INDUSTRIAL UPGRADING OF KOREA: PROCESS, PROSPECTS, AND POLICIES

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"... no time to be wasted. The window of opportunity would not be open for long" [1]

INTRODUCTION

For more than four decades the Korean economy expanded at a remarkable rate, dramatically transforming from a poverty-ridden agrarian base into a modern industrialised economy with OECD membership. [2] Since its initial take-off in the early 1960s, reform and restructuring programs appropriate to different stages of development more or less succeeded in facilitating Korea's industrial transition to sustain high growth. The 1997 Asian financial crisis rekindled debate over the extent of Korea's past success and raised doubts over whether Korea can sustain its growth momentum with continuous industrial upgrading in face of the formidable challenges of the "knowledge-based economy.' Indeed, despite a dramatic recovery from the nearly debilitating impact of the crisis, the Korean economy is still highly vulnerable, with many remaining structural problems. The traditional source of Korea's strong economic growth—successful mobilisation of capital and labour—is depleting fast, while learning from or adopting foreign technologies is becoming increasingly difficult.[3]

After five decades of industrialisation, Korea now resembles the major advanced economies in its basic industrial profile. But with industrial activities heavily concentrated in low to medium value added industrial activities such as processing and production, Korea remains behind these economies in the quality of its industrial structure. Except for a few elite firms that belong to *chaebol* in select fields such as semiconductors and automobiles, Korean firms lack their own basis of competitiveness that is adequate ensure their survival in the ever-accelerating wave of open, innovation-based, global competition.

Korea must surmount huge obstacles to retain growth momentum in the medium term and to become a competitive, knowledge-based economy with sound fundamentals in the long term. Although the need is urgent, there is no clear vision or cogent view about how to upgrade the competitiveness of Korean industries. Most agree that Korea should find new comparative advantages in high value added technology- and knowledge-intensive industries, but there is no consensus about which those industries are and what the government needs to do. Most agree that traditional interventionist policies that artificially funnel resources are neither desirable nor feasible, but Korea lacks the institutional mechanisms, policy guidelines, and incentives to help the majority of mediocre, non-innovative firms escape the 'incompetence-trap'.

In order to make headway toward an innovation-based, high-productivity economy with a solid and robust industrial and innovation base Korea needs to capitalise on its existing strengths. What are

the potentials of Korean industry and what policies are needed to realise them? These are the central questions of this chapter. A brief review and assessment of Korea's industrialisation process to date provides a background for the main section which characterises and assesses Korea's industrial basis today from a dynamic, comprehensive perspective. It highlights the limits and potential of Korean industries in the context of the rising trends of global competition and co-operation and discusses the basic direction of industrial upgrading as well as the requisite policy measures. The analysis especially stresses the importance of promoting small- and medium-sized companies. It concludes with a practical proposal for establishing a cluster of firms in the machinery industry—both to upgrade this core industry to compete in the environment of the twenty-first century and to provide a new model of industrial and regional development for other Korean industries to follow.

REVIEW OF KOREA'S INDUSTRIALISATION PROCESS

The Take-off Phase: 1961-1972[4]

With virtually no domestic economic resources to draw on, Korea relied mainly on foreign aid to finance the reconstruction and stabilisation programs that followed the partition and Korean War. Until the 1960s industrial policy was mainly inward looking, encouraging import-substitution in non-durable consumer-goods industries. Korea abruptly switched to an outward-looking, export-oriented industrialisation and growth strategy in 1962. The growth rate soared immediately to 9.1 percent in 1963 and the economy entered a prolonged period of high growth and rapid industrialisation.

Under this strategy, most other policy objectives were aligned with or subjugated to the goal of export-promotion and the government undertook a sequence of reforms of exchange rate, currency, budget, and tax system policies. Domestic market protection was high in industries without strong export prospects and low in industries with international competitiveness. The government introduced a complex system of incentives to promote exports. An important aspect of Korea's success in this phase was the deliberate concentration on industries with relatively low capital requirements, such as clothing and wigs, which had favourable and rising international demand. Exports rose sharply, while the industrial structure was solidifying and diversifying into such light manufacturing industries as clothing, footwear, and electronics. Strong export performance helped Korea overcome the constraints of its relatively narrow domestic market and the growth rate averaged 8.9 percent from 1963 to 1972.

The Heavy and Chemical Industry Promotion Phase: 1973-79

In 1973 Korea shifted from this general export-promotion strategy to a strategy biased toward the heavy and chemical industries (HCIs). Under the HCI drive, the government took the initiative in introducing sector-specific import-substitution while reinforcing and modifying the existing export incentive programs to favour the selected HCIs.[5] A rapid increase in domestic wage rates, increased global competition in traditional export markets, and adverse changes in global political and economic

environments called for deepening Korea's industrial structure around HCIs such as chemicals, basic metals, general machinery, shipbuilding, and electronics.[6] The government introduced a broad range of interventionist policy instruments, including special tax treatment and most notably, preferential access to credit through policy loans to support the large-scale, risky investments required by HCIs.[7] These policies, especially the special credit support, led to a dramatic expansion of fixed capital formation in the targeted industries, which exhibited rapid growth and high profitability despite relatively low rates of return.

During the 1970s under the HCI-biased development strategy Korea created comparative advantage in more capital-intensive industries, whether physical or human capital. The export ratio of the heavy and chemical industry sector rose from 7.4 percent in 1970 to 19.3 percent in 1980. The sector's share of total output almost doubled between 1970 and 1975 and it continued to rise. By 1980 heavy industry's share of total output surpassed the share of light industry.[8] Nevertheless, neglected industries such as textiles managed to survive, and indeed continued to drive export performance in the latter half of 1970s, when much of the heavy-chemical sector lumbered with excess capacity. Despite a slowdown in export growth, the Korean economy grew at an average annual rate of 8.9 percent in the 1973-79 period. It is now widely agreed that this high growth was largely due to expansionary aggregate demand policies and heavy foreign borrowing not to the HCI strategy, however. The over-ambitious HCI drive is seen to have caused serious economic problems such as inter-sectoral resource misallocation, external debt, and serious distortion of the private-sector decision process.[9] Regardless of its cost, the HCI strategy did achieve many of its original policy objectives; the industrial structure shifted markedly toward the heavy and chemical industries. Under the impetus of the HCI drive, the Korean economy made strong progress in upgrading its export structure from labour-intensive to capital- and skill-intensive products, with capital-intensive products such as ships and steel gradually replacing light manufactured products as its major export portfolio.[10]

Rationalisation and Liberalisation Phase: 1980s Onward

By 1979, the Korean economy faced grave structural and macroeconomic problems such as escalating inflation, faltering exports, and over-capacity in the HCIs. In the early 1980s the new government started various institutional and structural reform programs and established a new direction for industrial policy, concentrating on technology- and skill-intensive, rather than capital-intensive, industries.[11]

The shift toward a more sector-neutral and market-oriented approach to industrial policy was clearly articulated in the Fifth Five-year Development Plan (1982-86). Through an array of financial and import liberalisation programs, the government gradually reduced its role in credit allocation, terminating policies that awarded HCIs preferential interest rates and credit access. Flexibility in

interest rate management, introduced in 1984 and reinforced by deregulation in 1988, allowed financial intermediaries to determine their own lending rates within a given range. The tax reform of 1981 also greatly reduced the scope of special tax treatment for key industries.

Despite the general thrust toward neutrality, however, the government bypassed competitive solutions for the most part. Instead, it continued to take an active role in restructuring distressed industries, supporting the development of technology, and promoting competition. In its rationalisation efforts, for instance, the government would not let troubled firms go bankrupt for fear of enormous financial losses to the banking sector and their social and economic repercussions. Numerous rationalisation programs were thus staged under the initiative and tight supervision of the government via forced mergers, mandatory capacity reduction, and a general support for commercial banks. These massive government-directed restructuring operations engendered unfortunate side effects, particularly a serious moral hazard problem in private businesses.[12]

The reorientation of industrial policy that began in 1979 took root by the mid-1980s. Most troubled businesses in shipbuilding, shipping, and overseas construction, which had been plagued by over-capacity and financial distress, were successfully bailed out or rationalised without grave repercussions on the economy. Also there was a big turnaround in Korea's external balance around 1986 due largely to a fortuitous change in three external conditions (known now as 'the 3-lows').[13] With the completion of the five-year liberalisation program (1984-88), trade protection was significantly lowered by the end of the 1980s.[14] Foreign direct investment, one of the most tightly controlled areas of Korea, also began to increase sharply after 1984. Through the mid 1980s, Korea regained its growth-momentum and, helped greatly by resounding export performance in the second half of the decade, achieved an average growth rate of 9 percent for the 1980s.

During this period Korea greatly enhanced its overall technological capacity. Intervention in technological development emphasised the establishment of institutions to train scientists and engineers and to conduct basic and applied research. Under the Fifth Five-year Development Plan (1982-1986) national science and technology investment was increased from 0.9 to 2 percent of GNP and the Sixth Plan raised Korea's science and technology (S&T) spending ratio to 2.5 percent by 1991, roughly comparable to spending by OECD members. The government budget supported general research and scientific training, as well as special research centres for energy and resources, machinery, electronics, telecommunications, and chemicals. In addition, the National Project for Research and Development (1982) was established to fund public and public-private joint R&D projects in the high-technology fields of electronics, fine chemicals, and engineering. With the help of these programs, and new tax incentives under the Technology Development Promotion Act—strengthened in 1981—private R&D expenditures expanded rapidly, and a number of private research centres were established.

In sum, over the four decades from 1960 Korea transformed in stages from emphasis on light industry to heavy and chemical industries and to a greater technology base. Strong capital accumulation and growth in labour inputs, in which the government played a pivotal role as manager and nation wide resource mobiliser, underpinned this transformation. Toward the mid 1990s, the limits of such an input-driven, statist model of development began to loom in symptoms such as mounting trade deficits, rampant credit growth by financial institutions, and overextended, highly leveraged *chaebols*. Nonetheless, Koreans seemed optimistic about the future of their economy until 1996.[15] This attitude changed drastically in the turmoil and virtual collapse of the economy that followed the onset of the financial crisis in 1997. With the faltering of the mainstay industries and *chaebols* many came to see Korea's future as bleak. Korea's development paradigm is now at a crossroads. Korean industry must continue its transformation to provide a solid base for an innovation-based, high-productivity economy. This upgrading will take place in the context of rising trends of global competition and co-operation. In the remainder of this chapter we examine Korea's industrial structure from a comprehensive, dynamic perspective to identify the future direction of transformation and recommend policy measures appropriate for Korean industry to realise its potential.

INDUSTRIAL UPGRADING: NEW CHALLENGES AND PROSPECTS

Profile of Korean Industries and Direction of Upgrading

In the course of managing the crisis, the upgrading of Korean industry as a whole emerged as a hotbed of debate. As many of Korea's 'traditional' thrust industries, including the flagship electronics and automobile industries, slid into a deep slump, their potential for future growth came to be seriously questioned. At the same time interest in the more cutting-edge technology industries such as bio-engineering, aerospace, and new materials, as well as a group of other promising 'new' industries was heightened.

Considering the experiences of the major advanced economies, we should not expect industrial upgrading in Korea to be based on exciting new high-tech industries, however. Rather, it will be based on old established industries. Six industries have long formed the basis of the industrial sectors of the leading world economies, the United States, Germany, Japan, France, UK, Italy (hereafter, designated the G-6).[16] In 1994, these six industries—electrical/electronics, transportation equipment, chemicals, machinery, textiles/apparel, and scientific equipment—together accounted for 55 to 60 percent of total manufacturing value-added and employment in the G-6 nations and for 70 to 90 percent of their total manufacturing exports (Figure 9.1). Even in the United States and the UK, where fast changing industries such as bio-engineering and new materials play a vital role precipitating technological innovation in the major industries through new intermediate goods or technological spillovers, cutting-edge technology industries have only a small share of value added and employment. In Korea as well,

these new cutting-edge technology industries, which are all in their infancy at present, will gain their share gradually, in line with the overall upgrading of the six mainstream industries.

Over the past decades of industrialisation Korea's overall industrial profile has come to resemble that of the major advanced economies. The composition of Korea's output differed markedly from that of the G-6 nations in 1976, but by 1994 the discrepancy had completely gone (Figure 9.1). Moreover, the value added and export shares of the six major industries in Korea's economy (62.3 percent of value added and 82 percent of exports) lie in the normal range of the G-6 economies. It is worth noting that the industrial profiles of the G-6 economies today are virtually isomorphic to the ones they exhibited in 1976. In view of the speed and extent of change occurring in the technology and economic environment today, though, it unlikely that Korea's future industrial evolution will follow the same trajectory that the G-6 economies followed to date. Nevertheless, we speculate that Korea's industrial structure will not change drastically in the next ten years, since Korea currently lags considerably behind the G-6 economies in level of development and since their overall industrial profile has remained stable over the past two decades.

Despite the similarity in output structure there is a qualitative gap between Korea and other advanced economies, as indicated by differences in labour productivity and trade structure. Average labour productivity for the manufacturing sector in Korea stands at about half the level in Japan and also falls behind the levels in the United States, Germany, and France by substantial margins (**Table 9.1**). For individual industries, the gap in labour productivity between Korea and the best-performing country ranges from a low of 37 percent in the textile/apparel industry to a high of 71 percent in the electrical/electronic industry.[17]

Looking at export structure, the textile/apparel industry's share of exports in Korea is unusually high compared to most other economies (**Table 9.2**). Moreover, although Italy's export share in this industry is also high, Italy exports mainly high-quality, fashionable items whereas Korea exports low-end commodity items. Likewise, Korea's high export share in the electric/electronics industry is comparable to the share in Japan, but again Korea's exports in this category consist largely of final assembly products that are less technologically sophisticated than Japan's exports.

The weakness in Korea's trade structure is better illustrated by the pattern of specialisation (**Table 9.3**). Although chemical products and machinery account for 6.5 and 6.0 percent of Korea's exports respectively, Korea's overall trade position in these two industries is significantly in deficit, while all G-6 countries post a substantial surplus (except Italy in chemicals). Actually, the industries in which Korea runs a trade surplus, such as computers/office machines and telecommunication equipment, are ones in which all G-6 nations except Japan are in a deficit position.

The qualitative deficiency of Korean industries eventually translates into a gap in knowledge-

intensity, which in turn can be explained in terms of the composition of various activities comprising the chain of value-creation. Figure 9.2 illustrates the fundamental difference in value-creation structure between Korea and an advanced economy. For the purpose of exposition, products are divided into high value added (high-end) and low value added (low-end) goods. The value-chain is broken into five component activities according to knowledge-intensity, ranging from product design (the most knowledge-intensive) to production (the least knowledge-intensive).[18] Compared to advanced economies, Korea concentrates more on low-end products and less knowledge-intensive activities, such as production and simple adaptation or improvement of products or processes.

Figure 9.2 may be a stylised representation of Korea's development gap but, seen in conjunction with the previously discussed stability in the industrial profile of the G-6 nations, it has a crucial implication about the essence and direction of Korea's industrial upgrading. In the figure Korea's position today corresponds to the position of the advanced nations two or three decades ago. What occurred in the advanced nations over a long period was a gradual upgrading of traditional mainstay industries, characterised by sequential shifts toward more knowledge-intensive, higher value-added activities within and across industries. Accumulation of knowledge and technological capabilities is essentially a cumulative and gradual process, and so is an economy's evolution toward a more knowledge- and technology-intensive, advanced structure. Considering the obvious chronological lag in Korea's industrialisation, it may be then quite natural for a substantial qualitative gap to exist between Korea and the G-6 nations for now. The present gap implies that there is still room for the traditional type of industrial upgrading to take place in Korea, until it reaches a level of development comparable to the G-6 economies today. Given the far-reaching and ever-deepening impacts of globalisation and information and communications technology (ICT), upgrading in Korea will take place in a more complex and volatile dynamic context than it did in these advanced economies. Regardless of the exact mechanism and process, however, one thing is clear. There is no tectonic shift in industrial structure and advancement. The thrust and focus of Korea's industrial upgrading need to be on, not off, the existing mainstream industries.

Korean Industries in a Global and Dynamic Context

The process and outcome of industrial upgrading in Korea will vary across industries, depending particularly on the competitive base of domestic firms and the competitive structure of global markets. It is convenient to distinguish two groups of industries based on the competitiveness of global markets (Table 9.4):

- global, high-technology industries, such as electronics, fine chemicals, and automobiles, in which a few leading multinational enterprises (MNEs) maintain substantial oligopoly power and
- local, medium-technology industries, such as machinery and textiles/apparel, in which

innovative small- and medium-sized enterprises (SMEs) lead the market by producing highly differentiated or specialised products.[19]

Responding to the trends of integrating markets, accelerating technological change, and intensifying competition, leading MNEs in global industries have escalated their efforts to extend important dimensions of their business activities around the world. Their strategic thrust is to locate each functional business element in the most suitable site/firm and to tap and link together the tangible and intangible assets at each location to optimise the division of labour within the firm around the world. As MNEs pursue this strategy, both the number of cases and the value of inter-regional foreign direct investment (FDI) has increased sharply, and so have inter-regional M&A activity and strategic alliances among leading companies. Consequently, the overall performance and industrial profile of national economies has come to depend to some extent on the decisions by MNEs on where to locate their R&D, production, marketing, and outsourcing functions.

In contrast, globalisation has not occurred to this extent in the mid-tech industries and the dominant mode of international transaction in these industries remains traditional product trade. R&D requirements for these industries are relatively low, and markets are segmented along highly differentiated product lines. Accordingly, there is no impending incentive or pressure for individual firms to pursue scale economies (in R&D and production) through globalisation. Typically, several innovative SMEs that lead the market in some mid-tech industrial product locate together somewhere in Europe.[20] They comprise a unique regional innovation system and collectively maintain their competitive position in high value added market segments, producing highly differentiated fashion or specialty products. Because each firm's competitiveness stems from collective assets concentrated in a specific region, these firms tend to remain 'local', with all core dimensions of innovative activities existing within the regional boundaries.

If we look simply at the present level of productivity, Korean industry and Korean firms may not appear to have a very promising future. We know that there is a productivity gap between industries in Korea and in the most advanced (G-6) economies. At the individual firm level, Korean companies do not have a solid base of competitiveness from which to withstand fierce international competition. Even Korea's small circle of vanguard companies are seriously behind their foreign competitors with respect to business portfolio, financial structure, core competence, and globalisation. Indeed, Korea's industrialisation process to date was certainly input-driven, rather than productivity driven. Growth accounting studies attribute at most 40 percent of Korea's growth to pure improvements in total factor productivity.[21] Moreover, the latest study by Yoon and Lee (1998) suggests that while investment during the early 1990s continued to increase as fast as in the 1980s, TFP growth slowed sharply, with some industries, such as chemicals and home electrical appliances, exhibiting negative growth.[22]

To make a balanced assessment of the potential of Korean industries and firms, however, we

need to look at dynamics as well as static levels. Korea's potential appears brighter in light of recent efforts to accumulate innovative and technological capabilities and their associated industrial performance. Recent critics of Korea's low productivity tend to neglect the persistent trend of productivity catching-up. Manufacturing productivity has continued to rise faster in Korea than in any of the leading economies, resulting in a steady narrowing of the productivity gap (Table 9.5). For instance, although labour productivity in Korea's manufacturing sector was just about 30 percent of the level in the United States in 1980, it stood at 46 percent in 1990 and reached about 63 percent by 1996.

Much, but not all, of Korea's productivity catching-up is ascribable to capital deepening (input-driven). Although capital accumulation itself contributes to TFP growth through learning-by-doing absorption of embodied technologies, maintaining persistent growth in productivity requires more systematic efforts to enhance technological know-how. Since the mid 1980s, facing rapidly rising wages, mounting pressure from second-tier NICs, and increasing difficulty in acquiring foreign technology, Korean companies stepped up sharply their indigenous R&D efforts. Business R&D expenditure, which started to pick up in the early 1980s, continued to rise steeply throughout the 1990s, and so did the total number of R&D personnel and corporate R&D centres (Tables 9.6 and 9.7).[23]

In fact, R&D records and market performance suggest that in the late 1980s, a significant number of Korean companies started to shift from the typical investment-driven stage to the innovation-driven stage. Most noteworthy were the efforts of leading firms in certain industries such as electronics and automobiles. With global technological advances accelerating, many major corporations began to move from 'imitative' towards 'defensive' R&D positions, which made it imperative for them to assimilate R&D-intensive and system-oriented technologies. They established extensive networks of in-house laboratories and pursued a more active overseas R&D strategy. On top of acquiring advanced technology in major industries through FDI, they set up R&D facilities near pockets of innovation in the United States, Japan, and Europe in order to monitor frontier technological changes as well as to tap high calibre scientists and researchers (Table 9.8). In addition, they resorted to M&A to gain access to cutting-edge technologies.

Tangible outcomes of this vigorous effort started to show up in the mid 1990s. In 1996, Korea ranked eighth in the number of U.S. patent registrations, and seventh in the number of foreign-owned R&D laboratories in the United States. All major Korean automobile makers had acquired the capability to design and develop their own mid-sized models. In electronics, cases of successful new product development increased in such fields as DRAM and TFT-LCD, and Korea's lag behind the world leaders in the timing of commercialisation was substantially reduced or even reversed. Most significant, strategic alliances between Korean companies and leading foreign companies became frequent, showing that Korean companies were sophisticated enough to enter the global market based

on their own technological assets.

Despite these considerable improvements, Korea is far behind the advanced economies in both the level and scope of its technological capabilities. In industries such as machinery, heavy equipment, shipbuilding, and petrochemicals, technological gains have been largely confined to production or process improvement, while product design and basic project engineering remain in the infancy stage. Even in Korea's technological vanguard fields, such as electronics, the technological capabilities of Korean leaders only extend as far as commercial product development (commercialisation) and not to applied or generic research capabilities possessed by the global leaders. In fact, Korea's technological dependency actually increased in the course of the technological upgrading of Korean industries (Table 9.9). As more Korean companies moved into production of more technically sophisticated products, they had to import more advanced and expensive foreign technologies, resulting in a persistent increase in the technology trade deficit.

The backward technical level of Korean firms may partly reflect some serious shortcomings in their basic business orientation and past strategy, but it may reflect more the disadvantage of being a late-comer still in the middle stage of corporate evolution. Just as technological progress is a continuous and cumulative process, so is a firm's evolution toward a higher stage of technological development. Korean firms accumulated a set of technological assets commensurate with their stage of development and evolution under the regime of nationalistic industrialism. Now, the advent of global competition and alliance capitalism (Dunnings 1997), fundamentally changed the meaning of an individual firm's or economy's technical standard, as well as the paradigm of its technological evolution. The adequacy of Korea's technological assets is to be tested in conjunction with its other indigenous assets, where the central theme is how much strategic value they would fetch in the global market, especially in relation to the globalisation strategies of the world leaders.

Korea's Locational Advantages

Context and Hypothesis

Despite the severe economic setback spawned by the 1997 financial crisis, many experts predict that East Asia as a whole will resume its growth momentum and emerge as one of the largest world markets by early in the twenty-first century.[24] No only will the region's market grow larger, but the mode of international and intra-firm interactions in the region will change as well. The share of Asia in global trade and investment flows has increased drastically over the past 20 years or so. More noteworthy is the sharp increase in trade flows *within* Asia. Increasing *intra*-regional trade in lieu of traditional *inter*-regional trade has been a global trend since the early 1980s. But intra-regional trade in Asia has surged markedly, with its share of global trade more than doubling between 1980 and 1995 (Table 9.10).[25]

The trend increase in intra-regional trade in Asia (from 6.4 percent of world trade in 1981-85 to 12.0 percent in 1991-95) indicates that the Asian market has become mature and diverse enough to develop a more intricate and sophisticated intra-regional division of labour, involving a greater variety of goods and services geared to region-specific demands. As the rewards to firms with a presence in the region increase, MNEs, especially U.S. and European MNEs engaged in global industries, will reinforce and upgrade their Asia strategy so that they can better respond to and capitalise on the new challenges and opportunities of the Asian market.

By and large, the competitive advantages of Western MNEs in respect to their Asian manufacturing business overlap in highly knowledge-intensive activities, such as advanced research or engineering of technologically sophisticated products. They will continue to perform most of these activities at the global 'centres of excellence' located in the Europe, Japan, or the United States. The optimal intra-firm, global division of labour for each MNE is to combine these activities with some medium value added activities encompassing production, after-service, and local adaptation located in the Asia region.

Although most Korean firms are not competitive enough to survive direct head-to-head competition with the leading MNEs, they do have indigenous assets that can complement the Asia strategy of these MNEs. In essence, the single national entity Korea commands a fair degree of the locational advantages of East Asia in a wide range of industrial activities of interest to MNEs. Korea's specific locational advantage compared to other East Asian economies including Taiwan, Singapore, and ASEAN, surely will differ from industry to industry.[26] Nevertheless, in the medium- to high-tech industries and business services, Korea has considerable advantage over all the ASEAN and neighbouring economies in terms of skilled manpower including R&D personnel, related and supporting industries, and 'relevant' market size (Table 9.11).[27] In addition, Korea may find a natural advantage in its physical proximity to China's colossal market (especially the northeastern coastal area). Of course, proximity may not prove to be much an asset for Korea in some consumer markets. China could easily out-compete Korea and attract a range of low-to-mid value-added business activities based on its low labour costs. Nevertheless, with a longer history of industrialisation Korea has an advantage in some mid-to-high valued added areas in which quality and reliable provision of skills, parts, and institutional support count more.

Korea seriously lags behind Japan in the quality of technicians and engineers, let alone in endowments of other science, technology, and industrial resources needed for highly advanced industrial activities such as advanced research and engineering. Yet, wages of mid-level technicians and engineers are substantially lower in Korea than in Japan, making Korea an advantageous place for some mid-level, relatively cost-sensitive activities.

The locational advantages of Korea, Japan, and China are compared roughly in Table 9.12. More research is needed to identify the exact functional areas in which Korea has advantages in individual industries. Nevertheless, Korea's most pronounced advantage is probably as a production site for mid- to high-end products of virtually all 'global' industries, including electronics, automobiles, petrochemicals, and heavy machinery and equipment. In addition, Korea may have a modest advantage in some skill- and experience-intensive activities such as local adaptation of products or processes, which also applies to most global industries.

Recent Trend in Inward FDI

The latest trend in inward FDI partly testifies to Korea's locational advantages in these areas. Although FDI inflows to Korea increased steadily since 1993, they remained quite limited until the second half of 1998 when they started to surge. Total inflow in 1998 reached US$8.89 billion, exceeding half of the total volume of inflows from 1991 to 1997.[28] The trend continued in 1999, with the final figure reaching US$15.54 billion.

The composition of FDI inflows in terms of source countries and recipient businesses also changed (Table 9.13). While investment from the United States and Japan has been predominant for a long time, investment from the EU region, especially from the Netherlands, Germany, and France, increased sharply. In 1998, the EU countries' combined share of investment into Korea exceeded 50 percent. Japan's share of FDI into Korea has been falling since the mid-1980s, with a marked decline in 1998. Entering 1999, however, investment from Japan bounced back sharply.

By sector, FDI into Korea has become more diversified and nuanced (Table 9.14). The share of the services sector has risen steadily, shifting the balance away from a manufacturing-centred structure. While consumer-oriented businesses such as restaurants and hotels once led this trend, the focus of service sector investments is shifting toward finance, telecommunications, and other business services. In the manufacturing sector, chemicals, electrical and electronic equipment, transport equipment, and machinery continue to absorb a majority of incoming FDI. A noteworthy trend is a prominent increase in FDI into the food processing, paper and lumber, and machinery industries. In general, the motives behind inward FDI into Korea appear to have matured and diversified. Until recently, the dominant form of FDI was so-called market-oriented FDI to penetrate the domestic market.[29] Since the Asian Crisis the number of investments of a more strategic nature has been growing, with a host of leading MNEs, including Japanese firms, using Korea as platform for their Asian or even global strategies.

Of course, it is too early to tell whether these changes herald a new long-term trend. The upsurge in FDI volume over the past two years could prove to be transitory, induced only by the sharp depreciation of the won as well as severely depressed asset prices. Indeed, with the portfolio of

businesses for sale (M&A targets) in Korea running out, inbound FDI may level off eventually. On the other hand, the recent upsurge could prove to be the start of a longer-term trend in FDI. If so, the legal and institutional shake-up regarding inbound FDI will have been the critical reason for the change. Once one of the most closed economies in the world, Korea is now free of obvious barriers to incoming FDI, thanks to the thorough liberalisation measures taken in the course of managing the crisis. Most legal barriers were removed or eased (restrictions on ownership share and business area, for instance), administrative procedures were simplified, and even hostile M&As by foreigners were legitimised.

Remarks

Even if Korea's locational advantages do attract investment in a broad range of business activities, the economy's prospects also depend on who will manage and control those activities. It is reasonable to expect foreign MNEs to control a substantial part of these activities, in which case Korean firms will assume a subordinate or supporting role. But a more reciprocal partnership relation should develop in areas where Korean firms possess some independent technological or managerial assets that complement the global strategy of foreign MNE's. In Korea's technological frontier fields such as semiconductors and displays (TFT-LCD, PDP, and the like) the engineering acumen and commercialisation ability of Korean firms will be a main attractive factor and various forms of strategic alliances with foreign MNEs will continue to spring up. Korean firms should also retain some autonomy in other industrial fields such as automobiles and heavy equipment, although the specific types of relationships with MNEs will differ (Figure 9.3).

In the automobile industry, for instance, no Korean company, including leader Hyundai, has the ability to cope with the escalating global competition on its own. In their desperate search for survival strategies Korean automobile companies need to note that besides their well-regarded production techniques, they possess a unique set of managerial assets and know-how that can perfectly complement the strategies of foreign MNEs, especially in emerging markets. These assets could be highly valued by global leaders such as GM, Ford, and Volkswagen, which lack a competitive position in emerging markets, especially China and India, comparable to that of their Japanese counterparts (Table 9.15). Despite the strategic value of establishing a presence in the emerging markets, the global leaders are not likely to attempt full-scale penetration of these markets independently, because the overall business environment is too challenging. As alliance partners with the MNEs, Korean automobile makers would bring the substantial volume of investment they already have in place in the region and, more importantly, their managerial know-how and determination to maintain a physical presence for the long term.[30]

Challenges and Policy Responses

Prospects and Challenges

Korea's future industrial upgrading can be accomplished in two steps that have different basic strategy and different policy goals. First, over the coming ten years or so, Korea needs to solidify its present competitive advantages and gradually expand its areas of competitiveness, drawing on present 'core' competencies and locational advantages within an East Asian regional division of labour. After securing its position as a regional production platform for high-end products and a regional innovation site for an array of advanced activities, such as advanced engineering and basic research beyond commercialisation, Korea then may move to become a 'centre of excellence' that can support and self-generate advanced scientific and technological tasks such as applied research and advanced system engineering.

Although Korea may ultimately attain this goal, it will not happen automatically. Korea must overcome two obstacles in the coming decade for the first step to succeed. They are feeble market and framework conditions and un-competitive SMEs, especially in the machinery industry.[31] According to the *World Competitiveness Report* for 1998, Korea lags most seriously behind other advanced economies in the framework conditions of the labour market, the financial market, corporate governance, the public sector, and the regulatory system (Table 9.16). Besides inflicting turbulence and turmoil, the Asian Financial Crisis benefited Korea by driving it to greatly upgrade outdated framework conditions through across-the-board reforms in all major trouble areas. These reform efforts are ongoing and we do not know how successful they will ultimately be. Certainly, however, with the opening of the economy, including the financial sector, to foreign MNEs, the institutional framework will emerge from the crisis more sober and robust than in the pre-crisis closed economy.

Transforming Korea into an innovation-driven advanced economy with a solid self-regenerating industrial foundation will require more than the improvement of framework conditions. To re-invigorate and re-orient the economy Korea will need foreign MNEs to bring in capital, technology, and essential soft assets, such as managerial know-how, work practices, and new rules based on 'global standards'. With the continued upgrading of the economies in Asia, the MNEs in Korea will gradually move up to more technologically demanding, higher value added activities, such as advanced research and production of state-of-the-art products. To attract and retain these activities, Korea will need a much more advanced science and technology (S&T) infrastructure and a substantive pool of SMEs with high technical capabilities. Despite recent progress, there are still relatively few SMEs with innovation potential in Korea, and their R&D capabilities are quite limited. R&D efforts in Korea are highly concentrated among large-sized firms and around the two pillar industries, electronics and automobiles (Table 9.17). Even with the best possible outcome from the ongoing structural reforms, the

performance of SMEs is unlikely to improve markedly because of the grave elements of market failure intrinsic in the SME sector. The limited technical capacity of SMEs will eventually become a challenge to upgrading the economy.

The locational advantages the economies in Asia, including Korea, are extremely volatile, especially because of the rapid maturing and industrialising of China's economy. Proximity to China could be a great advantage in terms of market access, but it could easily also prove to be a great disadvantage if Korea does not overcome the deficiencies in its SME sector and framework conditions to keep ahead of China. Without great improvement over the next ten years, Korea's attraction to foreign MNEs will decline fast. Most new FDI into East Asia will head to China. Even worse, a substantial part of the core industrial activities that now are located in Korea, including activities of Korea's indigenous flagship companies, will relocate to China.

Promoting SMEs: the General Problem

The employment and output shares of Korean SMEs in manufacturing have increased consistently over the past two decades (Table 9.18). There also has been considerable structural upgrading of the SME sector as a whole, with the share of low-tech, labour-intensive products declining in place of the shares of mid- to high-tech products with greater technology and skill content (Table 9.19).[32.] In line with such structural upgrading, the number of SMEs conducting some form of R&D has increased explosively, as has the number of in-house R&D facilities and research personnel (Table 9.20). Though yet small in number, innovative and proactive SMEs with technical competence have started to emerge.

Despite this progress, innovative SMEs that have an independent and sustainable competitive base are rare. Most SMEs in Korea are engaged in the production of technologically unsophisticated parts and components under a passive subcontract relationship with larger companies. Accustomed to low-cost competition for undifferentiated products in sheltered market, they remain relatively uninterested in serious innovation and R&D. Very few SMEs conduct any R&D (7.4 percent of SMEs in 1996), and they invest only a tiny amount of resources for systematic R&D (Table 9.20).[33] Even among the leaders, innovations centre around minor modifications of products or processes based on imported or borrowed technology. SMEs rarely come up with more significant process innovations or product developments that incorporate new technological concepts.

In consequence, most Korean SMEs are in great peril. Their ultimate basis for competitiveness—that is, their sheltered markets, subcontracts with leading domestic companies, and production cost production advantage—are quickly eroding and they face such adverse forces as market liberalisation, globalisation of parent companies, and relentless catching-up of the NIEs, especially China. Moreover, most SMEs in Korea lack the ability to capitalise on changes that favour SMEs, such as the increased

demand for differentiated products and the easier, lower cost access to information through, for instance, the Internet.

Korea needs a creative new approach to realise the imperative to upgrade its SMEs. Even first-tier OECD member economies still find nurturing innovative SMEs a top policy challenge, and there are no universally applicable best policy measures yet. The backbone of Korea's SME policy at present remains to redress the disadvantages of SMEs' vis à vis larger businesses through direct resource support and market protection. The experiences of many advanced countries as well as Korea clearly testify that such redemptive and protective measures are not sustainable and in fact run counter to the long-run interests of SMEs by undermining the incentive to build up the capability to respond independently to changes in the business environment.[34] Korea needs to foster a business environment conducive to the innovative activities of proactive SMEs and to develop institutional components and arrangements to stimulate co-operative networking.

For SMEs, networking constitutes the best and the most economic mode of absorbing new scientific and technological information. A primary reason for the paucity of innovative SMEs in Korea and their limited R&D capacity is the lack of formally organised networks and other specialised sources serving a similar function. The form of network most relevant to Korea at this time is the local network comprised of a group of potential innovators clustered in a specific geographic area (industrial district). Local networking can bring huge efficiency gains when combined with the spatial agglomeration economies of innovative firms with interrelated business interests. Many regions in Korea are home to such agglomerations of industry, but because they import core components and key facilities from abroad, they are no more than specialised production areas. They are void of the intricate local linkages, extensive long-distance connections, and regional developmental dynamics that define local networks.

Promoting SMEs: the Case of the Machinery Industry

The general machinery industry illustrates the importance of and the key policy issues related to developing local networks in an industrial district. As a result of fast expansion since the mid 1980s, the general machinery industry became one of Korea's 'core' mid-tech industries, accounting for 7.8 percent of GDP and 6.2 percent of manufacturing exports in 1996 (Tables 9.21 and 9.22). Domestic firms built up technological capacity through learning-by-doing, stepped up R&D efforts, and effective absorption of advanced technologies from Japan, the United States, and Germany.[35]

The general machinery industry is in a perilous situation today, however, as the market environment becomes more challenging. Despite considerable progress, the accumulated technological capability of domestic firms is insufficient, and the majority of SMEs are engaged in joint-production of low-end machinery and commodity-type parts and components.[36] The technology level for R&D,

design, and new product development is low by international standards, even among the leading Korean SMEs (Table 9.23). Many small machinery firms have managed to survive under the shelter of so-called 'Import Source Diversification Program', but the recent phasing out of such protective measures leaves them on their own to handle unchecked competition from Japanese producers.[37]

Although this new market environment poses a grave threat to many individual domestic firms in the machinery industry, it may also present the opportunity for the industry as a whole to pursue a new mode of industrial development. The rapid expansion of the Asian market (ASEAN and China) for those mid-quality machine products in which Korean companies have a comparative advantage is the source of opportunity. Although Korean companies do not have the advanced skills and technologies to compete in the major OECD market for spearhead products such as automation facilities and CAD/CAM, they can stay competitive in lower quality, more price-sensitive products for which there will be increasing demand from many Asian nations. The small domestic market has been a critical constraint to the emergence of specialised machine makers in Korea. The rapid expansion of the Asian market will ease that constraint and create the opportunity for innovative Korean firms to upgrade their competitive base against an ample, yet unoccupied market.

A new policy approach and stalwart policy leadership are called for if this opportunity is to lead to the upgrading of Korea's entire machinery sector. Firms in the machine industry tend to interact closely at the local level, exchanging tacit knowledge about production processes and components and also providing markets for each other. Because network externalities at the local level are so crucial, SMEs in the machine industry tend to locate in industrial districts. Countries with a strong machine industry have industrial districts with innovation networks, the representative model of which is Baden-Würtemburg, Germany.

Korea has some specialised industrial districts where several firms produce machines and machine components, but neither the resident firms nor the local public sector have taken the initiative to form innovative network linkages.[38] In principle, the development of innovation networks requires action at the local level, and the initiative to develop a dynamic industrial district needs to be led by some local champion, whether it is an individual firm or public authority. Such a local initiative or leadership is unlikely to spring up in Korea in the foreseeable future. First, the few innovative Korean firms that could be active networking participants are spatially dispersed across disjoint regions. If it is necessary to agglomerate innovative firms in a single industrial district in order to achieve a critical mass, then the central government should take on the task to create such a precondition.

Second, in addition to the spatial agglomeration of existing firms, the new type industrial district is an intricate institutional complex involving diverse modes of business transaction, interest co-ordination, and private-public partnership, but no Korean firm or public authority has a practical vision for such an

industrial complex. Rather than Korea attempting to develop such vision by trial and error, it might be less costly to call on established leaders with extensive, in-depth operational experience to set up such an industrial district. Specifically, the complex of machinery industry firms in Baden-Würtemburg presents a promising place to find such leaders. Indeed German entrepreneurs would likely find this an attractive opportunity, considering the rapidly growing market in China (and in other Asian NIEs) and the mounting pressure from their Japanese competitors. Given the present locational advantages of Korea as against China discussed earlier, German machinery and machinery-related companies seeking a location for new regional business platforms in East Asia should find Korea attractive.

In order for Korea to get the most out of this situation, it needs to attract not just individual German firms, but an entire cluster of German machinery companies as a collective unit. To accomplish this requires a strong, concerted scheme of incentives. A policy initiative at the local government level would not suffice. The central government, in close consultation with local governments, needs to assume an active role in this precedent-setting endeavour.

It may take more than a decade to establish a machinery industry complex in Korea. Getting all basic institutions and core interface arrangements in place calls for collaborative initiatives and co-ordinated, systematic efforts by the central government, regional authorities, and businesses. In its formative stage the district will surely not be as effective as established ones in other advanced nations due to deficiencies in the quality of participants, external linkages, and collective intangible assets. Nonetheless, successful launching and gradual phasing-in of a machinery industry district could be an epochal event for the entire Korean economy. It would give a big boost to Korea's arduous endeavour to foster a competitive machinery sector. In addition, it could have a huge diffusion effect by providing a model of industrial and regional development that could be emulated by other stagnant industries such as textiles and apparel and fine chemicals.

Although 'innovation' has become a buzzword in Korea these days, neither the practical meaning nor the impending policy implications of this word appear to be properly understood. Put bluntly, the gist of 'innovation' is collaborative networking among various parties subjected to common competitive pressure. Accustomed to input-driven growth and input-based competition most Koreans perceive innovation, instead, as a kind of individual output that merely requires more individual ingenuity or more stand-alone R&D effort. Although pouring in more R&D resources will surely make the Korean economy somewhat more innovative, there is a clear limit to a purely input-based model of innovation. Probably the greatest expected payoff of the new model of industrial district would come from the culture of collaborative and synthetic networking that it would create. At the present critical stage of industrial upgrading and evolution the Korean economy badly needs to build this kind of networking environment.

Notes

1. MOST/STEPI, OECD *Review of Korea's Science and Technology* (review version), 1995

2. The conventional view that Korea's success in attaining rapid and equitable growth was somehow 'miraculous' has been challenged recently by a cadre of so-called 'contrarian scholars', who contend that Korea (and Singapore) simply experienced Soviet-style, input-based growth driven by massive state-led mobilisation of labour and capital over a protracted period. The conventional view is well represented in *The East Asian Miracle* (World Bank 1993), and the contrarian view by Krugman (1994).

   For a comprehensive discussion of the issue of the role of the Korean government, especially the debate over Korea's trade regime in theoretical and empirical literature, see Rodrik (1995). A lucid review can be found in Yoo (1996).

3. The contribution of capital and labour inputs to growth is destined to disappear over time, and a stage of relatively weak growth will naturally set in due time. According to the base-scenario of KDI's long-term growth projections, Korea's growth potential will slow down to 5.5 percent for 2000-10 period, and it will decline further to 4 percent in the following decade (Annex Table A9.2).

4 Scholars differ on the classification of Korea's industrialisation process. The classification that we adopted for this chapter is supported by many including Park (1994).

5 Yoo (1996) contains an interesting characterisation of the nature of the Korea's trade policy during the HCI phase.

6 See Park (1994) for a discussion how external factors might have motivated the HCI drive and Yoo (1996) for a succinct differentiation of the HCI drive from the general export-promotion policy of the 1960s.

7. For a general evaluation of all these fiscal and credit policies, see World Bank (1993).

8. There were some differences among heavy industries. The chemical industry and primary metal manufacturing, lost ground slightly in 1980s after recording substantial gains in the 1970s, whereas the share of the metal products and machinery industries continued expanding even in the 1980s. The share increase was particularly substantial in the general machinery, electrical machinery, and transportation equipment industries. The shares of the electronics and transportation industries were even higher than the share of textiles in the early 1980s.

9. A comprehensive and rigorous study of the HCI derive can be found in Stern et al (1995). Park (1994) takes a positive view of the role of the HCI drive while Yoo (1996) argues that the misguided policy hampered Korea's industrialisation process.

10. Even so, textiles and garments still occupied the largest share of exports.

11. The basic tenet of this rationalisation program was laid down by Comprehensive Stabilisation Program, announced in 1979 under President Park. These policy efforts and the enactment of the requisite laws brought major reforms in four areas including financial liberalisation (Deregulation in 1984 and 1988), realignment of the industrial incentive system (Industrial Development Law, 1986), promotion of competition among domestic and foreign firms (Fair Trade Law, 1981), and trade and capital market liberalisation (Import Liberalisation Program, 1983, and Revised Foreign Capital Inducement Act, 1984).

12. Government interventions reduced the incentive for private industry to undertake positive adjustment programs and they encouraged firms to wait for public rescue. Distressed companies could postpone adjustment until the rescue, hoping that their share in the final merger or cartel would be an improvement over scaling down or a private merger proposal. Surely it is too early to assess the overall effect of the rationalisation programs during this period, but some (Park, 1994,

for instance) argue that they were economically justified by the extent of the market imperfections that prevailed at the time.

13. The '3-lows' are: low interest rate, low yen (appreciation of yen against US dollar), and low oil prices.

14. With the completion of the program, the import liberalisation ratio increased from 80 percent in 1983 to over 95 percent. About three-quarters of the items remaining under restriction were primary products, food and beverages. Together with the lower quantitative import restrictions, the average nominal tariff rate was gradually lowered from 24 to 13 percent between 1983 and 1989.

15. Despite some reservations voiced from inside and outside Korea and especially remarks by the group of so-called 'contrarians' demystifying the East Asian Miracle (see, for instance, Krugman (1994)) the prevailing sentiment until 1996 was that Korea had made all requisite adjustments and preparations to stay on a super-growth track for a prolonged period. Such optimism appeared to be justified by Korea's astonishing industrialisation history itself and further vindicated by the extraordinary economic performance in 1994-95, which most Koreans belatedly came to acknowledge was due to the worldwide boom in the semiconductor market, especially DRAMs.

16. Four of the six major industries (electrical/electronics, transportation equipment, machinery, and scientific equipment) are grouped together under the 'machinery and equipment' category in Figure 9.1.

17. International comparisons of productivity, especially comparisons of levels, are tricky. Here, in order to deliver the key message of this chapter clearly using a consistent data set, the comparison is made using nominal exchange rates, nominal value-added, and without controlling for labour hours.

18. The five categories are: product design, advanced research (Generic/applied research and advanced engineering), product development, adaptation/modification, and production.

19. The high-tech and mid-tech classification here differs from the usual OECD classification. Global high-tech industries in this paper correspond to the OECD's high- and medium high tech-industries categories, while local mid-tech industries correspond to the OECD's medium-low tech category.

20. Some of the best known examples are Emilia Romana of Italy (textiles/apparel) and Baden-Wuertemberg of Germany (machinery and motor vehicles).

21. The quality and results of these sources-of-growth studies vary, depending on the period covered, methodology, and data set used. Although some studies claim that the TFP growth factor in Korea is as low as 9 percent, it appears that reasonable numbers lie somewhere in the 20-35 percent range.

	Kim-Lau (1994)	Young (1995)	Collins-Bosworth (1996)	Kim-Park (1988)	Yoon-Lee (1998)
Period covered	60-90	66-90	60-94	66-83	(70-95)
TFP/VA growth	16.0	21.3	26.3*	36	28.4

Note: * measured in total output.
Source: Reconstructed from Yoon and Lee (1998).

22. According to Yoon and Lee (1998), the slowing-down of TFP has occurred in about two-thirds of the 27 industrial branches encompassing almost all of Korea's major export industries. The productivity decline was most pronounced in the mid-tech industries such as machinery and petrochemicals.

23. While growth in R&D investment remained stagnant in almost all advanced economies during the 1990s, R&D expenditure in Korea increased more than 20 percent a year during at least until the 1997 crisis. The R&D-GDP ratio in Korea rose steeply from 2.1 percent in 1992 to 2.8 percent by 1996. Another notable aspect of Korea's R&D efforts is the overwhelming role of the private sector. Nowadays in Korea, the proportion of government-funded R&D investment, which was as

high as 80 percent in the early 1980s, is in the range of 18-23 percent.

24. In its latest forecast of the world economy up to 2020, WEFA (1999) predicted that Asia, excluding Japan, will continue to lead the world growth with the average annual growth rate of 5.8 percent (5.3 percent for Korea), followed by Latin America (4.2 percent), Europe (2.2 percent), the U.S. (2.2 percent), and Japan (1.9 percent). For the 10-year period until 2010 WEFA predicted that China and India will lead Asia's growth (7.4 percent), followed by the ENIEs group (Indonesia, Thailand, Philippine; 6.0 percent), and by the four Asian tigers (Korea, Singapore, Taiwan, and Hong Kong; 5.6 percent).
25. Forecasting the world trade flows by regions until 2020, one research institute in Japan predicted in 1996 that East Asia will grow into a single largest trading region of the world by 2020, surpassing EU in both export and import shares. In addition, the study forecasted that the intra-regional trade share in East Asia will keep growing to take up about 20.4 % of global trade flows, and that the shares of inter-regional trade involving Asia will dwindle eventually than now.
26. One rough method to gauge the locational advantages of East Asian nations in different industries is to compare the each economy's distribution of R&D workers across industries. According to analysis by Andersson (1999) Indonesia's locational advantages appear in food products, wood/paper/textile products, and chemicals for food products, Malaysia's are in electrical/electronics products; Singapore's in electrical/electronics and services; Thailand's in services; and Korea's in chemicals, electrical/electronics, and transportation equipment.
27. Concerning overall R&D capacity, Andersson (1999, p. 135), for instance, states: "Looking at the level of research and development, especially Korea but also Taiwan are well on par with the most developed countries in the world, whereas the other Asian countries lag behind. … In absolute terms, China is a major player in several respects."
28. In terms of notified volume. Executed volume was US$5.16 billion.
29. Until the mid 1980s, low-cost labour was the main advantage of investing in Korea. As wages increased after the mid-1980s, an increasing proportion of FDI was made to penetrate attractive domestic markets.
30. The alliance between Hyundai and Renault for joint venture production in Malaysia may be a case in point. The unique managerial advantage of Korean carmakers in the emerging market was pointed out by McDermott (1996).
31. From a mid- to long-term perspective, Korea's backward S&T infrastructure may be another principal hindrance. To stay focused and short, this chapter does not address the S&T issue.
32. The output composition of manufacturing SMEs is similar to that of the manufacturing sector overall. In 1995, for instance, machinery and equipment industry produced the largest share of valued-added by SMEs (35.7%), followed by textiles and clothing (16.0%), chemicals (14.7%), and food processing (10.3%). As in the manufacturing sector as a whole, SMEs in heavy and chemical industries far outweighed those in light manufacturing in activities (62.4% vs. 37.6%) – although by a somewhat smaller margin (73.4% vs. 26.6%). The SME sector has undergone a discernible structural change toward HCIs over 1985-95. The shares of relatively high value-added sectors such as machinery and equipment have increased substantially while the shares of the traditional SME sector such as textiles and clothing have dwindled. The speed and extent of structural progress is in the SME sector are still less than in the manufacturing sector overall. For instance, while the machinery and equipment industry's share in total manufacturing value-added increased from 30.6 percent to 45 percent, its share of value-added by manufacturing SMEs increased from 25.4 percent to 35.7 percent. This implies that SMEs have lagged somewhat behind large firms in the structural transition to high value-added industries.
33. Although more than 7 percent of SMEs are reportedly engaged in some R&D, more than 60

percent of firms conducting R&D spend less than 3 percent of their revenue on R&D. For SMEs as a whole, total R&D spending is as little as 0.3 percent of total turnover.

34. The popular perception that direct government intervention is required to rectify the disadvantages of SMEs has long been an ideological cornerstone of Korea's SME policy. The amended 1982 Constitution, for instance, states that the 'protection' and 'promotion' of small businesses shall be the government's 'responsibility' and 'duty'. Korea started to switch to a more market-logic policy in the late 1980s, emphasising the selective nurturing of innovative groups, but the backbone of SME policy has not changed that much.

35. In the 1990s, some leading domestic firms started to form technical alliances with foreign companies to gain design capability and to localise core parts and components. For instance, Daewoo Heavy Industries allied with Kawasaki Heavy Industries to develop its own industrial robot model and it collaborated with Toshiba to develop a sophisticated 32-bit CNC device for its CNC lathes and machining centres, which are currently for sale.

36. Export have increased steadily, but as imports of high-end products continued to increase sharply to keep pace with facility investments in the manufacturing sector, the trade deficit in general machinery remains huge and rising. In 1996, the deficit in this industry reached $13.9 billion, which in turn amounted to 91 percent of Korea's total trade deficit that year.

37. There also has been a naturally protected low-end market due to proximity to users, cheap cost of production and the language barrier. This market is gradually fading away too. With the advance of transportation and communication, foreign firms are at near parity in terms of speed of getting access to users' needs and the cost of A/S service. Most of all, the low price market which has been dominated by domestic machine producers will be challenged by cheap machines from the second tier NICs such as China and Malaysia as well as those from some transition economies in Eastern European region such as Czech republic, Poland and others.

38. Though firms are located in the same district, the linkages and interactions among the resident firms are quite limited because they import most core components and technologies from abroad.

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TABLE 9.1
Index of Labour Productivity by Manufacturing Industry in Selected Economies, 1995

(US Manufacturing = 100.0)

	US	Japan	Germany	France	UK	Italy	Korea
Manufacturing	100.0	122.6	99.7	107.3	57.2	68.0	62.2
Major Industries Sub-total	106.4	119.2	104.0	109.2	55.6	64.9	59.7
Textile/Apparel	48.2	39.5	58.2	67.2	36.5	45.5	19.9
Chemicals	155.4	174.1	160.3	169.0	88.6	93.6	87.1
Machinery	98.7	123.9	84.1	85.6	50.2	75.2	49.9
Electric & Electronics	123.0	125.2	85.5	106.3	44.5	74.7	79.4
Transport Equipment	107.3	146.1	109.4	98.5	53.9	67.0	63.3
Scientific Equipment	85.4	123.4	69.9	106.6	51.2	72.9	42.3

Note: Data for Italy and UK are 1994.

Source: OECD, OECD STAN Database, 1999.

TABLE 9.2
Composition of Manufacturing Exports by Industry in Selected OECD Economies, 1994

(Percent of total manufacturing exports)

	US	Japan	Germany	France	UK	Italy	Korea
Textiles and apparel	3.6	1.8	4.9	6.2	5.1	18.0	18.9
Chemical products	16.3	10.3	18.5	20.4	21.1	13.2	12.4
Machinery	19.1	21.0	16.9	10.8	17.4	18.2	7.5
Electrical and electronics	15.5	23.7	11.2	9.9	11.9	8.2	28.9
Transport equipment	20.3	26.5	21.5	20.5	15.0	10.4	13.6
Scientific equipment	5.0	5.9	3.8	1.3	4.3	2.0	1.1
Major industries subtotal	79.9	89.1	76.9	69.1	74.9	70.0	82.5

Source: OECD, OECD STAN Database, 1997.

TABLE 9.3
Patterns of Trade Specialisation by Industry in Selected OECD Economies, 1995

(Percent)

	US	Japan	Germany	France	Italy	Korea
Chemical products	0.20	0.17	0.24	0.11	-0.29	-0.21
Rubber and plastic products	-0.04	0.63	0.17	0.13	0.27	0.43
Drugs and medicines	0.07	-0.45	0.21	0.11	-0.04	-0.44
Basic metals	-0.31	0.45	0.12	0.05	0.17	0.06
Machinery and equipment	0.02	0.72	0.44	0.06	0.45	-0.51
Electrical and electronic equipment	-0.18	0.55	0.13	0.06	0.10	0.32
Office and computing machinery	-0.28	0.39	-0.26	-0.19	-0.12	0.16
Communication equipment	-0.30	0.51	-0.00	-0.01	-0.23	0.49
Motor vehicles	-0.37	0.72	0.31	0.07	0.01	0.68
Aircraft and shipbuilding	0.52	0.58	0.21	0.50	0.23	0.16
Scientific equipment	0.02	0.42	0.20	-0.08	-0.10	-0.47
Textiles, apparel, and leather	-0.64	-0.59	-0.28	-0.16	0.45	0.53
Other	-0.27	-0.65	-0.20	-0.13	-0.56	-0.53

Note: Trade specialisation coefficient defined as (exports - imports)/(exports + imports).

Source: OECD, *Foreign Trade by Commodities*, 1995.

TABLE 9.4
Characteristics of Major Industries

		Global, High-tech Industries (Electronics, Automobiles, Chemicals)	Local, Mid-tech Industries (Machinery, Textiles/Apparel)
Characteristics	Market structure	Oligopoly among leading MNEs - Highly dynamic	Led by innovative SMEs - stable monopolistic competition in a highly differentiated market
	Lead nations	• Automobiles: US, Germany, Japan, France, Italy • Electronics: US, Japan • Chemicals: US, UK, Germany	• Machinery: US, Germany, Japan • Textiles & apparel: Italy, France
	Source of competitive advantage	Economies of scale in R&D and production - Individual core competence - Global R&D network	Economies of agglomeration -Collective innovation in local networks of clusters
Globalisation	Globalisation of firm	Intensifying and deepening - Intra-firm, global division of labour - Global network of R&D and sourcing - Multi-domestic strategy	Limited - Intricate local division of labour - Local network - traditional export
	Trade Pattern	Increasing intra-firm and intermediate product trade Decreasing inter-regional trade	Typical inter-regional product trade some intra-regional trade in intermediate products
	Linkage with home country	Weakening (low/mid value-added activities out-sourced)	Robust (core activities integrated into a region)
Developing Countries	Overall position	Passive participants - Competition to attract MNEs - Produce low-end products and parts	Import high-quality products Export commodity products and parts
	Prospect of advancement	Low/modest (absolute gap in capital & technology)	Very low (difficulty building innovative clusters)

TABLE 9.5
Labour Productivity in Korea Relative to the U. S. Level, 1980-95
(Percent)

	Manu-facturing	Textiles and Apparel	Chemical Products	Basic Metals	Machinery	Electrical/ Electronics	Shipbuilding	Motor Vehicles
1980								
PPP	42.7	47.7	42.1	48.6	37.3	36.8	119.3	31.1
NER	30.3	33.9	29.9	34.5	26.5	26.1	84.7	22.1
1990								
PPP	60.8	62.4	39.3	127.2	57.7	57.0	106.4	75.3
NER	46.2	47.4	29.9	96.7	43.9	43.3	80.9	57.2
1995								
PPP	77.7	51.7	70.0	152.1	63.9	80.7	152.2	63.3
NER	62.2	41.4	56.0	121.7	50.6	64.6	121.8	50.7
Productivity growth rate	8.2	4.3	8.0	9.6	10.1	13.6	8.2*	

Note: PPP denotes productivity based on Purchasing Power Parity Exchange Rate, NER denotes comparison based on nominal exchange rate. Growth rate of productivity measured in real-value added terms. *denotes productivity growth for transportation equipment.
Source: OECD, OECD STAN Database, 1997.

TABLE 9.6
Evolving R&D Profile of Korea, 1980-95

	1980	1985	1990	1995
R&D expenditures				
GDP share (%)	0.77	1.58	1.95	2.61
Government share (%)	64.0	25.0	19.0	16.0
R&D/Sales (%)	0.50	1.51	1.96	2.72
Research scientists and engineers				
Number	–	19,000	70,500	100,500
% in manufacturing	–	89.2	89.9	86.2
Number of R&D centres/labs	54	183	996	2,270

Note: Numbers of scientists and engineers for 1990 and 1995 refer to 1989 and 1994.
Source: Ministry of Science and Technology, *Report on the Survey of R&D in S&T*, various issues.

TABLE 9.7
R&D Expenditures of Major OECD Countries

	Increase in R&D spending 1991-96	1996 R&D Expenditures US$ billions	R&D Share of GDP %		R&D Share of Sales %		Government Share of R&D Expenditures %
			1992	1996	Total	Manu-facturing	
United States	2.83	184.7	2.78	2.54	2.8	2.9[3]	33.6
Japan	1.83	138.6	2.94	3.00	2.8	3.4	26.5
Germany	1.39	53.1	2.48	2.26	4.0[3]	-	37.3
France	2.68[4]	35.9[1]	2.42	2.34[1)]	4.8[2]	-	43.6[1]
UK	3.63[4]	22.6[1]	2.18	2.05[1)]	-	-	36.4
Korea	21.21	13.5	2.08	2.79	2.4	2.8	22.1

Note: [1] 1995 [2] 1994 [3] 1993 [4] Increase for 1990-95.
Source: Ministry of Science and Technology, *Report on the Survey of R&D in S&T*, 1997.

TABLE 9.8
Overseas R&D Centres of Korean Firms, 1995

(Number of centres)

	US	Japan	Europe	Russia	Total
Electrical/ Electronics	15	8	7	1	31
Motor Vehicle	4	3	2	-	9
Other	5	1	4	1	11
Total	24	12	13	2	51

Source: Reproduced from Table 5-4-3 STEPI (1998).

TABLE 9.9
Characteristics of Korea's Technology Trade, 1990-97

(US$ million, percent)

	Trade Volume			Major Import Products						Major Source Countries					
	Imports	Exports	Imports minus Exports	Electrical and Electronics		Machinery and Equipment		Chemicals and Petroleum Products		United States		Japan		EU	
	$US mil	$US mil	$US mil	$US mil	%	$US mil	%	$US mil	%	$US mil	%	$US mil	%	$US mil	%
Volume of trade	1,200	630	-1,137	601	50.1	232	19.3	138	11.5	633	52.8	360	30.0	177	14.8
Growth rate															
1990-97	12.1	33.3	11.3	15.3		10.7		-0.7		16.2		5.8		8.3	
1994-97	23.7	13.7	24.5	17.8		31.3		24.1		28.4		14.2		33.8	

Source: Reconstructed from Tables II-62 and II-63, Korean Industrial Technology Association (KITA), *Annual Report on Industrial Technology*, 1998.

TABLE 9.10
Patterns of World Trade Flows by Region, 1981-85 and 1991-95

(Percent)

	1981-85				1991-95			
	EU	NAFTA	Asia	Import Total	EU	NAFTA	Asia	Import Total
EU	18.1	3.4	1.9	34.0	24.1	3.3	3.4	33.8
NAFTA	3.6	7.1	3.5	18.5	3.4	7.3	4.4	17.8
Asia	2.3	5.3	6.4	18.2	4.5	6.8	12.0	26.0
Export Total	35.7	20.9	17.6	100.0	39.1	20.0	23.8	100.0

Note: Asia refers to 38 countries excluding Middle East area

Source: IMF, *Direction of Trade Statistics*, Yearbook.

TABLE 9.11
R&D Personnel in East Asia and Other Economies, 1997

	US	Germany	Japan	Korea	Taiwan	Singapore	China	Malaysia
Total number (1,000s)	962.7	459.11	891.8	135.7	98.6	12.1	588.7	4.4
Ratio to Korea (Korea = 1)	9.37	2.25	6.62	1.00	0.59	0.07	5.73	0.02
Number per 10,000 population	37.29	56.24	70.93	29.80	45.65	32.26	N/A	2.05

Note: Korea is for 1996.

Source: IMD, *The World Competitiveness Yearbook*, 1999 and Andersson, 1999, for China.

TABLE 9.12
Summary of Locational Advantages of Japan, Korea, and China

	Japan	Korea	China
Advanced research (generic/applied)	◎	×	×
Commercial research and basic engineering	◎	×/△	△/×
Product/process adaptation and improvement	◎/○	○/△	×
Production (mid to high-end product)	△	◎	△
Production (low to mid-end product)	×	△	○

Note: ◎ indicates a strong advantage, ○ denotes an advantage, △ means neutral, and × denotes a disadvantage.

TABLE 9.13
Amount and Composition of Korea's Inward FDI by Source, 1981-98

	1981-1985	1986-1990	1991-1997	1998
Amount		US$ millions		
United States	375.9	1,005.2	2,182.0	1,450.3
Asia	304.7	1,996.3	3,288.9	877.2
Japan	263.2	1,850.2	1,733.3	413.6
Europe	109.0	598.3	4,615.9	2,662.5
Germany	24.2	165.2	761.5	643.8
France	9.1	63.5	814.3	352.7
Netherlands	8.8	107.2	1,338.4	1,218.3
Total	832.	3,704.2	10,452.0	5,155.6
Share of Inward FDI		%		
United States	45.17	27.14	20.88	28.13
Asia	36.62	53.89	31.47	17.01
Japan	31.63	49.95	16.58	8.02
Europe	13.09	16.15	44.16	51.64
Germany	2.91	4.46	77.29	12.49
France	1.09	1.71	7.79	6.84
Netherlands	81.06	2.89	12.81	23.63
Total	100.0	100.0	100.0	100.0

Source: Reconstructed from Kim, 1999.

TABLE 9.14
Amount and Composition of Inward FDI by Sector, 1981-98

(US$ million, percent)

	Amount				Share of Inward FDI			
	1981-85	1986-90	1991-97	1998	1981-85	1986-90	1991-97	1998
Agriculture and fishing	2.5	20.4	35.8	162.8	0.31	0.55	0.34	3.16
Mining and quarrying	1.4	4.5	19.9	21.3	0.17	0.12	0.19	0.42
Manufacturing	593.0	2,277.6	6,104.0	2,831.6	71.26	61.49	58.40	54.92
Food	42.6	154.9	663.9	629.8	5.12	4.18	6.35	12.22
Textile and clothing	8.2	53.6	199.8	6.7	0.99	1.45	1.91	0.13
Paper and lumber	15.8	25.0	335.3	446.7	1.90	0.68	3.21	8.66
Chemicals	114.1	415.2	1,388.8	429.1	13.72	11.21	13.29	8.32
Fertiliser	1.2	0.3	0.7	0.3	0.14	0.01	0.01	0.00
Medicines	47.3	135.3	234.1	119.6	5.68	3.65	2.24	2.32
Petroleum	5.6	49.7	684.3	0.9	0.68	1.34	6.55	0.02
Ceramics	3.2	42.0	196.5	243.3	0.39	1.14	1.88	4.72
Metals	24.3	39.4	71.3	5.8	2.91	1.06	0.68	0.11
Machinery	22.8	265.1	571.0	534.8	2.74	7.16	5.46	10.37
Electrical and electronics	174.7	616.5	865.8	231.7	21.00	16.64	7.90	4.49
Transport equipment	125.9	437.5	825.8	154.0	15.13	11.81	7.90	2.99
Other manufacturing	7.3	43.0	66.6	28.6	0.88	1.16	0.64	0.55
Services	235.2	1,401.8	4,292.2	2,139.8	28.26	37.84	41.07	41.51
Electricity and gas	0.0	0.0	26.1	0.0	0.00	0.00	0.25	0.00
Construction	40.2	9.0	101.3	5.4	4.83	0.24	0.97	0.11
Wholesale and retail	15.0	5.0	690.0	519.6	1.81	0.14	6.60	10.08
Trade	0.2	55.5	701.7	243.0	0.02	1.50	6.71	4.71
Restaurants	0.1	4.1	67.3	6.2	0.02	0.11	0.64	0.12
Hotels	76.6	887.1	573.7	0.0	9.20	23.95	5.49	0.00
Transport and storage	7.0	6.6	160.1	4.2	0.84	0.18	1.53	0.08
Finance	78.7	313.6	1,191.1	471.4	9.46	8.47	11.40	9.14
Insurance	1.0	76.7	181.3	73.1	0.12	2.07	1.73	1.42
Other services	31.4	44.2	597.9	816.1	3.77	1.19	5.72	15.83
Total	832.1	3,704.2	10,452.0	5,155.6	100.0	100.0	100.0	100.0

Source: Reconstructed from Kim, 1999.

TABLE 9.15
Asian Market Shares of Major Automobile Companies, 1995

(Percent)

	China	India	Taiwan	Thailand	Indonesia	Malaysia	Philippines	Overall Asia Share
Japanese companies	24.4	36.2	58.0	89.9	95.3	92.3	87.9	54.3
Toyota	0.7	0.3	17.0	27.9	25.5	7.7	29.1	10.7
Nissan	-	0.7	11.9	15.4	0.5	6.0	14.7	4.9
Mitsubishi	1.7	0.8	18.7	12.5	19.2	51.4	24.9	11.5
Honda	-	-	7.2	4.8	1.3	3.9	9.2	2.4
Mazda	-	0.5	1.0	4.1	0.8	1.0	6.0	1.2
Suzuki	9.9	33.9	1.2	0.6	18.5	1.0	-	11.0
Isuzu	4.1	-	-	20.8	11.2	3.2	1.7	5.9
Daihatsu	8.0	-	0.2	0.7	6.5	17.5	0.5	-
US companies	1.8	--	–	2.0	1.2	2.5	-	4.9
Ford	-	--	–	0.9	0.7	2.1	-	3.0
European companies	15.7	--	–	6.1	3.2	5.1	0.8	9.0
VW/Audi	14.1	--	–	0.6	-	0.1	-	5.4

Note: Asian share is combined share in seven nations.
I: Abrenica, 1997.

TABLE 9.16
Korea's Rank on Selected Competitiveness Factors

	Competitiveness Factor	Rank
Internationalisation	• Protectionism	46
	• Culture	46
	• Government procurement	45
	• Incentives for inward FDI	42
Government	• Regulation	46
	• Legal frame	45
	• Transparency	43
	• Policy-making	40
Finance	• Presence of foreign institutions	46
	• Access to foreign markets	45
	• Capital cost	45
	• Central bank	44
Corporate	• Governance	46
	• Venture firms	43
	• Labour relations	43
	• Image	42

Note: Rank is Korea's ranking out of 46 nations surveyed with higher ranking indicating greater weakness.
Source: IMD, *World Competitiveness Yearbook*, 1998.

TABLE 9.17
Composition of R&D Investment by Industry and Size of Establishment

(Percent)

	Total	5-99 employees	100-299 employees	300-999 employees	1000+ employees	Share of Sector's R&D by 1000+ Establishments
All sectors	100.0	3.5	5.4	9.7	81.4	81.4
Manufacturing	84.5	2.8	4.6	7.3	69.8	82.6
Principal industry subtotal	77.9	2.5	4.2	6.3	64.9	83.3
Electrical/electronics	36.6	0.9	1.5	1.6	32.6	89.1
Transport equipment	25.9	0.1	0.5	1.9	23.4	90.3
Scientific instruments	0.7	0.2	0.3	0.1	0.1	14.3
Chemical products	10.0	0.7	1.1	1.8	6.4	64.0
Machinery	3.6	0.5	0.5	0.7	1.9	52.8
Construction	5.0	0.0	0.0	1.0	4.0	80.0
Transportation, storage, telecommunications	3.7	0.0	0.1	0.5	3.1	83.8

Source: Ministry of Science and Technology, *Report on the Survey of R&D in S&T*, 1997.

TABLE 9.18
Evolution of SMEs in Korea's Manufacturing Sector

					SME % of Manufacturing Total			
	1980	1985	1990	1995	1980	1985	1990	1995
Number of establishments	29,779	42,950	67,679	95,285	96.9	97.5	98.3	99.0
Employees (thousand)	1,000	1,368	1,864	2,034	49.6	56.1	61.7	68.9
Value-added (billion won)	4,168	10,059	31,432	73,808	35.2	37.6	44.3	46.3
Productivity differential	55.0	47.2	45.8	39.4				

Note: Productivity differential indicates productivity of SMEs as a percent of productivity in companies with 300 or more employees.

Source: National Statistical Office, *Basic Survey on Korea's Manufacturing Sector*. 1998

TABLE 9.19
Structural Changes in Korean Manufacturing

(Percent of total value-added)

	Manufacturing Total					SMEs				
	1975	1980	1985	1990	1995	1975	1980	1985	1990	1995
Embodied technology										
High-tech	10.7	12	15.7	19.1	22.7	6.5	10.2	12.6	14.8	13.4
Mid-tech	17.7	22.4	23.1	30.1	30.9	20.2	24.0	25.7	29.2	31.3
Low-tech	71.6	65.6	61.2	50.8	46.4	71.3	65.9	61.7	56.0	55.3
OECD S&T classification										
Resource-intensive	39.6	33.1	28.8	24.9	22.9	39.8	32.1	28.9	25.1	25.3
Labour-intensive	26.3	24.6	22.5	18.8	16.0	29.1	31.6	31.5	28.8	25.9
Specialised supplier	9.1	11.5	16.0	21.3	26.9	8.8	10.0	12.8	17.6	19.6
Scale-intensive	21.3	26.9	28.7	30.9	30.3	18.8	21.5	21.2	23.0	24.0
Science-based	3.7	3.9	4.0	4.1	3.8	4.0	4.8	5.5	5.4	5.1

Source: Reproduced from Woo and Lim, 1998.

TABLE 9.20
R&D by SMEs in the Manufacturing Sector

	1980	1985	1990	1993	1996
SMEs conducting R&D					
Number	2,982	5,630	6,758	5,645	7,084
Percent of all SMEs	10.0%	13.1%	10.0%	6.4%	7.4%
R&D/Sales	0.13	0.22	0.25	0.42	0.34

Source: Small and Medium Industry Promotion Corporation, *Major Statistics of SMI*, 1996.

TABLE 9.21
Evolution of Korea's Machine Industry, 1986-96

	1986	1991	1993	1996
Production (US$ millions)	4.948	24.110	25.017	51.921
Share of domestic manufacturing (%)	5.1	8.5	7.8	-
Share of world production (%)	1.1	4.5	4.6	-
Exports (US$ millions)	1.663	3.838	4.912	10.736
Imports (US$ millions)	4.847	12.69	11.321	26.463
Trade balance (US$ millions)	-3.184	-8.852	-6.409	-15.727
Overall trade balance (US$ millions)	4.206	-6.980	1.86	-15.306
Domestic market share (%)	40.0	61.5	63.9	60.8
Exports/production (%)	33.6	15.9	19.6	20.6

Note: Domestic market share of domestic producers = (production - exports) / (production + imports – exports)
Source: Reproduced from Woo and Lim, 1998.

TABLE 9.22
Characteristics of the General Machinery Industry by Firm Size, 1993
(Percent)

	5-9 Employees	20-99 Employees	200-299 Employees	300 + Employees
Production share	16.9	30.7	15.5	36.9
Employment share	28.1	37.4	13.6	20.9
Establishment share	72.6	24.8	2.0	0.6
Productivity differential 1993	53	65	85	100
Productivity differential 1983	49	62	79	100

Note: Productivity differential indicates productivity of SMEs as a percent of productivity in companies with 300 or more employees.
Source: National Statistical Office, *Survey on Korean Manufacturing Sector*, 1993.

TABLE 9.23
Comparison of the Machinery Industry in Korea and Germany, 1993
(Percent)

	Employment Share		Relative Productivity	
	Germany	Korea	Germany	Korea
Number of employees				
20 ~ 99	18.9	36.3	59.8	23.9
100 ~ 299	24.1	15.5	67.4	30.8
300 ~ 499	13.0	6.1	69.6	29.6
500 or more	44.1	42.2	100.0	59.5

Note: Relative productivity indicates productivity of firm size category relative to productivity of German firms with 500 or more employees.
Source: Reproduced from J.K. Park, 1997.

ANNEX TABLE 9.A1
GDP Growth by Phase of Industrialisation

(Percent)

	Take-off 1963-1972	HCI Drive 1973-1979	Rationalisation 1980-1989	Liberalisation 1990-1995	1963-1995
GDP growth rate	8.93	8.87	9.00	7.48	8.47
Per capita GDP	6.46	7.14	7.70	6.51	6.79

Source: National Statistical Office, *National Income Accounts of Korea*.

ANNEX TABLE 9.A2
Growth Accounting and Long-term Growth Projections

(Percent)

	1972-1982	1982-1992	1992-2000	2000-2010			2010-2010		
				Base	Low	High	Base	Low	High
Actual Growth	7.1	9.5							
Cyclical factor	-0.7	1.3							
Potential Growth	8.1	8.1	7.2	5.5	5	6	4	3.5	4.4
Inputs	5.2	4.4	3.8	2.7	2.6	2.8	1.9	1.8	2
Labour	3.2	2.5	1.9	1	1	1	0.4	0.4	0.4
Capital	2	1.9	1.9	1.7	1.6	1.8	1.5	1.4	1.6
Productivity	2.9	3.7	3.4	2.8	2.4	3.2	2.1	1.7	2.4
Resource reallocation	0.7	0.9	0.7	0.5	0.4	0.6	0.2	0.2	0.3
Scale economies	1.5	1.8	1.5	1.1	1	1.2	0.7	0.5	0.7
Technology	0.7	1	1.2	1.2	1	1.4	1.2	1	1.4

Note: base denotes base growth scenario; low means low growth scenario; and high refers to high-growth scenario.
Source: KDI.

FIGURE 9.1
Value Added Share of Major OECD Economies by Industry

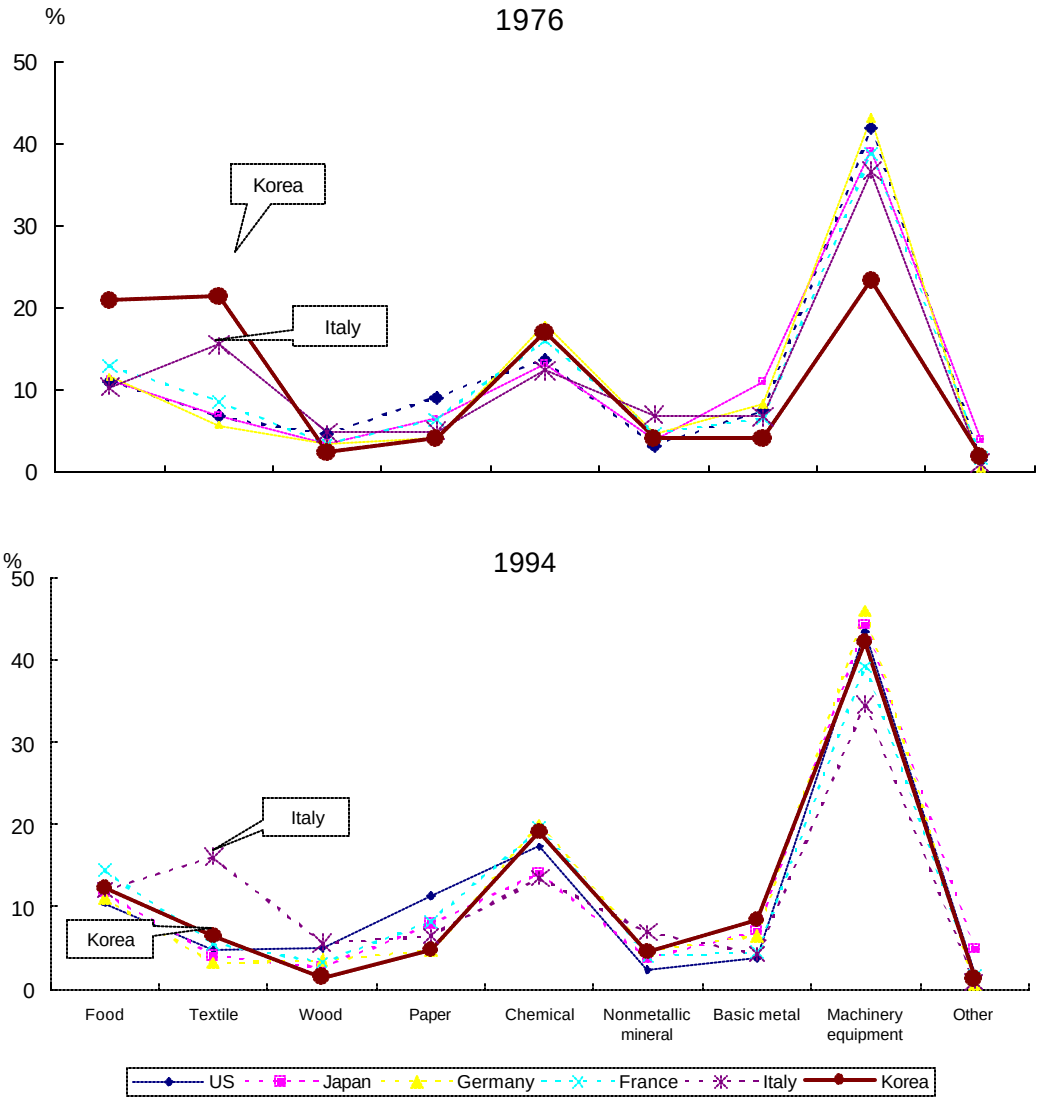
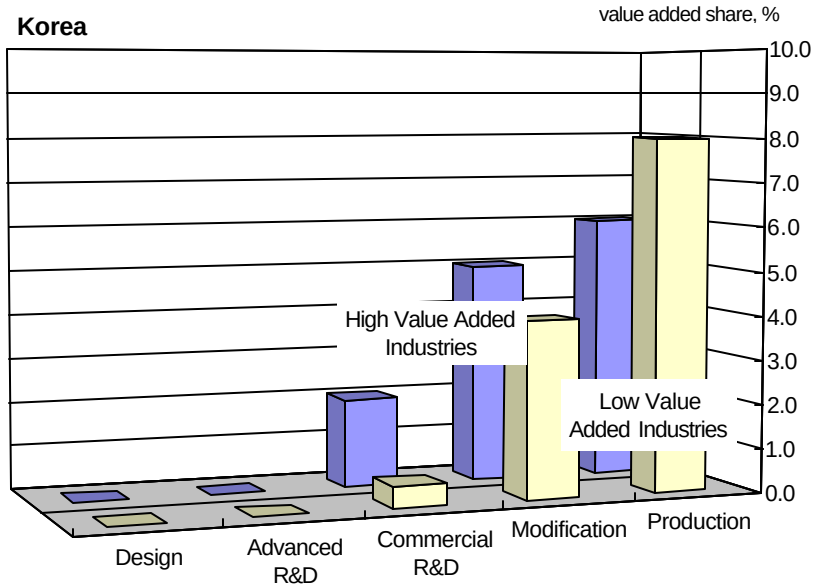


Figure 9.2
Characterisation of Gap in Knowledge-Intensity



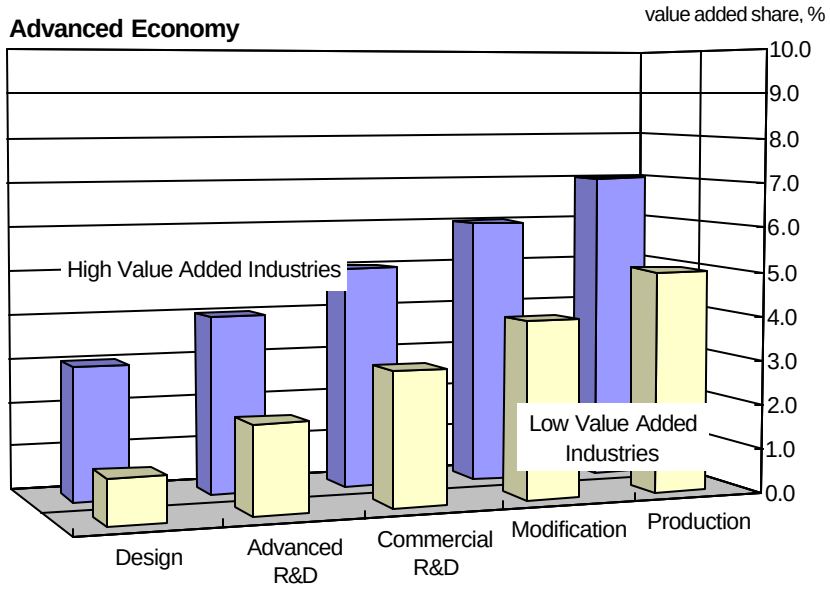


FIGURE 9.3
Conceptual Characterisation of the Positions of MNEs and Domestic Firms in Korea

Principal Interests of Foreign MNEs in Korea