Commodity Chains in East Asia and the Development of the Electronics Industry in South Korea¹

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The development of the electronics industry in the East Asian region is characterized by the "flying geese pattern." Forming this flying geese pattern, the most important factor has been the search for low wage labor by firms of more developed countries. They relocate their labor-intensive industries and processes to the developing countries. However, this explanation is not complete because it does not explain how the development of the Korean electronics industry is breaking the existing commodity chains and forming new ones. Like other fast growing economies of East Asian countries, Korea's electronics industry began from importing foreign technology and investments mainly from Japan and the United States. Subsequently, Korean producers began to compete with the developed countries in consumer electronics under their own brand names and became one of the most important manufacturers in the world semiconductor industry. In this regard, the Korean electronics industry demonstrates an exceptional development pattern. To explain this, we must focus on the role of the government and the industrial structure. The distinct development of the electronics industry in Korea is attributed to the interaction between local firms belonging to chaebol, and government support.

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INTRODUCTION

In the development of Japan and East Asian Newly Industrializing Economies (NICs), the electronics industry has been one of the most important strategic industries for economic growth.¹ Furthermore, the economies of Southeast Asian countries, such as Malaysia and Thailand, have developed very rapidly due to the growth of the electronics industry (Tan 1996). The electronics industry as such should be regarded as the most important industry for economic development. However, except for the East Asian NICs and some Southeast Asian countries, most developing countries in other parts of the world have not been able to develop or even enter the electronics industry.

From the late 1960s, the Korean electronics industry has shown tremendous growth. Production and export of electronics increased enormously in the 1970s and the 1980s. By the early 1990s, the new Korean manufacturers were successfully competing with the existing brands (such as those from the United States, Japan, and Western Europe) in the international consumer electronics market. Also, the Korean semiconductor industry became the most important supplier of Dynamic Random Access Memory (DRAM). How could this happen? It is generally assumed that developing countries have difficulty breaking out of the existing commodity chains (Gereffi et al. 1994; Henderson 1994). In this regard, the development of the Korean electronics industry is an ideal test case which deserves careful investigation.

Commodity chains, defined as "a series of linkages between sites involved in producing part of an overall product for sale on the market" (McMichael 1996, 295) or "a network of labor and production processes whose end result is a finished commodity" (Hopkins and Wallerstein 1986, 159), have been continuously reshaped in the world economy. This concept is relevant insofar as it explains changing international competitiveness or division of labor. Such changes are understood as the outcome of the movement of capital in core countries. As Gereffi et al. point out, "there are two primary factors that explain shifts in the geographical location and organization of manufacturing in global commodity chains. One is the search for low wage labor, and the other is the pursuit of organizational flexibility" (1994, 6). From this perspective, however, the domestic factors of semi-peripheries or peripheries are hardly considered.

The development of the Korean electronics industry from low-level parts assembly to high-level brand name exports cannot be adequately explained by those two factors, since the breakthrough has been led mostly by domestic firms. In this sense, the success of the Korean case, which has been able to form new global commodity chains along with the existing ones, is indeed exceptional and we need to consider how the nation-state and the domestic industrial structure allow for certain degrees of freedom against the external constraints.

This paper attempts to explain the rapid growth and the exceptional breakthrough of the Korean electronics industry. We will start with a general review of the electronics

¹ For example, in 1985, the Korean electronics industry marked 9.2 percent of total manufacturing production and 15.2 percent of total exports. In 1998, the figures became 23.1 percent and 29.2 percent, respectively.

industry in a worldwide context. Then, we will move to a case study of the Korean electronics industry to show the historical pattern of development mainly in quantitative terms. Next, we will analyze the flying geese pattern of the East Asian economy, in which some countries can gain new advantages in the changing international division of labor. Finally, we will focus on how domestic factors, such as the role of the government and the internal industrial structure, made a qualitative breakthrough in Korea. A brief discussion of the implications of the findings will conclude the paper.

THE ELECTRONICS INDUSTRY & THE DEVELOPING COUNTRIES

"The story of industrialization in the developing world in large measure has been a story of the emergence and expansion of two sectors: textiles and electronics" (Henderson 1994, 258). Textile and apparel are important segments of the economy for developing countries. In the inter-industry division of labor, developing countries can begin their catch-up process from these industries because of their labor-intensive characteristics. In fact, these industries have shifted the main producing areas from the developed to the developing economy. The high wage level of the developed economy was the main force behind this shift.

Compared to the textile and apparel industries, the electronics industry is both a capital-intensive and knowledge-intensive industry. At the same time, the final products are composed of numerous parts and components, and the production of these electronic goods often involves a great deal of labor-intensive processes. Furthermore, the separation of production in electronics is easier than any other capital- or technology-intensive industry. Therefore, since the 1960s, major electronics producers in the developed economies have relocated their production lines to the developing countries to secure low wage labor and expanding markets.

As Henderson (1994) points out, electronics as such is a more important industry than textiles in the development process. Above all, developing countries can initiate their technological upgrading with the advent of the electronics industry. Furthermore, electronics is one of the fastest growing industries in the world economy. The world electronics industry marked an average 11.4 percent annual growth rate from 1985 to 1990. In addition, the electronics industry has a variety of add-on effects on other related industries. Also the possibilities for the development of new products and innovation of production processes are likely to appear, particularly in this rapidly expanding sector of economy.

However, these potential benefits do not always materialize for all economies. Above all, for developing economies to enter the electronics industry foreign capital and technology are needed. In this sense, the perspective of commodity chains provides useful insight. To gain access into the electronics industry and to acquire its benefits, many obstacles must be overcome along four stages of development. Developing countries should start their technological upgrading processes at the "implementation" stage. In

this beginning stage, the electronics industry is developed as an import-substitution industry or as offshore production. Technology at this stage is usually transferred as packages from foreign investments. The next stage would be "assimilation." During this stage, local firms acquire technological skill by "learning by doing," and gain comparative edges in low-end products. This stage is followed by the "improvement" phase. During this period, innovations are made with imported technology, and technology transfer can be achieved through licensing. The final phase is the "independent R & D" stage. Technology export and investment into low wage economies occur at this stage to form a global commodity chain. Local actors are important in these development processes because it is very difficult to receive technological upgrading from foreign firms.

If we classify the electronics-producing countries into four groups along the stages of development, the United States, Japan, and Western European nations should belong in the final stage group. Independent R & D and a balanced development of machinery, components, and materials in electronics are characteristics of these countries. The third stage group would be the East Asian NICs including Korea, Taiwan, Singapore, and Hong Kong. Rapid development and increasing export of electronics products are common in these countries. They try to concentrate on manufacturing capital- and technology-intensive parts and assembling final products for export. Although a gap between the last stage and the third stage group still exists, the third stage group has been able to compete with the last stage group in some products such as DRAM, VCRs, and computers. Southeast Asian countries such as Malaysia, Thailand, and Indonesia would belong to the second stage group. They concentrate on labor-intensive parts and component production for the international market. Foreign investments in the form of joint ventures are the prevailing mode of production in this group. Latin American countries such as Brazil and Mexico belong to the first "implementation" stage group. In these countries, production is directed not at the international market but at the domestic market for import-substitution.

As shown in Table 1, more than half of the world's electronics market has been dominated by the United States and Japan from 1986 to 1996. The United States has been the largest producer and Japan has been the biggest exporter throughout these ten years. Aside from these two giants, only a few Western European countries showed significant figures for production and exports in 1986. The rest of the world remained insignificant.

However, in 1996, the shares of East Asian NICs changed dramatically. Korea became the fourth largest producer of electronics, closely chasing the third largest, Germany. The exports of Singapore and Hong Kong were larger than those of Germany and Britain. By 1996, the East Asian NICs had become important producers and exporters of electronics in the world markets. Together, they contributed 12.5 percent of the world's products and a quarter of the world's exports. In addition, Southeast Asian countries, such as Malaysia and Thailand had the fastest growing economies in electronics production and exports during the 10-year period.

Table 1 also suggests that the progress of the electronics industry in the developing

countries was not even. Most of the other developing countries, which are not listed in the table, were unable to enter into the electronics industry. Only four East Asian NICs and a few Southeast Asian countries reached the potential of the electronics industry. However, among the success cases, the degree and scope of success varies. It seems that the four East Asian NICs have moved from being primary production contractors to intermediaries, or the middle-man position, in electronics commodity chains.²

TABLE 1. ELECTRONICS PRODUCTION AND EXPORTS
(SELECTED PRODUCER ECONOMIES)

	1986			1996		
	Production(A) (%)	Exports(B) (%)	(B/A) x 100	Production(A) (%)	Exports(B) (%)	(B/A) x 100
World Total	462,573 (100.0)	185,941 (100.0)	40.2	1,064,900 (100.0)	724,600 (100.0)	68.0
North America						
U.S.A.	178,995 (38.7)	29,822 (16.0)	16.7	300,282 (28.2)	104,484 (14.4)	34.8
South America						
Brazil	5,489 (1.2)	648 (0.3)	11.8	19,170 (1.8)	1,056 (0.1)	5.5
Europe						
Germany*	31,515 (6.8)	19,518 (10.5)	61.9	51,463 (4.8)	13,081 (5.9)	83.7
Britain	19,841 (4.3)	11,385 (6.1)	57.4	39,108 (3.7)	40,472 (5.6)	103.2
France	21,399 (4.6)	8,679 (4.7)	40.6	35,554 (3.3)	28,111 (3.9)	79.1
Asia						
Japan	123,843 (26.8)	51,533 (27.7)	41.6	244,954 (23.0)	107,307 (14.8)	43.8
Korea	9,177 (2.0)	6,372 (3.4)	69.4	18,136 (4.5)	32,969 (4.5)	68.5
Singapore	5,403 (1.2)	6,675 (3.6)	123.5	43,597 (4.1)	66,544 (9.2)	152.6
Taiwan	7,677 (1.7)	6,260 (3.4)	81.5	32,125 (3.0)	34,887 (4.8)	108.6
Hong Kong	4,262 (0.9)	6,620 (3.6)	155.3	8,744 (0.8)	18,697 (6.7)	556.9
Malaysia	2,392 (0.5)	2,600 (1.4)	108.7	29,577 (2.8)	35,341 (4.9)	119.5
Thailand	847 (0.2)	518 (0.3)	61.2	19,110 (1.8)	13,784 (1.9)	72.1

Note: * West Germany in 1986

Source: Elsevier Yearbook of World Electronics Data.

Producers in the NICs started overseas investments in Southeast Asia in the 1980s. Thus, producers in Southeast Asian countries were able to grow because of outside investment from the NICs as well as Japan. Although the success of the NICs seems to be outstanding, they still have difficulties with their middle-man status in the commodity chain. The NICs are subject to the TNCs or large retailers, who control whether they can gain the potential benefits of high value-added nodes on a full scale (Henderson 1994). For further development, an escape from this position is necessary.

² Gereffi coined the term, "middle-man," when he discussed "triangle manufacturing." According to him, the East Asian NICs producers in the textile and apparel industry have been changed "from a primary production contractor for U.S. buyers to a 'middle-man' in the buyer-driven commodity chain" (Gereffi 1994b, 224).

In this context, the Korean consumer electronics and semiconductor industries are the exceptional cases which escaped such constraints. In fact, as Henderson argues, "in comparison with the output of the leading developed industrial economies, the electronics industries of the developing world, with the exception of that of Korea, remain relatively minor players" (1994, 259). Although much of the electronics production in Korea is still undertaken by original equipment manufacturing (OEM), some *chaebol* firms have been able to produce and export electronics products for the international market under their own brand names. Samsung and LG are representative cases of this breakthrough.

THE DEVELOPMENT OF THE KOREAN ELECTRONICS INDUSTRY

Electronics has been one of the fastest growing industries in Korea for the past three decades. As shown in Table 2, the total production of electronics in 1996 was over 15,000 times that of 1965. Electronics export in 1996 was over 20,000 times that of 1965. In 1996, the rapidly growing electronics industry marked 13.6 percent of total manufacturing production and 31.8 percent of total exports in Korea. By 1996, Korea became the fourth largest producer and the sixth largest exporter of electronic goods in the world.

TABLE 2. ELECTRONICS INDUSTRY IN KOREA

	(in \$ million, current price)			
	1965	1975	1985	1996
Production Manufacturing Total	1,571 (100)	20,176 (100)	88,841 (100)	451,228 (100)
Electronics	11 (0.7)	860 (4.2)	7,285 (8.2)	61,367 (13.6)
Exports Total	175 (100)	5,081 (100)	30,283 (100)	129,715 (100)
Electronics	2 (1.1)	582 (11.5)	4,590 (15.2)	41,223 (31.8)
(Exports/ Production) x 100	18.2	67.7	63.0	67.2
World Ranking Production	n.a.	13	7	4
Exports	n.a.	13	11	6

Source: Korea Institute for Industrial Economics and Trade (KIET).

In consumer electronics, Korean brands are now quite familiar to many people throughout the world. Recently, Korean electronics manufacturers have started to develop and produce high value-added products such as LCD's (liquid-crystal display), HDTV's (high-definition television), and MP3 players. The achievement of the semiconductor industry in Korea is also outstanding. Except for offshore production, the history of the Korean semiconductor industry began in the early 1980s. After one decade, Korea became one of the major producers of semiconductors. Now Korean manufacturers are the greatest MOS (metal oxide semiconductor) memory chip producers and exporters in the world.

The electronics industry in Korea began to take shape in 1959 when Goldstar started to produce vacuum-tube radios. Afterwards, from the mid-1960s, there was a wave of U.S. semiconductor firms investing in Korea. Komy, Signetic, Fairchild, Motorola, and IBM poured investments into Korea to establish assembly lines. At that time, Japanese firms were rarely present in Korea. It was from American investments that local Korean producers learned how to assemble semiconductors. Production of black and white televisions also started in those days.

During the 1970s, Japanese electronics manufacturers began to show strong interest in Korea, after the Korean government adopted an industrial promotion policy from the late 1960s to attract foreign investment and increase export. As a part of these efforts, the Masan area was declared a free trade zone and the city of Kumi was constructed as an industrial complex for electronics manufacturing. In this favorable environment, Japanese electronics firms rushed into Korea, where they could avoid trade conflicts with the United States by detouring Japanese exports through Korea.

During the 1970s, firms with foreign direct investment (FDI) constituted around 60–70 percent of total electronics industry production and exports. For foreigners, Korea at this period was the best place to obtain high-quality labor at low wages and to enter a preferential investment environment. By the late 1960s, U.S. firms in Korea mushroomed in the area of assembly lines for semiconductors, while Japanese firms in Korea from the 1970s flourished in consumer electronics and parts production.

Since the mid-1980s, FDI in Korea has demonstrated different patterns. Due to the fast growing economy, Korea's domestic market has gained importance and the low wage advantage no longer exists. In this context, foreign investors shifted their interest to the Korean market. Accordingly, offshore production in Korea significantly decreased during this period.

FDI and joint ventures were critical to the development of the Korean electronics industry during its early stages. During the 1960s and the 1970s, the Korean electronics industry experienced the implementation and assimilation phases with the heavy presence of foreign investment. Korean electronics producers were able to start learning production technology from foreigners. However, only a limited amount of capital was invested in R & D, plants, and equipment. Any serious effort toward the next stage of development was not in the interests of foreign firms in Korea.

It was the investment of local *chaebol* firms that enabled the Korean electronics industry to enter into the next stage of development. From the late 1970s, local firm investment increased enormously to upgrade production systems. During the 1980s, *chaebol* companies began to put independent R & D systems in order. They also increased investment in semiconductors, personal computers, and VCRs. As a result, production capacity tremendously expanded.

Corresponding to these technological developments was a change in the main products for the electronics industry. Korean consumer electronics products started with the assembly line of radios in the 1960s. Through the assembly of cassette tape recorders and black and white televisions in the 1970s, Korean firms began to produce color televisions

and VCRs in the 1980s. Camcorders, CD players, DVDs (digital video displayers), digital televisions, and MP3 players are now produced in Korea. In the industrial electronics area, the main products changed from magnetic phones to electronic, cordless, and mobile phones, and then later to computer and mobile communication equipment. In the area of electronic parts, Korea has become one of the largest producers of semiconductors.

TABLE 3. THE PRODUCTION STRUCTURE OF THE KOREAN ELECTRONICS INDUSTRY

	1966	1975	1985	1996	(unit: percent) World (1997)
Consumer Electronics	44.7	31.4	33.1	22.3	8.7
Industrial Electronics	33.5	10.9	20.8	23.7	63.1
Electronic Parts/ Components	21.8	57.7	46.1	54.0	28.3

Source: KIEIT.

Table 3 shows the structure and development pattern of the Korean electronics industry. Compared with the world production structure, consumer electronics occupied significant portion. But since the 1980s, the relative importance of consumer electronics has gradually been reduced. This decline came with the growing development of industrial electronics and electronic parts, mainly semiconductors.

The export of Korean electronic goods reflects the production structure. In the 1990s, export of industrial electronics and electronic parts increased, in relation to the change made in consumer electronics. Notably, the export of electronic parts has increased very rapidly due to the semiconductor. Since the mid-1980s, the semiconductor has become extremely important to the Korean electronics industry. For example, in 1997 and 1998, the export of semiconductors was over 40 percent of total electronics exports. The increase of exports in industrial electronics for the same period was, however, very small. In consumer electronics, not only compositional proportions but also the amount in absolute terms of export has declined since the mid-1990s (EIAK 1999).

The main markets for Korean electronics export have been the United States, Europe, and East Asia. The United States and Japan have been important trade partners for Korea. In 1996, exports to the U.S. market reached over a quarter of total electronics exports, and Korea has enjoyed a continuous trade surplus with the United States. However, Korea has suffered large trade deficits from Japan. The imports from Japan have been mainly industrial electronics and core parts.

These trends reveal an important structural pattern of the Korean electronics industry. The Korean electronics industry imports capital equipment, plants, and core components such as non-memory semiconductors and condensers mainly from Japan, and exports final products to the United States. This trade pattern has been established because the Korean electronics producers have imitated Japanese products and production settings while the Japanese manufacturers have retained core technology and components. From the 1980s, efforts were made to avoid this situation from the government as well as

from the business sector, yet the efforts were in vain since the pattern persists today.

After the 1980s, the Korean electronics industry began to lose its comparative advantage over low-end parts and some consumer electronics. A sharp increase in production costs, especially in labor, took form. As an alternative, Korean electronics producers began to relocate their production processes. Table 4 shows Korean electronics producers' investments abroad. The main regions of relocation have been Southeast Asia and the United States. Initially, Korean producers relocated their assembly lines or component production to Southeast Asia to secure low wage labor. Many Korean manufacturers have invested in consumer electronics and parts production in Southeast Asia. Secondly, investment in the United States was motivated to facilitate advanced technology transfer, to prevent trade conflicts, to expand marketing ability through existing brand names, and to secure marketing networks from U.S. companies. The large-scale investments of Samsung, Hyundai, and LG in the United States were mainly achieved in the form of M & A (merger and acquisition).

TABLE 4. CUMULATIVE FDI IN THE KOREAN ELECTRONICS INDUSTRY UNTIL 1997

(in \$ million, current price)		
	Amount	Cases
Electronics Industry Total	6,755 (100.0)	1,475 (100.0)
Business Types		
Production	3,658 (54.2)	971 (65.8)
Sales	1,730 (25.6)	334 (22.6)
R & D	151 (2.2)	37 (2.5)
Others	1,216 (18.0)	133 (9.0)
Region		
Asia	2,285 (33.8)	903 (61.2)
America	2,896 (42.9)	772 (52.3)
Europe	1,516 (22.4)	175 (11.9)
Others	56 (0.8)	31 (2.1)

Source: Electronic Industries Association of Korea (EIAK), 1999.

The Korean electronics industry, as with other East Asian NICs, has shown tremendous growth. But there is a more important dimension to consider than the quantity of growth. Korean producers have begun to break the existing buyer-driven commodity chain in some consumer electronics, and transformed into one of the main producers in the global semiconductor commodity chain. To explain this qualitative change, we will focus on domestic factors such as the initiatives of the Korean government and the response of *chaebol* firms. Before we do so, we will describe the flying geese pattern of East Asian development in electronics to understand why the electronics industry has developed so rapidly in East Asia.

THE FLYING GEESE PATTERN OF EAST ASIAN DEVELOPMENT AND COMMODITY CHAINS IN THE ELECTRONICS INDUSTRY

The development of the East Asian economy has been characterized by the "flying geese" pattern of growth. This refers to the "multi-stage process of catching-up by all the countries involved in an area" (Ichimura 1998, 25). McMichael (1996, 84) and Cumings (1987, 45-46) point out that this flying geese pattern came to exist by the effect of product cycles. When firms from the developed countries enter higher technology-intensive and high value-added industrial sectors, they tend to relocate their existing industry or production processes to the developing economies, low wages being the main motivator. In addition, firms tend to invest in different regions to pursue organizational flexibility. The rising activism for environmental protection in the developed nations is another factor for offshore movement.

In East Asian growth, Japan leads in technological innovation. Korea and Taiwan are following the trajectory of Japanese development. Southeast Asian countries such as Malaysia, Indonesia and Thailand, meanwhile, are using capital, technology and equipment from Japan and the NICs to follow the paths their predecessors paved. According to the stages of technological development, Japan belongs to the advanced stage. Japan retains comparative advantages in industrial electronics where higher level technology and intensive capital investments are essential. The East Asian NICs including Korea, Taiwan, and Singapore all occupy the third stage of development. However, their main products as well as their industrial structure reveal divergent patterns.

Korea's main development has been in consumer electronics and semiconductors. Korean producers, mostly big *chaebol* firms supported by the government, still import some parts, especially higher technology-intensive parts from Japan, but they compete with the last stage group through their own brand name products. In contrast, the Taiwanese electronics manufacturers, mostly small- and medium-sized firms based on "quanxi network," are geared toward the production of microcomputers (Oru et al. 1997; Chan, ed. 2000). Singapore produces high technology-intensive electronic parts, but most of the producing companies are foreign ones, in contrast to the domestic firms of Korean and Taiwan.

Southeast Asian countries, particularly Malaysia, Thailand, and Indonesia can be included in the second stage group. Electronics production and export in these countries have been rapidly growing since the introduction of an export-oriented industrialization policy in the 1980s. They have concentrated on the manufacturing of low-end products and labor-intensive parts or components, mainly through foreign direct investment.

The strategy of Japanese firms has been the main force behind shaping the flying geese pattern of the East Asian electronics industry. Until the 1970s, Japanese investment in Southeast Asian countries was limited to small joint ventures. At that time, Southeast Asian countries pursued import-substitution strategies, and Japanese firms were not interested in their rather limited domestic markets.

However, the situation began to change in the 1970s. Due to trade conflict with

the U.S. and Western Europe, Japanese firms needed to invest in NICs as a detour for their exports. The export-oriented industrialization strategy in Southeast Asian countries enabled Japanese firms to take advantage of the newly established platform for export. At that time, declaring export processing zones or free trade zones was becoming popular in the region. Korea and Taiwan offered the model for this investment pattern.

Investments by Japanese firms during 1979-85 were stagnant. However, after 1985, Japanese investment in Southeast Asian countries began to increase again (Sirikrai 1994), as the Japanese yen began to appreciate steeply against the U.S. dollar. At the same time, the production costs in NICs (Korea, Taiwan, or Singapore) were getting higher, and Southeast Asian countries were ready to offer incentives to foreign investors. Japanese firms began to pour a large amount of investments into ASEAN (Association of Southeast Asian Nations). It was also during this period that waves of Korean investment into Southeast Asia began to occur (K. Lee 1995).

Japanese and NIC investment into Southeast Asia have contributed to the flying geese pattern of development in the East Asian electronics industry. The pattern initiated investment and technology transfer from Japan as well as the relocation of production processes. It could also be argued that the pattern is impossible without the export-oriented strategy of the region in general. Each country produced electronic goods for the international market in a specific sector where it holds a comparative advantage.

In conclusion, the economic development of the East Asian region is characterized by the flying geese pattern. The most important factor in the flying geese pattern has been the low wage labor priority by firms of more developed nations. They relocate their labor-intensive industries and processes to developing countries. The development of the East Asian region can be analyzed in this respect. However, this explanation is only partial, because it does not attribute the Korean electronics industry for breaking existing commodity chains and forming new ones in selected electronics products.

THE DOMESTIC FACTORS: GOVERNMENT AND INDUSTRIAL STRUCTURE OF THE ELECTRONICS INDUSTRY IN KOREA

It is a well-known fact that the Korean economy was mobilized for rapid growth under the tight hold of political power (Lew 1997). The Korean government enjoyed a firm control over the industry, effectively enforcing businesses to follow its policy recommendations. In this process, those who were obedient to state initiatives were rewarded and those who were against them were penalized (Lew 1996). The main policy measure of the Korean government was the control of bank credit. In the state-controlled banking system, the government and large businesses formed a "quasi-internal capital market" (Lee 1992).

The electronics industry in Korea was no exception. State favors have been critical factors for the growth or death of individual firms in the Korean electronics industry. Big business groups, or *chaebol*, have been in a position to take advantage of state policy.

which is why they have played a leading role in the development of the Korean electronics industry under the guidance of the "developmental state."

In the mid-1960s, the Korean government adopted systematic industrial policies in order to develop strategic export industries. As priorly discussed, the electronics industry is composed of divergent processes, some of which are labor-intensive. Thus, the Korean government pursued the development of the electronics industry because its labor-intensive characteristics could well match the highly-trained labor force in Korea. In 1966, the government founded a new public institution, KIST, to support R & D activities in the electronics industry. To expand exports, the Five-Year Plan for Electronics Product Export (1967-71) was formulated. The Korean government also enacted the Electronics Industry Promotion Law to be followed by the Eight-Year Plan for Electronics Industry Promotion (1969-76). At the same time, the government tried to attract foreign investment by establishing supportive institutions and laws. In 1969, a southern medium-sized city, Masan, was designated a free trade zone, and Kumy, a nearby city, was established as an industrial complex for electronics production.

During the 1970s, the primary strategy of the government in electronics was export promotion by way of imported parts assembly. This strategy was coupled with increasing foreign investment. Fortunately, foreign investors at that time were actively seeking out low wage labor and favorable conditions for their offshore investments. Due to these policy measures and international concerns, a sizable electronics industry came to exist in Korea by the end of the 1970s.

With the advent of the 1980s, the Korean government revised the Electronics Industry Promotion Law to provide funds for development. A new master plan was established in 1982, which introduced measures for the development of specific electronic products such as computers and semiconductors. This plan encouraged large-scale investment in the semiconductor industry by Korean electronics manufacturers. Parallel with efforts from the private sector, the government initiated a support program to technologically upgrade private semiconductor firms. Since then, the Korean semiconductor industry has experienced an extremely rapid growth.

The Korean government also strongly encouraged local firms to produce core parts components of electronics, which were mostly being imported from Japan at the time. In order to catch up with Japan, the Korean government initiated "G-7 Projects" in the 1990s to bridge the technological gap and take on higher value-added nodes. These state efforts turned out to be partially successful.

In short, the Korean government actively pursued an export-oriented industrialization strategy and promoted the production of electronics output. In the early stages, efforts were made to attract foreign investment for assembly lines. But later, technological upgrading was the most important factor in eliciting government support. The government prepared master plans and provided incentives to local and foreign firms to follow them. Also, in the case of the semiconductor industry, the Korean government did not hesitate to adjust its original strategy to the demand of local firms. In the early 1980s, the Korean government conducted a promotion plan for the semiconductor industry. The plan's

main strategy was import-substitution of semiconductors. But the *chaebol* did not follow this directive, and instead made large-scale investments for the international market. However, this conflict was resolved very quickly through an altered strategy in the mid-1980s, in which the government began to support local firms' R & D in semiconductors for the sake of exports.³

In a sense, the Korean electronics industry is a very exceptional case, because it has been able to break the existing buyer-driven commodity chains in the world economy. In the 1980s, large firms, relying on *chaebol*, began to export under their own brand names. In buyer-driven commodity chains such as consumer electronics, it is very difficult to move from the position of "middle-man" because of the existence of large retailers and transnational corporations. In order to break away from these chains and export under domestic brand names, enormous investments in production facilities and marketing networks are indispensable. This transformative breakthrough was achieved by local firms in Korea with government support.

In regard to the semiconductor industry, Korea became one of the biggest producer countries in the world. The semiconductor industry, especially the DRAM industry that Korean producers have concentrated on, is a very risky sector. Enormous investments are needed for entrance into the sector, and fluctuation in demand and price is extremely high. In addition, this sector is characterized by rapidly changing technology. For these reasons, it is very difficult for developing economies to enter the DRAM industry. Korean producers of *chaebol* have invested in the semiconductor industry since the 1980s. The magnitude of their investments was spectacular. In 1992, Samsung, LG, Hyundai, Daewoo, and Korea Electronics, taken together, invested about 1,770,000 million won in semiconductor plants and equipment. In the same year, total investments in plants and equipment in Korea's semiconductor industry (about 1,795,000 million won, approximately U.S. \$ 2,299 million) were over 19 percent of total world investments (about U.S. \$ 11,900 million). The investments reflected 28.7 percent of the total sales of Korean semiconductors (about 6,264,000 million won). Such an enormous amount of investment is only possible through large *chaebol* groups.

To explain the exceptional development of the Korean electronics industry, we must focus on the Korean big business *chaebol* groups. As discussed above, huge investments and technological foundations are needed to alter the existing commodity chains of consumer electronics and to gain access into the DRAM industry. Both are very risky projects. Yet *chaebol* are able to not only invest on a large scale, but they can lower their risks due to their size and diversification.⁴ The big electronics companies belonging to *chaebol* secure a market for their products and take advantage of intra-corporate transfers of technology, know-how and trained personnel (Lew 1996, 269-70).

Foreign investments were helpful for a certain level of technology transfer, especially

³ This case shows the change in government-business relations in the 1980s. The Korean semiconductor firms belonging to *chaebol* did not depend on state-guided funds as much as before. Therefore, the government could not influence these firms' strategies. Instead the government changed its policy direction. (Kim 1997)

⁴ "Not only are *chaebol* able to lower their risks by branching into various business lines, but their sheer size resulting from this unrelated diversification protects them from bankruptcy risk" (Lew 1996, 268).

in the early stages of development. However, foreign investments were not expected when it came to core technology and higher value-added nodes. It was at this point that the big Korean firms played a critical role. Since the Korean electronics industry was developed mainly by companies belonging to conglomerates such as Samsung, LG, Daewoo, and Hyundai, their extensive, large-scale investments made the breakthrough possible. Furthermore, the state did not hesitate to support *chaebol* firms. Thus, the distinctive development of the Korean electronics industry has been shaped by the alliance between big companies belonging to *chaebol*, and the government.

CONCLUSION: IMPLICATIONS FOR DEVELOPMENT THEORY

The electronics industry is an essential industry for economic development. Due to the easier division of production processes in the electronics industry than in other industries, as well as its labor-intensive characteristics, the developed countries tended to relocate their production lines offshore. The four East Asian NICs, followed by the Southeast Asian economies of Malaysia and Thailand, took advantage of this opportunity. In this regard, shifts in the international division of labor offered the chance for development to East Asian NICs and Southeast Asian countries.

This international shift has been coupled with the export-oriented development strategy of the region. As discussed earlier, East Asian NICs and some Southeast Asian countries adopted an export-oriented strategy and began to attract foreign investment. Although the strategy cannot fully explain their economic success, and the role of foreign investment diverged across countries, all nations witnessed rapid development coupled with growing production and exports. The relevance of the commodity chains perspective lies in this point.

Despite overall of success in the region, Korean consumer electronics and semiconductor industries show exceptional development patterns. Altering existing commodity chains has been achieved only in Korean consumer electronics and the formation of new commodity chains has occurred in the Korean semiconductor industry. In this regard, the development of the Korean electronics industry is an extraordinary case. Admittedly, the structure of the Korean electronics industry is uneven and there still exists a wide technological gap between Korea and the leading countries. However, Korean consumer electronics producers have begun to compete with the United States, Japan, and Western European economies, and have come to be one of the biggest producers in the semiconductor industry.

This type of development is not accidental. To escape from offshore assembly, large-scale investment by domestic firms in equipment, plants, R & D, and marketing was necessary. The breakthrough was engineered by local Korean firms of which the majority are members of *chaebol* groups. Along with the *chaebol*-oriented industrial structure, the role of the government has been crucial in the development of Korea's electronics industry. During the industry's early stages, the government made efforts to attract foreign

investment and expand exports. Following the growth of local firms, the government turned to support domestic investments and reduce risks for the firms. In the 1980s, the government encouraged technological advances by supporting local firms' R & D investments. Technological innovation was indeed the most urgent agenda for the state, as well as for local firms, in order to secure Korea's place in the worldwide electronics industry.

The development of the Korean electronics industry sheds light on the role of nation-states and local firms. In this globalized world, it is not an easy task to conceptualize a model for "national development." The capability of nation-states to manage their economics has grown weaker, while the international flow of capital, commodity, and labor has increased. But, as we have seen in the case of the Korean electronics industry, the growth of local firms is crucial in promoting technological advancement and progress into high value-added production. The role of the nation-state can be an important factor in determining a country's developmental path. The nation-state can still implement measures to cope with external constraints and provide support for the growth of local firms. (Lew 1987).

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