent of the total exports of Korea. Korean industries have also been the major base for United States and Japanese firms' OEM production. In addition, the two countries have been the main sources of foreign direct investment in Korea. From these relations, we can easily see that it would have been impossible for Korean firms to grow

Foreign Technology Imports by Industry
1962-1990

Unit: case

Industry	62-71	72-76	77-81	82	84	85	88	90	62-90	*
Agriculture & livestock	6	-	5	3	5	2	1	1	35	0.5
Food	8	7	30	21	24	16	15	18	224	3.2
Pulp and Paper	4	3	7	2	1	-	4	1	27	0.4
Textiles	7	10	12	4	2	7	1	2	62	0.9
Chemical textiles	7	14	29	23	29	17	51	42	333	4.8
Ceramics & cement	12	9	34	9	10	11	20	26	198	2.9
Oil refinery & chemicals	64	85	194	44	64	95	147	124	1,192	17.2
Pharmaceuticals	19	8	31	12	19	13	14	14	165	2.4
Metals	29	45	105	24	21	21	26	21	392	5.6
Electronics & electric	70	84	205	60	78	131	209	212	1,642	23.6
Machineries	64	116	403	62	123	153	181	174	1,790	25.8
Shipbuilding	1	10	45	14	17	17	14	14	201	2.9
Communication	16	10	21	12	-	6	3	7	91	1.3
Electricity	2	7	37	8	4	2	4	3	89	1.3
Construction	4	4	25	6	14	5	5	13	113	1.6
Others	5	22	42	4	28	21	56	66	390	5.6
Total	318	434	1,225	308	437	517	751	738	6,944	100.0
Growth rate(%)	-	-	-	24.7	20.7	13.7	17.9	-3.3	-	-

Royalty Payment by Industry

Unit: \$ million

	62-76	77-81	82	84	86	88	90	62-90	*
Agriculture & livestock	2.0	4.6	1.0	0.3	0.2	1.3	3.1	16.1	0.3
Food	2.0	3.3	1.4	3.3	6.1	5.2	9.5	49.6	1.0
Pulp & paper	0.1	7.4	-	0.2	0.1	0.4	1.2	11.0	0.2
Textiles	0.7	4.9	0.6	1.9	2.0	1.4	1.3	16.4	0.3
Chemical textiles	8.7	13.3	1.1	3.5	4.6	6.9	13.2	77.4	1.6
Ceramics & cement	1.1	10.5	2.8	4.4	13.0	6.8	15.6	94.9	1.9
Oil refinery & chemicals	32.6	147.3	24.4	30.2	44.9	106.5	210.3	853.5	17.3
Pharmaceuticals	1.2	0.7	0.4	2.9	6.8	5.6	6.8	38.2	0.8
Metals	23.9	32.0	4.4	7.1	9.5	6.0	8.6	130.0	2.6
Electronics & electric	12.8	47.5	20.2	50.2	134.2	259.6	461.2	1667.6	39.9
Machineries	14.6	89.3	20.6	49.4	89.7	120.8	216.4	953.6	19.4
Shipbuilding	5.1	11.2	15.7	12.6	13.6	6.0	16.2	154.7	3.2
Communications	5.0	18.7	7.1	7.6	13.8	5.4	6.5	92.5	1.9
Electricity	2.8	25.4	10.0	31.1	60.3	113.8	79.9	558.9	11.3
Construction	0.3	17.7	3.1	2.7	4.0	1.8	4.0	40.4	0.8
Other	0.7	17.6	2.9	5.9	8.2	28.8	33.2	170.8	3.5
Total	113.6	451.4	115.7	213.2	411.0	676.3	1087.0	4925.5	100.0
Growth rate(%)	-	-	8.0	42.6	39.1	29.1	22.3	-	-

Technology Imports by Country of Origin

Unit: Case, \$ million

	62-76		77-81		82		84		86		88		90	
	Cases	\$	Cases	\$	Cases	\$	Cases	\$	Cases	\$	Cases	\$	Cases	\$
U.S.	164	29.7	302	159.2	68	59.5	99	116.1	157	191.6	200	330.0	221	514.1
Japan	494	63.7	631	139.8	164	29.3	217	53.2	264	129.5	354	214.7	333	241.4
Germany	23	8.2	70	14.0	14	2.9	36	11.6	23	19.1	49	22.1	55	59.3
France	7	1.6	39	14.3	16	3.6	23	3.6	19	17.2	47	47.9	25	29.9
U.K.	21	-	49	-	14	-	14	-	11	-	20	15.6	28	44.7
Netherlands	5	-	11	-	6	-	6	-	4	-	11	-	9	4.8
Others	36	-	123	-	26	-	42	-	39	-	70	-	67	-
Total	752	113.6	1225	451.4	308	115.7	437	213.2	517	411.0	752	676.3	738	1087.0

without meeting the technical standards and the tastes of the consumers of the two countries. But perhaps more fundamental reason for the concentration can be explained by the fact that many of the leading scientists, engineers, economists, political leaders and business leaders in Korea received their advanced education in the United States, and thus are accustomed more to American ways and technologies. In the case of Japan, due to geographical and cultural proximity, Koreans feel more comfortable with Japanese way of production, management, and technologies. And, of course, the most important reason has been that the two countries are the richest sources of technologies.

But Korea's exceedingly heavy dependence on these countries for both trade and technology has made its economy vulnerable to the extent that even minor changes in these countries affect the performance of Korean industries. This has been pointed out as a serious structural weakness of the Korean economy, and in the late 1970s, the government began to encourage export market diversification. And consequently, technology imports from the EC began to rise gradually. In 1990, Japanese share was reduced to 45.1 percent while that of the EC countries rose to over 15 percent.

B. Foreign Direct Investment

Foreign direct investment has not been active in Korea because of government restrictions. Especially during the 1970s, the government's reinforcement of FDI regulation stagnated the inflow of FDI, even though the economy grew very rapidly during the period. In contrast, foreign loans grew significantly. The total outstanding foreign debt grew from 20.3 million US dollars in 1970 to 37.1 million US dollars in 1982. This is because of the Korean government's distinctive foreign

investment policy that preferred loans to direct investment. During the period of 1962-1986, the cumulative total of long-term foreign capital reached 49 billion US dollars, of which commercial loans accounted for 64.5 percent, and borrowings from development agencies 13.8 percent, but FDI only 3.9 percent. The share of FDI in the total foreign capital in Korea was much lower than the average share in the 1970s in all the developing countries, which was estimated at 10-20 percent. (Ahn 1991) FDI stock as a percentage of GDP of Korea was also significantly lower than those of other NIEs. For the years of 1984-1986, FDI stock as a percentage of GDP in Korea stood at 2.8 percent, which is far lower than those of Taiwan (8.1 percent), Hong Kong (20-26 percent), Singapore (58.2 percent), and Brazil (13.6 percent).

With the liberalization of FDI in the 1980s, FDI inflow into Korea increased rapidly, but its contribution to technology transfer still remained insignificant relative to foreign licensing and capital goods importation. This is largely because Korea, being poor in natural resources, and costly in production (high wages, labor disputes, etc.) did not offer attractive climates for FDI.

Some (for example, Kim, 1992) argue that Korea's approach had been effective in terms of cost of technology acquisition and enabled Korea to remain economically independent. Politically also, the government was sort of forced to adopt this policy because of the general public's sentiment against foreign investment that was prevalent in those days. On the other side of this, Korean firms could not be able to maintain a continuous access to foreign technologies which FDI firms might have provided.

FDI by Industry

Unit: \$ Million(case)

	62-76	77-81	82-86	87-90	Total	%
Agriculture, Livestock & Fisheries	13.3 (60)	4.7 (11)	5.6 (6)	14.6 (3)	35.2 (80)	0.4 (2.4)
Mining	4.5 (23)	1.7 (3)	4.3 (10)	4.8 (8)	15.3 (44)	0.2 (1.3)
Manufacturing	907.6 (1070)	482.2 (191)	930.9 (450)	2,796.2 (925)	5,139.2 (2635)	65.3 (77.8)
Services	223.2 (87)	232.1 (39)	826.9 (99)	1,419.2 (401)	2,683.3 (627)	34.1 (18.5)
Total	1,145.4 (1240)	720.6 (244)	1,767.7 (565)	4,234.8 (1337)	7,872.7 (3386)	100 (100)
%	14.5 (35.6)	9.2 (7.2)	22.5 (16.7)	53.8 (39.5)	100.0 (100.0)	/

Trends of Foreign Direct Investment and Imports Capital Goods

	FDI		Capital Goods Imports
	Cases	\$ Million	(\$ Million)
1962 - 66	39	47.4	316
1967 - 71	349	218.6	2,541
1972 - 76	851	879.4	8,841
1977 - 81	251	720.6	27,978
1982 - 86	579	1,766.5	44,705
1987 - 90	1,380	4,239.0	81,406

Sources: EPB, 1991; MOST, 1991; MDF, 1991

FDI by Country of Origin

	Japan	U.S.	Germany	France	Others	Total
1962 - 76	958	188	20	5	68	1,266
1977 - 81	132	67	10	4	38	251
1982 - 86	276	168	21	6	108	579
1987 - 90	674	378	61	35	232	1,380
Total	2,067	801	112	50	437	3,476

IV. Technology Transfer Policy Toward a "New Economy":

Korea's Plan for the 1990s

In July, 1993, the new administration of Korea unveiled its Five-Year Plan for a "New Economy," as basic framework of economic policy during its term which ends in 1998. The international economic policy contained in the plan pursues greater market opening, and further internationalization of Korea's economic institutions and practices. Under this plan, therefore, trade barriers and other regulatory systems will be removed, as a measure to cope with changing international and domestic economic environments. The plan recognizes that Korea no longer has the advantage of low-cost labor to either attract foreign investments or lend price competitiveness to its industries, that Korea must compete in the world market on the basis of quality, and that government protection, assistance, and regulation can no longer be effective in upgrading its economy. Under this understanding, the plan suggests concrete measures for a greater liberalization and to strengthen the protection of intellectual property rights.

According to the Five-Year Foreign Direct Investment Liberalization Plan announced last June as a part of the government's 100-day Program for a New Economy, 132 out of the 224 currently on the negative list will be open within 1993; 113 of these industries will be completely opened and 19 will be partially opened. As a result, 1,065 industries out of 1,148 currently listed under the KSIC will be open to FDI, raising the overall liberalization ratio to 83 percent within this year, and up to 93.4 percent by 1997. The government will also lift the joint

venture requirement for 43 out the 50 industries which the requirement is applied to. To streamline the FDI procedure, the government plans to remove by 1994 its referral process, in which opinions of concerned ministries are solicited.

Through the liberalization the government plans to raise the FDI liberalization ratios to as follows:

Industry	liberalization ratio by year(%)				
	93	94	95	96	97
Manufacturing	98.1	98.1	98.1	98.5	99.3
Services	72.7	76.0	82.0	84.0	86.9
Agiculture	63.2	70.6	72.1	76.5	89.7
Average	85.1	86.9	89.6	90.9	93.4

Along with the FDI liberalization, the new government will strengthen the protection of intellectual property rights, recognizing that effective protection of IPR is critical for technological development within and attracting high-tech transfers from abroad. For this, the government plans to revise the existing laws on IPR, and upgrade legal and institutional system for IPR protection. Most of the improvements and enforcement will focus on smoothing disparities between domestic and the international standards, such as UR/TRIP's text.

The main contents of the legal improvement to be completed by 1994 are:

(1) Copyright Law

- extension of the term of copyright protection
- introduction of rental rights for sound recordings
- increase penalty from US\$3750 to US\$37,500
- classification of the possession of infringing goods for the purpose of selling them as a violation
- introduction of a dual penalty provision which will allow an infringer to be both fined and prisoned

2) Computer Program Protection Law

- introduction of rental rights
- penalty increase from US\$3,750 to US\$37,500
- introduction of dual penalty
- classification of a knowing use of illegal copies as a violation

(3) Customs Law

- Empower the Customs Administration to monitor and seize IPR-infringing goods

(4) Semi-conductor Maskworks Law

- tightening of the requirements for nonvoluntary licensing to cover only the cases in which domestic demand exists
- expansion of the right to compensation to cover patent holders and licensees

(5) Trademark Law

- introduction of a trademark system based on the color of trademark

(6) Patent Law

- extension of the term of protection from 15 to 20 years

(7) Industrial Design Law

- extension of the term of protection from 8 to 10 years

The above liberalization measures will completely open Korean industries to foreign investment and the planned strengthening of IPR protection will help make technology transfer into Korea more active. Most important, these changes on the part of Korea will qualify Korean firms as international actors not only in trade but in technological and production cooperation. But liberalization will not necessarily lead to increased FDI unless other cost-raising physical and social factors are removed from Korea. They are labor unrests, inadequate infrastructures, to name a few.

V. Conclusion

Korea relied almost completely on foreign technologies for its industrialization. But the way they obtained foreign technologies was quite unique in that they resorted to informal modes instead of formal modes of technology transfer. Thus unlike in other developing countries, FDI and FL played relatively less important role in the industrialization process of Korea, especially in the early stage of development. Rather, the strong export-orientation of the Korean industries facilitated rapid acquisition of technological capability by exposing the producers to international competition, and by giving them opportunities to work with foreign firms with advanced technologies, such as OEM production arrangement, import of turn-key plants, etc. Of course, the government-led credit-allocation system in the 1960s and 1970s motivated private firms to reinforce their technological efforts in response to the signal of the government. (Lee, 1993) But this unique strategy could succeed because Korea had abundant pool of well-educated but low-waged workers who were very fast in learning new technologies and also because the mature technologies that Korea needed could easily be transferred through learning based on reverse engineering of imported capital goods.

Turning into the 1980s, however, Korea could no longer pursue the strategy, because the strategy was not effective in acquiring the technologies required to further upgrade the economy, and also the new international economic environment did not allow the strategy any more. Korea in response, took a series of liberalization measures to expand technology transfer through formal modes. But despite the

liberalization, Korea has been ranked low in foreign investment climates due to social and physical disadvantages such as labor unrests, government regulations, high wages, and inadequate infrastructure, etc. In this sense, the government was not so successful in technology transfer policy in the 1980s.

Overall, however, technology acquisition policy of Korea deserves a high grade, if not perfect. The performance of the Korean economy justifies this. But can the past growth be maintained through the 1990s? It all depends upon how Korea internationalizes its economic institutions and practices, and more importantly how private industries respond to the changing world. Is Korea's strategy applicable to other developing countries? Perhaps, yes, but Korea's physical and cultural characteristics should well be understood before any such attempt can be made. At least, it may serve as a useful lesson to other late-comers.

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