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The East Asian Industrialization in the Gerschenkronian Mirror: Catching-up Strategies and Institutional Transition

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This article is an attempt at bridging the gap between economic history and development economics in analyzing the East Asian industrialization during the latter half of the twentieth century. It re-interprets Alexander Gerschenkron's 'patterns of industrialization' and discusses methods to extend a historical model to different historical contexts. It then compares four East Asian countries, namely, Japan, South Korea, Taiwan and Singapore in terms of Gerschenkronian substituting strategy and complementing strategy. It also examines the transitions of those catching-up economies and explores the future of the catching-up strategies.

The industrialization of East Asia during the latter half of the twentieth century has aroused great interest among development economists, but has been rarely studied by Western economic historians, with the exception of the Japanese 'miracle', now itself an historical fact. On the other hand, development economists scarcely have tried systematically to apply insights from economic history to the analysis of the East Asian industrialization, despite their frequent quotations from historical studies. This paper is an attempt at bridging this gap between economic history and development economics. It starts from re-interpreting Alexander Gerschenkron's model of late industrialization and discusses some methodological issues in extending historical models to different historical contexts. It then analyzes four East Asian countries, namely, Japan, South Korea, Taiwan and Singapore by examining the influences that brought about recurrences of, and deviations from, Gerschenkron's patterns. It extends the analysis to the problem of institutional transition as catching-up economies become mature and

more fully open to the forces of globalization, and explores some issues regarding the future of catching-up strategies.

GERSCHENKRON'S 'PATTERNS OF INDUSTRIALISATION'

Gerschenkron's model, what he loosely calls 'patterns of industrialization', is a three-country paradigm mainly derived from the experiences of Britain, Germany, and Russia in the nineteenth century. He identifies distinctive institutions spearheading industrialization as follows: (1) In Britain, the forerunner who pioneered the Industrial Revolution, the accumulated private wealth of capitalists was a major source of finance and individual entrepreneurs played a central role in industrialization. (2) In Germany, a moderately backward country, 'the universal banks' played a major role in financing industrialization and organizing the private sector. (3) In Russia, an extremely backward country, the state directly mobilized financial resources and created new industries. From these patterns, Gerschenkron makes a sweeping generalization: "The more backward a country's economy, the greater was the part played by special institutional factors ... [and] the more pronounced was the coerciveness and comprehensiveness of those factors".[1]

According to Gerschenkron, this pattern was a combined consequence of (1) the technological trend of the day, (2) different 'degrees of backwardness', and (3) the necessity and willingness on the part of the latecomers to directly compete with forerunners. He observes another pattern, that is, "[t] he more backward a country's economy, the more pronounced was the stress in its industrialization on bigness of both

[1] Gerschenkron, *Economic Backwardness*, p. 354.

plant and enterprise ... [and] the greater was the stress upon producers' goods as against consumer goods".[2] This was because, during the latter half of the nineteenth century when Germany and Russia embarked on industrial catching-up, technological progress was most rapid in the heavy industries and the "evolution of technology and changing composition of industrial output induced growing capital-output ratios and made for increases in the optimal size of plant".[3] And "it was largely by application of the most modern and efficient techniques that backward countries could hope to achieve success, particularly if their industrialization proceeded in the face of competition from the advanced country".[4] In a nutshell, the catching-up strategy of the latecomers in Europe was to focus on the most technologically dynamic industries of the day and leapfrog the forerunners in size of plants and enterprises.

Different institutional patterns across countries were a direct result of this catching-up strategy. British industrialists were forerunners in industrialization and did not face strong international competition. The technological trend during the First Industrial Revolution was also not so much towards increasing capital-output ratios as that during the Second Industrial Revolution when Germany and Russia began their catching-up efforts. It was thus enough for the British commercial banks to provide industrialists with only operating or working capitals.

However, Germany and Russia required special institutions to mobilize scarce resources in order to implement their catching-up strategies. The universal banks

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[2] Ibid., p. 354.

[3] Gerschenkron, *Europe in the Russian Mirror*, p. 113.

[4] Gerschenkron, *Economic Backwardness*, p. 9.

carried out this role in Germany, a moderately backward country, because the banking sector had already developed to a certain level although the country was far behind Britain in industrialization and per capita income. In Russia, an extremely backward country where "the standards of honesty in business were so disastrously low ... [and] fraudulent bankruptcy had been almost elevated to the rank of a general business practice", there was little to expect from the private sector.[5] The Russian state took over the entire role of devising a catching-up strategy and implementing it.

It should be noted that a main driver in Gerschenkron's schema is competition among nations. If Germany and Russia were content to remain in dependent status, they would not have needed to adopt this strategy, which was certain to exert great strains in their societies. The strategy was pursued because they wanted and needed to compete with Britain in terms of industrial and military might. In a world where industrialization had come to exist, economic backwardness was also a threat to national security. Gerschenkron's central concept of 'substitutes' was derived from this competition for supremacy and ensuring security among the European powers. The different strategies and institutions adopted by the latecomers were substitutes for the lack of the supposed 'prerequisites' of development like capital, technologies, or efficient financial intermediaries, which were present in the forerunners. In this respect, we may name this Gerschenkronian type catching-up process as a 'substituting strategy'.

There are three major obstacles in applying Gerschenkron's schema to the late industrializations of the twentieth century. First, it does not tell us much about the cases of failed industrialization which stemmed from 'growth-retarding' conditions although

[5] Ibid., p. 19-20.

Gerschenkron acknowledges this as 'the most important aspect of the problem of limitations'.[6] In his analysis of the European industrialization, Gerschenkron refers to Bulgaria as a case in point. But, even in Italy and Austria, which he regards as cases of bank-led catching-up in a moderately backward economy, it is often pointed out that their state administrations acted as 'obstacles' to industrial growth.[7] In the twentieth century, a larger number of failures in catching-up can be attributed to shortcomings of the state.[8]

Secondly, Gerschenkron's schema does not deal with the cases of dependent development. It is possible that some countries can proceed with industrialization with little urgent need for direct competition with the forerunners. A case in point acknowledged by Gerschenkron, as a clear exception to his model, is Denmark. The country did not have 'sudden spurts of industrialization' or any 'peculiar emphasis on heavy industries' because it had "great opportunities for agricultural improvement that were inherent in the proximity of the English market".[9] In the latter half of the nineteenth century in Europe, this kind of international specialization might have been evident only in agriculture. But a pronounced trend in the latter half of the twentieth century was the ever-increasing process of globalization, which has enlarged room for the latecomers to grow through utilizing international specialization in the manufacturing sector, as shall be elaborated later.

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[6] Ibid., p. 362.

[7] Trebilcock, *The Industrialization of Continental Power*, p. 335-43.

[8] For instance, see Hirschman, "The Political Economy".

[9] Gerschenkron, *Economic Backwardness*, p. 16.

The third limitation has to do with the role of the banks in 'moderately backward' countries. Gerschenkron attaches great importance to the role played by the universal banks, arguing that they were "perhaps the greatest organizational innovation in the economic history of the century".[10] He tested his hypothesis against the case of Italy and found it worked to his satisfaction. He also argued that the banks in other moderately backward European countries like Belgium, France, Austria and Switzerland played similar roles, though in varying degrees. Many historians agree with Gerschenkron in his observation that the universal banks played a central role in the German take-off in the nineteenth century.[11] But there are still strong reservations in the validity of his approach in other moderately backward European countries except Belgium.[12] If we consider non-European cases, his pattern becomes more problematic. The role of the banks in the U.S. was never so prominent as in Germany though it was important in some stages of growth and in some parts of the American economy.[13] It is also difficult to find the latecomers in the twentieth century where the banks played such a leading role in industrialization as in Germany.

However, it seems to me that these limitations are not quite 'fatal' as an interpretative tool for the following reasons. First, Gerschenkron's schema is constructed as an *economic* model. As an astute historian, he never belittles the

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[10] Gerschenkron, *Europe in the Russian Mirror*, p. 102.

[11] Tilly, "Germany," p. 181-82; Landes, *The Unbound Prometeus*, p. 350; Henderson, *The Rise of German Industrial Power*, p. 113; and Trebilcock, op. cit., p. 92-104.

[12] For a summary of this, refer to Sylla, "The Role of Banks".

[13] Ibid.; and Chandler, *Invisible Hand* and "The United States".

importance of political factors in the historical process.[14] But he chooses to focus on economic explanations of late industrialization.[15] This is why he distinguishes what he calls the 'negative' role of the state, which is "in the nature of creating a suitable framework for industrial development", from "promoting it directly" which can be named the 'positive' role of the state, and incorporates only the latter in his model.[16] Thus, different institutions, i.e., the British (unorganized) market, the German universal banks and the interventionist Russian state, are compared as functional substitutes. The negative role of the state is excluded because it can be carried out only by the state and therefore neither the banks nor the market can be its functional substitute. The schema strongly suggests an active role of the state for extremely backward countries, but it is not geared to explaining why the state carried out this role in some countries and not in others. This kind of limitation is inherent in any model since there is no such thing as a universal model that can explain everything.[17]

Secondly, Gerschenkron's model is constructed at an intermediate level of abstraction by retaining the temporal and spatial boundaries of nineteenth-century

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[14] Gerschenkron therefore stresses the importance of institutional changes like the emancipation of the peasants and judicial reforms, in the industrial take-off in France, Germany, and Russia. See Gerschenkron, *Economic Backwardness*, passim.

[15] In the same vein, Max Weber argues "a phenomenon is 'economic' only insofar as and *only* as long as our *interest* is exclusively focused on its constitutive significance in the material struggle for existence". See Weber, *Methodology*, p. 65.

[16] Gerschenkron, op. cit., p. 19.

[17] For the futility of searching for such universal laws, refer to Weber, op. cit..

Europe. So we should consider changes in technologies and institutions when we apply it to different times and spaces. It is not profitable to extend the particular technological trends or particular forms of institutions reflected in Gerschenkron's schema into more modern times.[18] For instance, the heavy industries were no longer a new and technologically dynamic force in the latter half of the twentieth century, although they still provided some latecomers with a springboard for take-off. The growing importance of a 'complementing strategy' in the East Asian industrializations in the latter half of the twentieth century, which primarily exploits any matching relationships between forerunners and latecomers, represents a new source of technological opportunities in the international development process. In extending a historical model, we should explicitly take the evolution of technologies into account.

The same can be said about institutions. Institutional innovations are results of historical development within a country and also of institutional learning across countries. For countries that industrialized later than Germany, therefore, the functions of the universal banks can be assigned to other institutions. One reason why Gerchenkron's view of moderately backward countries has rarely been extended by later scholars lies in the absence of the dominant role of the universal banks in other countries. But if we turn our attention towards finding 'functional substitutes' in

[18] Gerschenkron himself emphasises this aspect as follows: "We deal in particular or existential propositions. It is the very nature of an historical hypothesis to constitute a set of expectations which yields enlightenment and increases the stock of our empirical knowledge within a spatially and temporally limited zone" (*Europe in the Russian Mirror*, p. 130).

different contexts, it is not difficult to see a recurrence of the Gerschenkronian patterns. The *zaibatsu* or the *keiretsu* in Japan, or the *chaebols* in Korea are cases in point. These institutions, generally termed as 'business groups', mobilized resources and coordinated industrial expansion through non-market transactions within the private sector, as shall be discussed later.

Thirdly, related to the above, a historical model is different from a scientific hypothesis that is rejected by the growing incidence of 'exceptions'. It is context-specific and the so-called exceptions are in many cases results of applying the model to different contexts. The best a historical model can achieve is to offer enlightenment in understanding other situations by allowing us to view more clearly both regularities and deviations. In this respect, Gerschenkron argues that "[to] determine the delimitations [of a historical model is] ... on the contrary its reinforcement as a tool of historical understanding".[19] As shall be elaborated below, an extension of Gerschenkron's model in this spirit may reassert a large part of its significance in understanding the late industrialization in the twentieth century.

INTERPRETING THE EAST ASIAN INDUSTRIALISATION

East Asia during the latter half of the twentieth century is a fertile ground for the extension of Gerschenkron's three-country paradigm. Like the U.K. in the nineteenth century, the U.S. was an incontestable technological leader by the end of World War II and its technological leadership provided other countries with a strong impetus for

[19] Ibid., p. 130.

catching-up.[20] Japan had already progressed in its industrialization but was still far behind the U.S., allowing us to place it as a 'moderately backward' country. It was determined to catch up with the U.S. as much as Germany was with the U.K. in the nineteenth century. East Asian newly industrializing countries (NICs) like Korea, Taiwan, and Singapore followed suit as distant latecomers to Japan, like 'extremely backward' countries in Europe in the nineteenth century. The three country groups were clearly distinguished by relative 'degree of backwardness' and closely interacted with each other. We will below compare patterns of catching-up in these countries in terms of Gerschenkronian substituting strategy and complementing strategy.

The keiretsu and the developmental state in Japan

The catching-up experience of Japan during the postwar period can be properly understood in terms of the Gerschenkronian substituting strategy. Japanese companies attempted to compete directly with their forerunners in the U.S., and caught up with them by focusing on the most technologically dynamic industries of the day and by leapfrogging in plant size and investment. A typical case is the iron and steel industry just as it was in Germany in the nineteenth century. The electronics industry, especially the semiconductor industry, shows a similar pattern, though with some deviations due to different technological imperatives in that industry.

What is striking in the Japanese catching-up process in the iron and steel industry is that the country became the first in history to rise to the position of world leader without benefiting from raw materials endowment in the national or neighboring economies.

[20] See Abramovitz, "Catching-Up"; and Maddison, *Dynamic Forces*.

This was mainly due to the application of the 'Nishiyama model'. In 1950, Nishiyama, then the head of Kawasaki Steel, proposed that the newly established Chiba Works should "be equipped with the world's most advanced technologies in the best factory layout" in order to "compete internationally", that is , on a global scale.[21] This meant the establishment of 'bigger and bigger' plants since the technological trend in the industry was still towards increasing economies of scale. This Gerschenkronian strategy was combined with a Japanese peculiarity, i.e., its lack of domestic raw materials. Nishiyama located the new plants 'on the sea-coast with deep-water ports', aiming at reducing costs in importing raw materials and exporting intermediate and final products. Other Japanese producers followed suit. It was mainly the result of the adoption of the Nishiyama model that Japan possessed the eight biggest steel mills in the capitalist world by 1977.[22]

A similar leapfrogging strategy was practiced in the semiconductor industry. As in the iron and steel industry, the scale of production in the semiconductor industry increases rapidly and it is therefore promising for latecomers to embark on a larger-

[21] Yonekura, "The Postwar Japanese Iron and Steel Industry", p. 214.

[22] See Yonekura op. cit.; Hogan, *World Steel*; and Allen, *Japan's Economic Expansion*. Some researchers, like Lynn in *How Japan Innovates,* emphasize the importance of the Japanese early adoption of new technologies like the basic oxygen furnace (BOF) and continuous casting (CC). But the Nishiyama model was already formulated and implemented in 1950 *before* the introduction of BOF and CC in the late 1950s. In this respect, the early adoption of BOF and CC can be said facilitating factors in Japanese catching-up in the iron and steel industry.

scale of capital investment in their bids to outperform forerunners. However, as new products and processes emerge rapidly, capital equipment needs to be replaced continually and large-scale investment in research and development (R&D) must be carried out continuously. So the catching-up process in the semiconductor industry is a much more continuous and prolonged affair. Japanese producers made their play in this 'high-tech' industry by focusing on DRAMs, a segment with high capital intensity, and by outperforming their forerunners in the investment 'race', most remarkably during the period of recessions.[23]

The major institutions in applying this substituting strategy were the *keiretsu* system and the developmental state. Compared to Germany in the nineteenth century, the role of the state was certainly more important in Japan. On the global level, the economic role of the state was significantly enhanced with the wide adoption of Keynesian fiscal and monetary policies in the latter half of the twentieth century. Moreover, the situation of the Japanese state after the defeat in the Second World War was historically unique. Its role in international politics was severely restricted and the only remaining option to enhance the nation's prestige was economic development. The relative autonomy of the state over domestic interest groups was also significantly increased "[w]ith the *zaibatsu* weakened, the military smashed, and the landlords dispossessed, but with the

[23] The average ratio of capital spending to sale of U.S. producers remained only 12% during the period 1973-78 but the ratio of Japanese producers was 17.8% during the same period. The same pattern was repeated in the 1985/86 recession. See Gregory, *Japanese Electronics*, p. 95, 209; Hobday, "Corporate Strategies", p. 235-36; and Flaherty and Itami, "Finance".

bureaucracy untouched".[24] Hence the emergence of 'the developmental state': economic growth became the prime objective of the state and the state was equipped with the power to pursue that objective. The Japanese state not only applied a variety of macroeconomic stimuli to its industries but also employed comprehensive industrial policies.[25]

However, it seems that a more prominent vehicle in the finance and organization of industrial expansion in Japan was the *keiretsu*. The pre-war *zaibatsu* had already developed substantial technological and organizational capability during the heavy industrialization of the 1930s and the subsequent wartime efforts. Although production facilities in Manchuria were cut off and many of those in Japan were destroyed, experienced managers and engineers, and trained workers were still abundant after the war. Once constraints imposed by the Allied Forces were removed with the outbreak of the Korean War in 1950, the former *zaibatsu* system was revived in the form of the *keiretsu* system and initiated industrial expansion on a broad front.

For instance, the steel industry rapidly emerged as a major export machine mainly as a result of fierce domestic competition among the *keiretsu*, despite the fact that the government was initially critical of its capacity expansion.[26] The automobile industry's

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[24] Cumings , "The Origins", p. 64.

[25] See Johnson, *MITI*"; Allen, *A Short Economic History*; Okuno-Fujiwara, "Industrial Policy".

[26] The MITI at first opposed Nishiyama's plan, regarding it 'as an impossible dream', and defined the iron and steel industry as an 'inappropriate exporting industry'. See Yonekura, op. cit., p. 213-19.

phenomenal growth can be also attributed largely to competition within the private sector.[27] The consumer electronics industry in Japan rapidly overtook its U.S. counterpart from the late 1950s without any particular assistance from the government.[28] The system of the *vertical keiretsu* was also an important institutional feature that enabled catching-up in the semiconductor industry, although the state's involvement in organizing collaborative research, especially in the VLSI Project in 1976, can be regarded here as a facilitating factor.[29] This supremacy of private initiative is more apparent if we compare the Japanese catching-up process with those of later-comers like Korea, Taiwan and Singapore.[30]

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[27] In 1963, MITI tried to introduce the "Special Industrial Promotion Measures Temporary Act", attempting to force mergers and specialisation in the passenger car market, as well as in special steels and petrochemicals, regarding them as internationally uncompetitive. The measure provoked heated controversies in Japan and did not pass the Diet. If this act had been passed, Honda Motor would have been barred from producing passenger cars. See Kawahara, *The Origin of Competitive Strength*; and Morikawa, "Japan".

[28] Since the late 1950s, "virtually all the revolutionary innovations in consumer electronics products ... have come from Japanese industry", according to Gregory, *Japanese Electronics*, p. 7.

[29] Refer to Uenohara, "Background"; Flaherty and Itami, op. cit.; Gregory, op. cit.; Borrus, "Trade and Development"; and Shin, *The Economics of the Latecomers*.

[30] In a similar context, Patrick and Rosovsky argue that "the main impetus to growth has been private ... Government intervention generally has tended (and intended) to

A principal role of the *keiretsu* lay in the provision of capital, just as had been the case with the German universal banks of the nineteenth century. The *keiretsu* facilitated high-speed economic growth through 'interlocked shareholdings', internal resource transfers, loan guarantees and other in-house services. In the iron and steel industry, previous *zaibatsu* ties were strengthened mainly for the purpose of finance and new ties were established within the *keiretsu*.[31] In the automobile industry and the electronics industry, economies of scope resulting from the structure of business grouping were also important.

However, the Japanese *keiretsu* and the German banks differ in their coordinating power. In Germany, the banks were *de facto* the center of German capitalism. They not only provided industry with capital but also led industry-wide reorganization like promoting cartel association or vertical integration between independent producers by means of their multiple holdings across competing firms. In contrast, in Japan, competing banks mostly backed competing large firms within the confines of individual

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accelerate trends already put in motion by private market forces" (*Asia's New Giant*, p. 47).

[31] For instance, Kawasaki Steel established a close alliance with Daiichi Bank in order to finance its ambitious investment plan. Sumitomo Steel was supported by its *keiretsu* member bank, Sumitomo Bank. Yawata and Fuji, though they were classified independent from *keiretsu* grouping, strengthened their existing links with Mitsui and Mitsubishi *keiretsu*. NKK's joining Fuyo group was also driven by financial necessities because its affiliated *zaibatsu*, Asano *zaibatsu* lacked financial institutions. See Yonekura, op. cit.; Morikawa "The Zaibatsu; and Miyashita and Russel, *Keiretsu*.

keiretsu. So competition was not restrained, but rather intensified by the banks' support. This explains why the Japanese government continually attempted to arrange cartels to aim at controlling 'excessive competition'.

By utilizing the *keiretsu* system and the developmental state, Japan financed its industrialization mostly through domestic resource mobilization, with foreign direct investment (FDI) and foreign debts negligible in its overall industrial financing. Japan's foreign debt accounted for only 0.35% of GDP in 1975, even lower than that of the U.S. (4.07%), the U.K. (6.33%), France (0.53%), or Germany (0.40%).[32] The ratio of FDI to gross capital formation in Japan was only 0.1% during 1970-90, as table 1 shows. A consequence of this nationally-based development supported by bank financing was a heavy reliance on debts. The debt-equity ratio of the manufacturing sector in Japan reached nearly 500% at the height of its heavy and chemical industrialization in the 1970s, as figure 1 shows. Japan was able to reduce the debt ratios of its corporations thereafter but the level remained relatively high when compared to other developed countries.

Substituting versus complementing strategies in East Asian NICs

When compared to Japan, the East Asian NICs can be regarded as 'extremely backward' countries at the beginning of their industrialization.[33] Following the

[32] IMF, *International Financial Statistics.*

[33] Among the four East Asian NICs, Hong Kong is not analyzed here mainly because we consider it as an exceptional case. Its industrial growth can be interpreted as a form of complementary development like Taiwan or Singapore. But it was governed by

Gerschenkronian pattern, the state was the prime agent in initiating and organizing industrialization in these countries, employing a broad range of industrial policy measures and continually leading structural changes.[34] Reflecting the new technological and international environment in the twentieth century as well as their own historical peculiarities, however, there were also some significant differences from Gerschenkron's patterns in the catching-up process of these countries.

Korea closely followed the Japanese catching-up model. Its heavy and chemical industrialization programme in the 1970s progressed in the face of strong criticisms and skepticisms from international organizations and domestic academics, who viewed economic growth of the latecomers primarily in terms of comparative advantage and regarded the heavy industries as unsuited to Korea at that stage of development. POSCO, the state-owned steel company, faithfully adopted the Nishiyama model by building 'bigger and bigger' plants and by locating them on the seacoast.[35] Economies

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Britain, which had little interest in or inclination towards a state-led development of the economy, although it suppressed labor movements for security reasons. Hong Kong also enjoyed a monopolistic position in providing a bridge between China and the capitalist world. One consequence of this development pattern was a rapid de-industrialisation of Hong Kong from the 1980s as it was more and more integrated into the Chinese economy.

[34] Refer to Wade, *Governing the Market*; World Bank, *The East Asian Miracle*; Rodrik, "King Kong"; and Low, *The Political Economy*.

[35] POSCO, *The 20 Years*; Amsden, *Asia's Next Giant*; Enos and Park, *The Adoption and Diffusion*; Hogan, "South Korean Steel Growth"; and Juhn, "Challenge of a Latecomer".

of scale and modern technology were emphasized in other industries, and "by the end of 1970s, Korea had the largest textile plant, the largest plywood plant, the largest shipyard, the largest cement plant, and the largest heavy machinery plant in the world".[36] In the semiconductor industry, again imitating the Japanese model, Korea focused its catching-up effort on DRAMs and outperformed its forerunners in the race of continuous R&D and facility investments.[37]

However, reflecting its relative backwardness as compared to Japan, Korea focused on narrower segments of the heavy and chemical industries and pursued a more unbalanced growth strategy. POSCO relied mostly on imported facilities in its expansion in order to maintain the quality of its products, and gave only minor concessions to the persistent requests of the indigenous machinery industry to take part in the expansion of POSCO's mills. In the semiconductor industry, Korea also concentrated on the *manufacturing* of DRAMs, importing 97% of the equipment and 90% of raw materials even in 1989 when it was firmly established as a major producer of DRAM in the world market.[38] Korea's strategy was basically to gain international competitiveness in assembly businesses first and then spread its competitive strengths into backward- or forward-linked industries.

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[36] Kim, "National System, p. 367.

[37] Refer to Shin, op. cit. and Choi, *Dynamic Techno-Management Capability*.

[38] In comparison, the Japanese producers reduced the ratio of equipment import from 70-80% in 1976 to around 50% by 1980 with the VLSI Project. See Shin, op. cit. p. 132-33.

Consistent with this dependence on foreign equipment and materials, Korea relied heavily on foreign debts. Japan was able to finance its heavy and chemical industrialization mainly with its own domestic resources and export earnings because its machinery and material industries had been already developed to a certain level before the end of World War II. But Korea's domestic resources and export earnings were far short of financing its ambitious plan for the heavy and chemical industrialization. The country was also reluctant to attract foreign equity participation as it was pursuing a nationalistic substituting strategy. The assumption of foreign debt was therefore the only alternative financing method available in this situation. As a result, among the East Asian NICs, Korea displayed the highest reliance on foreign debt, while the share of FDI to gross fixed capital formation was the lowest, as table 1 and table 2 show.

The basic pillar of this catching-up route was the state-banks-*chaebols* nexus. In the early 1960s when the country earnestly began industrialization, the state nationalized commercial banks and subordinated their lending decisions to industrial policy. The state designated strategic industries and picked out the *chaebols*, the Korean version of family-owned business groups much like the original Japanese *zaibatsu*, to undertake the task of building these new industries. The state not only provided them with subsidies and tariff protection, but also guaranteed their foreign loans.[39] Due to the extensive utilization of the banking system for industrial financing as in Japan, the period of the HCI was characterized by a jump in the corporate debt-equity ratio, as figure 1 shows.

[39] See Jones, *Government, Business, and Entrepreneurship*; Amsden, op. cit.; and Chang, *The Political Economy*.

For the convenience of our comparison with Taiwan and Singapore below, the growth of the *chaebols* should be given particular attention. Although they were basically children of the state-led heavy and chemical industrialization of the 1970s, they rapidly began displaying financial muscle in initiating new large-scale projects, in a style not unlike that of the St. Petersburg banks in Russia in the early twentieth century. For instance, the *chaebols'* foray into the semiconductor industry in the 1980s was a result of oligopolistic competition among them in spite of the initial reluctance of the government to support it.[40] The pace of the *chaebols'* expansion was partly reflected in the phenomenal growth of research and development (R&D) expenditure in the private sector, which increased 128 fold from 1976 to 1990. The public share of R&D accordingly dropped from 64% in 1976 to 19% in 1990, a level similar to that in Japan.[41] The *chaebols* securely established themselves as the major promoters of high-risk projects in Korea in the 1980s.

On the other hand, Singapore and Taiwan adopted somewhat different catching-up strategies, which can be described as 'complementing strategies'. Singapore developed mainly through attracting and upgrading multinational companies' (MNCs) investments by providing them with 'complementary assets' such as infrastructure, human capital, fiscal incentives and so on. The Singaporean policy-makers were not interested in competing with its forerunners, and, instead, attempted to connect the economy directly to the 'First World'.[42] Since its industrialization was spearheaded by MNCs who

[40] See Yoon, "Industrial Development"; and Shin, op. cit..

[41] See Shin, op. cit. and figure 2.

[42] See Lee, *From Third World*; Mirza, *Multinationals and Growth*; and Low, op. cit..

already had their own technical and financial resources, Singapore did not face pressing needs to invest in local innovative capabilities and mobilize financial resources. Government-linked companies (GLCs), i.e., public enterprises in Singapore, also filled the areas, in which MNCs were not interested but which the Singaporean government regarded as strategic to the country's development, such as shipbuilding, steel-making and so on. As a city-state depending for its survival on trading, Singapore barely had room to deploy tariff protection for domestic market. Among the three East Asian NICs, Singapore grew through the most internationalist route towards industrialization.

Taiwan initially took a nationalistic path of development relying on three pillars, i.e., public enterprises, the *guangxiqiye* (local business groups), and SMEs. It underwent a short period of import-substituting industrialization and imposed heavy regulations on FDI. But it soon shifted to reducing protection and attracting MNCs in order to compensate for the lack of big local companies. The Taiwanese companies have seldom attempted to directly compete with their forerunners in Japan or in the U.S.. The Taiwanese state encouraged and even arranged alliances with MNCs when it felt it necessary to venture into high-risk areas like semiconductors.[43] The dominance of SMEs and the partnering with MNCs in high-risk projects reduced the need for external funding in the course of its industrialization.[44]

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[43] For instance, TSMC, currently the largest semiconductor foundry in the world with $5.3 billion of sales in 2000, was set up in 1987 as a joint venture between the Taiwanese government (48%), Phillips (27%), local private investors (25%) (Lim and Pang, *Foreign Direct Investment*).

[44] Wade, op. cit.; Whitley, *Business Systems*; and Fields, *Enterprise and the State*.

A major factor behind the emergence of the Taiwanese and Singaporean complementing strategies was the acceleration of globalization in the latter half of the twentieth century. The global operation of MNCs took off in the 1960s and it has become an ever-growing force in shaping the world economy.[45] The beginning of the electronics industry in Taiwan and Singapore in the 1960s, which later became the largest industry in the both countries, can be attributed to MNCs' relocation of labor-intensive production processes to developing countries.[46] At the start, the countries provided MNCs mainly with low-wage labor as a complementary asset. However, as MNCs continued to deepen and broaden their global production networks, they upgraded and diversified their complementary assets so that MNCs could remain and expand in their territories.[47]

In comparison with the substituting strategy in Korea, a distinctive feature of the complementing strategy in Taiwan and Singapore was the state's continued leading role in high-risk projects. In Korea, the private sector, especially the *chaebols*, rapidly took

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[45] Refer to Dicken, *Global Shift*.

[46] Henderson, *The Globalisation of High Technology*; and Chen, "The Development of Taiwan's Electronics Industry".

[47] The beginning of the electronics industry was similar in Korea. Although the consumer electronics like radios and TV sets was under strict import-substituting policy regulations, other segments like semiconductors and electronic calculators were developed solely for exports without significant linkages to domestic demand. The difference in the Korean case is that the country later pursued vigorous substitution of those enclave development items and thereby displaced MNCs with local enterprises.

over the leading role in R&D investment from the 1980s, as noted before. In Taiwan and Singapore, however, the growth of private R&D expenditure was far slower than in Korea, and the state maintained a crucial role in R&D investment (figure 2). This was because those companies adopting complementing strategies have relatively less incentive to invest in R&D as the partnering companies are normally the major source of their technological innovation. Of course, this does not exclude the possibility that the latecomers can acquire these high-end capabilities for themselves, and the successes of Singapore and Taiwan have in fact hinged on their ability to climb continuously up the technology ladder. However, in comparison with companies adopting substituting strategies that are compelled to rapidly build up their own capabilities to compete directly with incumbent MNCs, the pace of technology accumulation tends to be slower in those adopting complementing strategies. Therefore, it was imperative for their states to play a compensating role adjusting for the relative weakness of the local private sector.

For instance, in entering high-tech industries, Taiwan employed an 'orderly spin-off strategy'. Public research institutes like ERSO, developed major technologies and set up venture companies with combined investments from the government, the private sector, and sometimes from foreign companies.[48] Major high-tech venture companies were therefore in fact half-public enterprises, despite being formally private companies. In Singapore, where investments were spearheaded by MNCs, the local private sector's capability was severely underdeveloped compared to that of Taiwan. Therefore, when Singapore increasingly needed to complement MNC operations with high-end assets as

[48] Hou & Gee, "National Systems" and Chen, op. cit..

its per capita income approached the level of developed countries, it was the state that initiated investment in upgrading local technological capabilities by setting up various research institutes, and launching programs to nurture local venture firms, like 'Technopreneurship 2000' and so on.[49]

However, the complementing strategy has one definite advantage over the substituting strategy, that is, it is less risky, as it avoids direct competition with the forerunners and spreads financial risks among partners of the equity ownership. Therefore, Taiwan and Singapore faced much less urgency in building up domestic institutional mechanisms for the large-scale mobilization of financial resources, and their banks were less mobilized for industrial financing than their Korean counterparts. The result was a relatively low corporate debt-equity ratio in Taiwan or Singapore vis-à-vis that in Korea. The ratio for the Taiwanese manufacturing sector was 95.1% on

[49] Wong, op. cit. Similar weaknesses of the local private sector can be found in the marketing front. In Korea, the *chaebol*-owned general trading companies (GTCs) played a pivotal role in export expansion. The Korean GTCs increased its share of country's exports from 14.0% in 1975 to 47.9% in 1982 while the share of the *sogo shosha*, Japanese GTCs, decreased from 15.6% in 1976 to 7.9% in 1982. In contrast, Singapore's exports depended predominantly on MNCs' marketing networks reflecting its reliance on MNCs for production activities. In Taiwan, local trading companies accounted for only around 20% of Taiwan's total trade in the 1980s whilst the Japanese *sogo shosha* kept the central role as the country's international trading channel, taking 50% of the total trade. See Cho, *The General Trading Company* 1986 and Fields, op. cit..

average during 1974-1995 while that of Korea was 342.20% during the same period, as figure 1 shows. In a study covering the period of 1980-1991, the debt-equity ratio of Singapore firms was 123.3% while that of Korean firms was 366.2%.[50] Taiwan and Singapore also relied much less on foreign debts than Korea, as table 2 shows.

TRANSITION OF CATCHING-UP ECONOMIES

The catching-up system, once established, faces challenges from within. Successful economic growth itself, i.e., increasing maturity of the economy, presses for changes in the system. By its nature, the catching-up system is transitory and never stationary. If the objective of the system, i.e., catching-up, is achieved, the system loses its *raison d'être*. During the period of catching-up, it should also undergo continual adjustments as the gap with the forerunner is narrowed.

In Gerschenkron's schema, the relationship between the state, the financial sector, and the industrial sector is governed by the 'degree of backwardness', the converse of the 'degree of maturity'. As the situation of economic backwardness is corrected, the relations between those institutions need to undergo changes. So German industrial groups like Siemens or Krupp sought independence from the universal banks as their financial and organizational capabilities were strengthened.[51] The Korean *chaebols* also began seeking greater freedom from the government's tight grip from the 1980s.

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[50] Demigruc-Kunt and Maksimovic, "Stock Market".

[51] Refer to Feldenkirchen, "The Banks and the Steel Industry"; Chandler, *Scale and Scope*.

For the East Asian countries, these domestic changes coincided with the acceleration of globalization. Although the global operations of MNCs took off in the 1960s, it was in the 1980s, when the East Asian countries established themselves as successful catching-up countries, that the pace of globalization gained a decisive acceleration. Anglo-American countries like the U.S. and the U.K. initiated a fuller liberalization of their domestic economies and pushed for further liberalization of international trade and finance from the 1980s. And the wave of liberalization spread to other developed countries and also to developing countries.

Despite the fact that the three East Asian NICs were equally successful in their industrializations until the 1980s, the challenges from maturity and the acceleration of globalization affected them unevenly.[52]

First, differences in the state-finance-industry relations brought about different requirements for institutional adjustment. In Taiwan and Singapore, countries adopting a complementing strategy, the financial sector was not extensively mobilized for industrial financing, their states relying more on fiscal policies like tax breaks and high

[52] The case of Japan is not discussed in this section mainly for convenience of comparison since its stage of development is different from East Asian NICs, though the country, as an exponent of the substituting strategy, shares many similarities with Korea such as a greater need to adjust the relations between the banks and industrial companies.

depreciation allowances to achieve the necessary stimulus for further investment.[53] Therefore, the relation between the financial sector and the industrial sector did not need a large-scale transformation as their economies matured. The financial sectors of those countries had been already characterized by extreme conservatism and their lending decisions were more autonomous than that in Korea. What was required of them was the overall upgrading of their capabilities as their economies grew and became more complex, not a radical adjustment in their relations with the industrial sector. Likewise, the relation between the state and the private industrial sector in these countries did not need to undergo extensive adjustments. Their local capitalists remained relatively weak and the role of the state still lay basically in promoting them. The states of Taiwan and Singapore have even strengthened their promotional role in new high-risk industries. In this milieu, there was little need of anti-trust regulations.

In contrast, Korea faced greater strains in the state-banks-*chaebols* nexus as its economy became mature. The extensive mobilization of the banking sector for industrial expansion resulted in a high portion of policy loans in total loans.[54] As the interaction between finance and the industry became more complex as economic maturity advanced, the Korean banks needed to gain more autonomy in their lending

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[53] It of course allocated policy loans, but they "were broadly targeted to support exports or anti-inflationary import package ... and industry-specific loans were rare". See Cheng, "Guarding the Commanding Height", p. 56.

[54] Policy loan in Korea therefore constituted more than 40% of total domestic loan even in 1993 when the country already began opening its financial markets. See World Bank, *The East Asian Miracle*, p. 309.

decisions and the state was required to relinquish many of its previous direct controls over the financial sector while strengthening its financial supervisory role. The state-*chaebols* relation also needed to undergo change. As the *chaebols* grew, the Korean state was required to play a double role. It had to maintain some promotional role since the country was still in a catching-up stage while, at the same time, it needed to regulate the increasing dominance of the *chaebols* within the domestic economy. The Korean state strengthened anti-trust regulations from the early 1980s and 'the *chaebol* issue' has been one of the most thorny policy issues in Korea since then.

Secondly, the acceleration of globalization posed different challenges to the relationship between MNCs and local firms within the three East Asian NICs. With the acceleration of globalization, those companies that adopted a substituting strategy were under more pressure to transform themselves into full-fledged MNCs. They were required to carry out heavy investments to protect their local markets from the entrance of competing MNCs, on the one hand, and to penetrate foreign markets in order to capture new opportunities, on the other. The investments of the Korean *chaebols'* in the mid-1990s, which have been often criticized as 'over-investment' following the financial crisis of 1997, can be understood in this context. The latecomer firms adopting the complementing strategy in Taiwan and Singapore were also required to restructure their operations in line with the re-organization and changing needs of their partnering MNCs, but their task was not so tough as that of firms pursuing substituting strategies.

Thirdly, there were differences among the three countries in managing financial risks arising from the acceleration of financial globalization. Korea had, proportionally, larger foreign and corporate debts than Taiwan and Singapore. It was able to maintain

these relatively high levels of debts with the help of the government's control of cross-border capital flows and the commercial banks' willingness to keep providing the corporate sector with loans. But financial globalization weakened the government's capacity to control capital flows. The room for 'patient' money was also reduced as local firms were more broadly exposed to international financial markets. Financial liberalization in a country with relatively high exposure to foreign debts had to be paralleled by the construction of a system to manage the level and structure of debts as well as to protect the economy from the volatility of the international capital flows. In contrast, the relatively low levels of foreign and corporate debt in Singapore and Taiwan were a factor that made them less vulnerable to financial shocks.

There were certainly other factors explaining why Korea fell into financial crisis in 1997 while Taiwan and Singapore did not. But, if we compare the catching-up strategies and the consequent institutional structures of those countries, the greater challenges posed to Korea by economic maturity and the acceleration of globalization are to be noted. The financial crisis showed that Korea failed in surmounting these challenges.[55]

However, this is not to argue that the financial crisis was an inevitable consequence of the Korean path to industrial development. There is no such thing as necessity in history. The previous discussion does no more than point out the fact that, at some historical junctures, some countries are relatively disadvantaged in coping with new challenges while others are less disadvantaged. After all, as Gerschenkron emphasizes, the challenges to latecomers always look formidable and catching-up commences when

[55] For a detailed discussion on the Korean crisis and its aftermath, refer to Shin and Chang, *Restructuring Korea Inc.*.

they overcome obstacles with their own creativity. Bigger challenges can be countered by greater creativity.

CONCLUSIONS

Despite the fact that comparative advantage for the latecomers lies in labor-intensive industries, the Gerschenkronian catching-up strategy of building 'bigger and bigger' plants re-appears time and again, as we have seen from the cases of Japan and Korea. This is because, in the industries that require heavy capital investment and whose production processes are tightly integrated geographically, this kind of leapfrogging strategy provides the latecomers with a better chance to gain competitive edge against their forerunners. It is not simply 'a quest for prestige' or a result of 'economic megalomania', but is based on a sound economic calculation. A more intriguing question for the latecomers would lie in the degree of necessity and willingness to compete in these industries, which varies greatly according to the historical situation of individual countries. In the latter half of the nineteenth century, Germany and Russia wanted and needed to compete with Britain, and the focus on the heavy industries was a suitable technique for achieving this ambition since they were the most technologically dynamic industries of the day. In the latter half of the twentieth century, however, we see the emergence of new industries like the electronics industry, which are technologically dynamic but whose production processes can be spatially separated. And some latecomers did not have a compelling need or desire to directly compete with their forerunners. We have in the above explained the deviations from Gerschenkronian pattern in East Asia in view of these newly emerged factors, and investigated different paths of transition between substituting and complementing models of catching-up.

It would be a matter of further research to probe the feasibility of the two catching-up strategies for the current latecomers. In the 1960s when the East Asian NICs began their industrialization, the complementing strategy was an exception among developing countries. However, it has been increasingly treated as a norm for late industrialization by many scholars and international institutions as the globalization tendency accelerated in the 1980s and 1990s.[56] The substituting strategy appears to have lost credibility in proportion.

But it should be noted that this strategy worked quite well for Japan until it became a fully developed country and for Korea at least until it reached the level of a middle-income country. It is also not improbable that the current trend of globalization can be reversed in the future, as happened with the earlier episode of globalization that was followed by the period of the Great Depression in the 1930s, and more nationalistic models of late industrialization may regain their vogue in the future. Even if the current pace of globalization is maintained, some reservations remain in regards the general utility of the complementing strategy.

First, there are business areas within which the MNCs are not interested in relocating or outsourcing to the latecomers but in which the latter may find great potential for growth. In deciding on the catching-up strategies, therefore, a crucial question is posed: how sufficient a specialization in the complementary areas that can match MNCs' needs will be available for the latecomers in meeting their needs of economic growth? The answer will be ultimately determined by the size of the market created by the

[56] See World Bank, *World Development Report*; Dunning, *The New Globalism*; and Lipsey, "Globalization and National Government Policies".

international subcontracting network at any given time. The size of countries concerned will also be a factor. For bigger countries, engaging only in the complementary areas to MNCs may not suffice to attain a desirable rate of economic growth. For smaller countries, it should be relatively easier to achieve a desirable rate of economic growth through specializing in limited areas. As the Taiwanese case shows, this scope has been greatly expanded with the acceleration of globalization. But it remains to be seen whether it will work for bigger countries like Korea, China and so on.

Secondly, there may be limits to growth through complementing strategy above a certain level of development. As an economy grows and its production costs rise, it should keep moving to higher value-added products. But it may be the case that the scope for this upgrading is reduced if the economy sticks to the path of complementary development since it makes less economic sense for MNCs to part with their higher-end capabilities. For instance, one reason why MNCs globalize their operations is to recoup on the rapidly increasing costs involved in developing new technologies.[57] In this respect, the core R&D capability is the last thing MNCs will transfer and there is no complementary asset latecomers can provide to attain this capability. So a complementing strategy may have to be followed by a 'delayed substituting strategy' at some stage of development. It seems that the acceleration of globalization has enabled the latecomers to postpone the need to adopt a substituting strategy to a later stage of development, rather than rendering such a strategy unnecessary.

[57] Freeman, "Convergence and Divergence"; and Pavitt, "Global Corporations".

Bibliography

Abramovitz, Moses. "Catching-Up, Forging Ahead and Falling Behind." *Journal of Economic History* 46, no. 2 (1986): 385-406.

Allen, George. C. *Japan's Economic Expansion*. Oxford: Oxford University Press, 1965.

_____. *A Short Economic History of Modern Japan*. fourth ed. London: Macmillan, 1981.

Akyuz, Yilma., Chang, Ha-Joon. and Kozul-Wright, Richard. "New Perspectives on East Asian Development." *Journal of Development Studies* 34, no. 6 (1998).

Amsden, Alice. H. *Asia's Next Giant*, New York: Oxford University Press, 1989.

Bank of China, Taiwan. *Financial Report of the Manufacturing Sector in Taiwan District, Republic of China* (in Chinese). various years.

Bank of Korea (BOK). *Financial Statement Analysis*. various years.

Bank of Korea (BOK). *Economic Statistics Yearbook*. various years. website, http://www.bok.or.kr

Borrus, Michael., Millstein, J.E. and Zysman, John. "Trade and Development in the Semiconductor Industry: Japanese Challenge and American Response." In *American Industry in International Competition*, edited by Zysman, John. & Tyson, Laura. Ithaca & London: Cornell University Press, 1983.

Bureau of Statistics (Japan). *Japan Statistical Yearbook.* various years.

Bureau of Statistics of Taiwan. *Taiwan Statistical Data Book*. various years. website, http://www.stat.gov.tw/

Chandler, Alfred. Jr. *The Visible Hand: The Managerial Revolution in American Business*, Cambridge, Mass.: Harvard University Press, 1977

_____. *Scale and Scope*. Cambridge, MA: Harvard University Press, 1990.

_____. "The United States: Engines of Economic Growth in the Capital-Intensive and Knowledge-Intensive Industries", in Chandler, Alfred, Franco Amatori and Takashi Hikino (eds.) *Big Business and the Wealth of Nations*, Cambridge: Cambridge University Press, 1997.

Chang, Ha-Joon. *The Political Economy of Industrial Policy*. London: Macmillan, 1994.

Chang, Ha-Joon and Park, Hong-Jae. "An Alternative Perspective on Government Policy towards Big Businesses in Korea". A paper prepared for the project on "The

Korean *Chaebols* in Transition" organised by the Korea Economic Research Institute (KERI), 1999.

Chen, Tain-Jy, Been-Lon Chen, and Yung-Peng Chu. "The Development of Taiwan's Electronics Industry." A paper presented at Asia-Europe Forum on "Industrial Policy, Innovation, and Economic Growth", Copenhagen, March 2000.

Cheng, Tun-Jen. "Guarding the commanding heights: the state as a banker in Taiwan." In *The Politics of Finance in Developing Countries*, edited by Haggard, Stehpan. et al. Cornell University Press, 1993.

Cho, Dong-Sung. *The General Trading Company.* Lexington Books, 1986.

Choi, Youngrak. *Dynamic Techno-Management Capability : the case of Samsung semiconductor sector in Korea,* Aldershot: Brookfield, USA : Avebury, 1996

Cumings, Bruce. "The Origins of Development of the Northeast Asian Political Economy: Industrial Sectors, Product Cycles, and Political Consequences." In *The Political Economy of the New Asian Industrialism,* edited by Deyo, F.C. Ithaca & London: Cornell University Press, 1987.

Demigruc-Kunt, Ash. and Vojislav. Maksimovic. "Stock Market Development and Firm Financing Choices." *The World Bank Economic Review* 10, no. 2 (1996).

Dicken, Peter. *Global Shift*. London: Paul Chapman Publishing, 1992.

Dunning, John. H. and Khalil A. Hamdani, eds. *The New Globalism and Developing Countries.* Tokyo: United Nations University Press, 1997.

Feldenkirchen, Wilfred. "The Banks and the Steel Industry in the Ruhr: Developments in Relation from 1873-1914." In *German Yearbook on Business History 1981,* edited by Engels, W. and Pohl, H. Berlin & New York: Spinger-Verlag, 1981.

Fields, Karl J. *Enterprise and the State in Korea and Taiwan,* Ithaca and London: Cornell University Press, 1995.

Flaherty, M.Therese. and Hiroyuki Itami, "Finance." In *Competitive Edge: The Semiconductor Industry in the U.S. and Japan,* edited by Okimoto, Daniel. et al. Stanford: Stanford University Press, 1984.

Freeman, Christopher and John Hagedoorn. "Convergence and Divergence in the Internationalization of Technology." In *Technical Change and the World Economy: Convergence and Divergence in Technology Strategies*, edited by Hagedoorn, J. Edward Elgar, 1995.

Gerschenkron, Alexander. *Economic Backwardness in Historical Perspective*. Cambridge, MA: Harvard University Press, 1962.

_____. "The Early Phases of Industrialization in Russia: Afterthoughts and Counterthoughts." In *The Economics of Take-Off into Sustained Growth*, edited by Rostow, W.W. London: Macmillan, 1963.

_____. *Continuity in History and Other Essays*. Cambridge, MA: Harvard University Press, 1968.

_____. *Europe in the Russian Mirror, Four Lectures in Economic History*. Cambridge, MA: Harvard University Press, 1970.

Gregory, Gene. *Japanese Electronics Technology: Enterprise and Innovation*. New York: John Wiley & Sons, 1986.

Henderson, William Otto, *The Rise of German Industrial Power: 1834-1914.* London: Temple Smith, 1975.

Henderson, Jeffrey. *The Globalisation of High Technology Production.* London: Routledge, 1989.

Hirschman, Albert O. *The Strategy of Economic Development.* New Haven: Yale University Press, 1958.

_____. "The Political Economy of Import-Substituting Industrialization in Latin America"(1968). Reprinted in *Bias for Hope*, edited by Hirschman, A.O. London: Westview Press, 1985.

Hobday, Michael. "Corporate Strategies in the International Semiconductor Industry." *Research Policy* 18 (1989): 225-38.

Hogan, William. T. *World Steel in the 1980s: A Case of Survival*. Toronto: Lexington Books, 1983.

_____. "South Korean Steel Growth Spurs Industrial Development." *Iron and Steel Engineer*, November (1990).

Hou, Chi-Ming. and San Gee, "National Systems Supporting Technical Advance in Industry: The Case of Taiwan" In *National Innovation Systems: A Comparative Analysis*, edited by Nelson, R.R. Oxford University Press, 1993.

International Monetary Fund (IMF). *International Financial Statistics* (CD-ROM), 2000.

Johnson, Chalmer. *MITI and the Japanese Miracle: The Growth of Industrial Policy 1925-1975*. Stanford University Press, 1982.

Jones, Leroy. P. and Il Sakong, *Government, Business, and Entrepreneurship in Economic Development: The Korean Case*. Harvard University Press, 1980.

Juhn, Sung-il. "Challenge of a Latecomer: The Case of the Korean Steel Industry with Specific Reference to POSCO." In *Changing Patterns of International Rivalry: Some Lessons from the Steel Industry*, edited by Abe, E. & Suzuki, Y. Tokyo: University of Tokyo Press, 1991.

Kawahara, Akira. *The Origin of Competitive Strength: Fifty Years of the Auto Industry in Japan and the U.S.* New York: Akira Kawahara, 1997.

Kim, Linsu. "National System of Industrial Innovation: Dynamics of Capability Building in Korea." In *National Innovation Systems: A Comparative Analysis*, edited by Nelson, R. Oxford: Oxford University Press, 1993.

Landes, David S. *The Unbound Prometeus: Technological Change and Industrial Development in Western Europe from 1750 to the present*. Cambridge University Press, 1969.

Lee, Kwan Yew. *From Third to First World: the Singapore story, 1965-2000*. Singapore Press Holdings, 2000.

Lim, Linda. Y.C. and Eng Fong Pang. *Foreign Direct Investment and Industrialization in Malaysia, Singapore, Taiwan, and Thailand.* Paris: OECD Development Centre, 1991.

Lipsey, Richard. G. "Globalization and National Government Policies: An Economist's View." In *Governments, Globalization, and International Business*, edited by Dunning, J. H. Oxford University Press, 1997.

Low, Linda. *The Political Economy of a City-State: Government-made Singapore*. Oxford University Press, 1998.

Lynn, Leonard. *How Japan Innovates: A Comparison with the U.S. in the Case of Oxygen Steelmaking*, Boulder, 1982

Maddison, Angus. *Dynamic Forces in Capitalist Development: A Long-Run Comparative View*. Oxford University Press, 1991.

Mirza, Hafiz. *Multinationals and Growth of the Singapore Economy*. New York: St. Martins Press, 1986.

Miyashita, Kenichi and David Russell. *Keiretsu: Inside the Hidden Japanese Conglomerates*. Tokyo: McGraw Hill, 1994.

Morikawa, Hidemas. "The Zaibatsu in the Japanese Iron and Steel Industry", In Pohl, H. ed. *Innovation, Know How, Rationalization and Investment in the German and Japanese Economies 1868/1871 - 1930/1980*, Wiesbaden: Franz Steiner Verlag GmbH, 1982.

_____ "Japan: Increasing Organizational Capabilities of Large Industrial Enterprises, 1880s-1980s." In *Big Business and the Wealth of Nations*, edited by Chandler, A. et al. Cambridge: Cambridge University Press, 1997.

National Science and Technology Board (NSTB). *National Survey of R&D in Singapore*, various issues.

OECD. *External Debt of Developing Countries*. Paris: OECD, 1986.

_____. *External Debt Statistics*. Paris: OECD, 1999.

OECD website. *Joint BIS-IMF-OECD-World Bank statistics on External Debt*, www.oecd.org/dac/debt

Patrick, Hugh. T. and Henry Rosovsky eds. *Asia's New Giant*. Washington D.C.: Brookings Institution, 1976.

Pavitt, Keith and Patel, Parimal. "Global Corporations and National Systems of Innovation: Who Dominates Whom?" In *Innovation Policy in a Global World*, edited by Archibugi, D., et al. Cambridge University Press, 1999.

Pohl, Hans. "On the History of Organisation and Management in Large German Enterprises since the Nineteenth Century." In *German Yearbook on Business History 1982*, edited by Engels, W. & Pohl, H. Berlin & New York: Springer-Verlag, 1982.

POSCO. *The 20 Years' History of POSCO* (in Korean). Pohang: POSCO, 1989.

Rodrik, Daniel. "King Kong Meets Godzilla: The World Bank and The East Asian Miracle", in *Miracle or Design?* 1996

Schumpeter, Joseph. *The Theory of Economic Development*. London, Oxford, New York: Oxford University Press, 1934.

Science and Technology Policy Institute (STEPI) Website, http://www.stepi.re.kr

Shin, Jang-Sup. *The Economics of the Latecomers: Catching-Up, Technology Transfer and Institutions in Germany, Japan and South Korea*. Routledge, 1996.

Shin, Jang-Sup and Ha-Joon Chang. *Restructuring Korea Inc.: Financial Crisis, Corporate Reform, and Institutional Transition*. London: Routledge, 2002 forthcoming

Singapore Department of Statistics website, http://www.singstat.gov.sg

Sylla, Richard. "The Role of Banks." In *Patterns of European Industrialization: The Nineteenth Century*, edited by Sylla, R. & Tonilo G. London: Routledge, 1991.

Tilly, Richard. "Germany." In *Patterns of European Industrialization: The Nineteenth Century*, edited by Sylla, R. & Tonilo G. London: Routledge, 1991.

Trebilcock, Clive. *The Industrialization of the Continental Powers 1780-1914*. London: Macmillan, 1981.

Okuno-Fujiwara, Masahiro. "Industrial Policy in Japan: A Political Economy View." In *Trade with Japan: Has the Door Opened Wider?*, edited by Krugman, P. Chicago University Press, 1991.

Uenohara, Michiyuki. et al. "Background." In *Competitive Edge: The Semiconductor Industry in the U.S. and Japan*, edited by Okimoto, D. et al. Stanford: Stanford University Press, 1984.

UNCTAD. *World Investment Report*. New York & Geneva: United Nations, various years.

Wade, Robert. *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*. Princeton, NJ: Princeton University Press, 1990.

Weber, Max. *The Methodology of the Social Science*, translated and edited by Shils. E.A. & Finch, H.A. Glencoe: Free Press, 1949.

Whitley, Richard D. *Business Systems in East Asia*. London: Macmillan, 1992.

Wong, Poh-Kam. "Leveraging Multinational Corporations, Fostering Technopreneurship: The Changing Role of S&T Policy in Singapore." *International Journal of Technology Management* (1999).

World Bank. *The East Asian Miracle: Economic Growth and Public Policy*. Oxford University Press, 1993.

_____. *World Development Report 1999/2000: Entering the 21st Century*. Oxford University Press, 1999.

Yonekura, Seiichiro. "The Postwar Japanese Iron and Steel Industry: Continuity and Discontinuity." In *Changing Patterns of International Rivalry: Some Lessons from*

the Steel Industry, edited by Abe, Etsuo and Yoshitaka Suzuki. Tokyo: University of Tokyo Press, 1991.

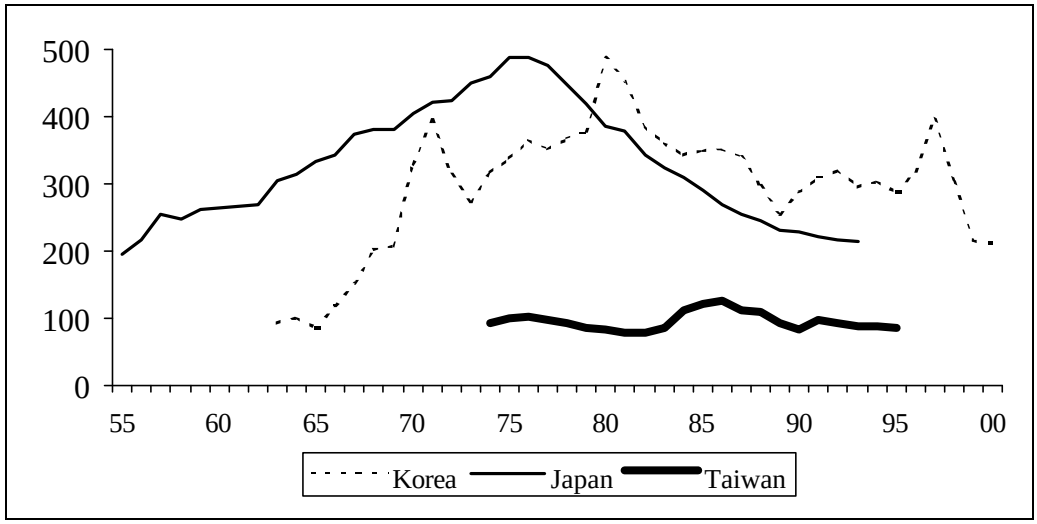
Yoon, Jung Rho. "Industrial Development of Korea and the State: With Speicial Reference to the Semiconductor Industry (in Korean)". In *Productive Capacity, Science and Technology of Contemporary Korea*, edited by Hankook Sahwesa Yunguhwe. Seoul: Moonhak gwa Jisungsa, 1990.

Table 1. Ratio of FDI inflows to Gross Fixed Capital Formation in Selected East Asian countries, 1971-1997
(%)

Country	1971-1980	1981-1990	1991-1997
Japan	0.1	0.1	0.2
Hong Kong	5.1	9.9	8.7
Republic of Korea	1.2	0.9	1.0
Singapore	15.8	26.2	25.9
Taiwan	1.3	1.3	2.7

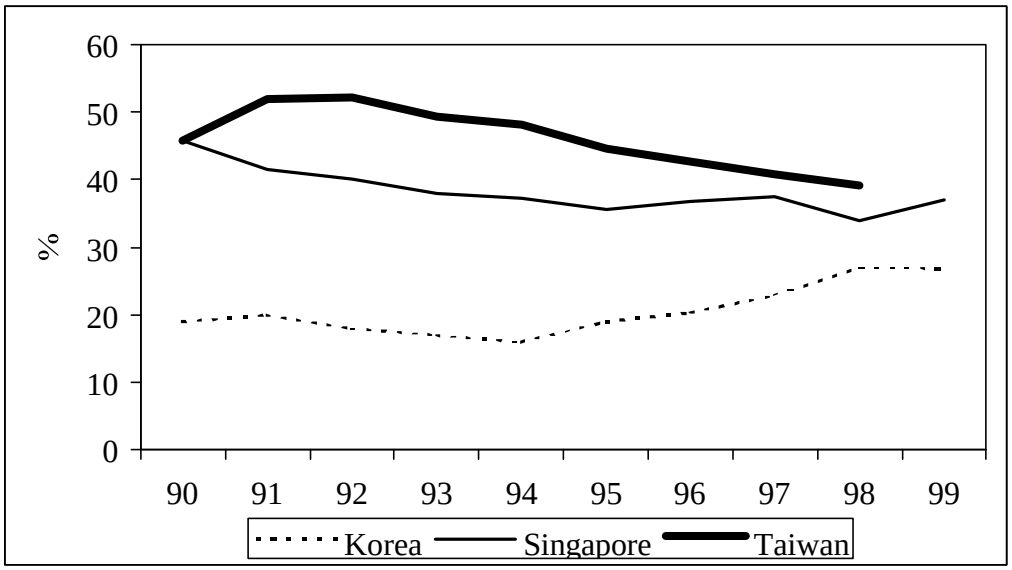
Source: Akyuz *et al.* (1998) for figures during 1970-1990 and UNCTAD for figures during 1991-1997.

Figure 1. Trend of Debt-Equity Ratio in Japanese, Korean and Taiwanese Manufacturing Firms



Source: Bureau of Statistics (Japan), BOK website
Bank of China, Taiwan (1999), Fields (1995)

Figure 2. Public Share of R&D in Total R&D Investment In Korea, Taiwan, and Singapore



Source: STEPI website, NSTB, Bureau of Statistics of Taiwan

Table 2. External Debt to GDP Ratios of Korea, Taiwan, and Singapore (%, Selected years)

	1976	1982	1985	1993	1996	1997
Korea	36.7	52.0	52.1	12.7	20.2	25.5
Taiwan	13.6	12.8	14.5	7.6	8.0	9.3
Singaopre		22.0	22.8	9.5	10.7	16.5

Source: BOK, OECD (1986; 1999, website), IMF (2000)