SOUTH KOREA: ECONOMIC MIRACLE BY POLICY MIRACLE?

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Abstract

Historical, cultural and institutional factors certainly did have a positive impact on the economic growth in South Korea and the other East Asian newly industrialising economies. However, these factors would not have been of any importance without governmental influence. Particularly in South Korea, a strong state with highly respected and qualified bureaucrats could play a central role in stimulating economic growth, first by trade policy (export-push strategy), later by industrial policy and technology policy. The most outstanding strengths of South Korean policy are flexibility, planning and implementation, pragmatism and a close relationship between bureaucrats and industry. These close relationships with firms and their highly respected position allow bureaucrats to monitor policy carefully and change policies quickly.

1. Introduction

The combination of spectacular economic performance and shared growth in the East Asian Newly Industrialising Economies (NIEs) attract a lot of attention. Since the 1970s the success stories of the East Asian NIEs (in first instance: Hong Kong, Singapore, South Korea and Taiwan) have become a main subject of research in development economics. Recently, some studies convincingly demonstrated this performance with a large number of indicators (World Bank 1993; Chowdhury & Islam 1993; SaKong 1993). The East Asian Miracle study of the World Bank (1993) was discussed in several newspapers and magazines (Economist 1993; FT 1993d; ESB 1993; WiWo 1994). Although there are strong controversial opinions about the explanation of the emergence of East Asian NIEs, there is no doubt at all about their remarkable economic development and shared growth (Vogel 1991:2). The World Bank (1993:2) even states in its East Asian Miracle report: "if growth were randomly

distributed, there is roughly one chance in ten thousand that success would have been so regionally concentrated".

There are several reasons for this attention to the emergence of East Asian NIEs. First, it is quite remarkable that this part of the world has been developing so fast compared with other parts such as Latin America and Africa. This strong concentration of economic growth suggests a set of common factors to be found in East Asia, and nowhere else in the world (yet). Obviously, the possibility of applying these factors to development in other parts of the world bears promises for large populations, now living in poverty. Second, the emergence of the NIEs is a major shock to the established economic powers in the world. While three powers, Japan, Europe and the USA, are competing for world economic leadership, a fourth player, the group of South-Asian NIEs, entered the stage. This group might perhaps not be as large as the other three players, it is certainly one that needs to be considered by the three traditional players.

Table 1: Asian NIEs

Economy	Gross domestic savings ratio (%) 1988	GDP per capita ($) 1988	Share of manufacturing (%) 1988	Human development index 1989
Hong Kong	33	13,380	22	0.936
Singapore	41	10,417*	30	0.899
Taiwan	33	5,739	39	0.920
South Korea	38	5,156	32	0.903
Malaysia	36	4,773	23	0.800
Thailand	34	2,908	24	0.783

Source: Summers & Heston 1991, Chowdhury & Islam 1993:5 (rest).
Note: * 1985.

NIEs can be statistically defined as countries with at least a savings ratio equal to 15%, a real GDP per capita equal to US$ 1,000, a share of manufacturing in GDP and employment equal to 20% and a human development index equal to 0.75 (this is an index to measure deprivation; it combines purchasing power, life expectancy and literacy) (Chowdhury & Islam 1993:4). Applying this definition to Asia, six different

countries, apart from Japan, satisfy the criteria: South Korea, Taiwan, Hong Kong, Singapore, Malaysia and Thailand (see Table 1).

Among the four initial industrialisers, there are large differences in economic structure and size between the two 'city-states' Hong Kong and Singapore, which can be economically regarded as entrepôts with a limited domestic market, and the larger countries Korea and Taiwan (see Table 2). This distinction certainly has repercussions for their economic structure and policies. Thailand and Malaysia can be regarded as the 'second' wave of East-Asian industrialisers. Recently, a 'third' wave of industrialisers has appeared (for example, Indonesia, Philippines, Vietnam, the coastal provinces of China).

Table 2: Population and area figures

Economy	Population in million inhabitants (1989)	Area in 1000 sq. km.
South Korea	42.4	98
Taiwan	20.0	36
Hong Kong	5.8	1
Singapore	2.7	1

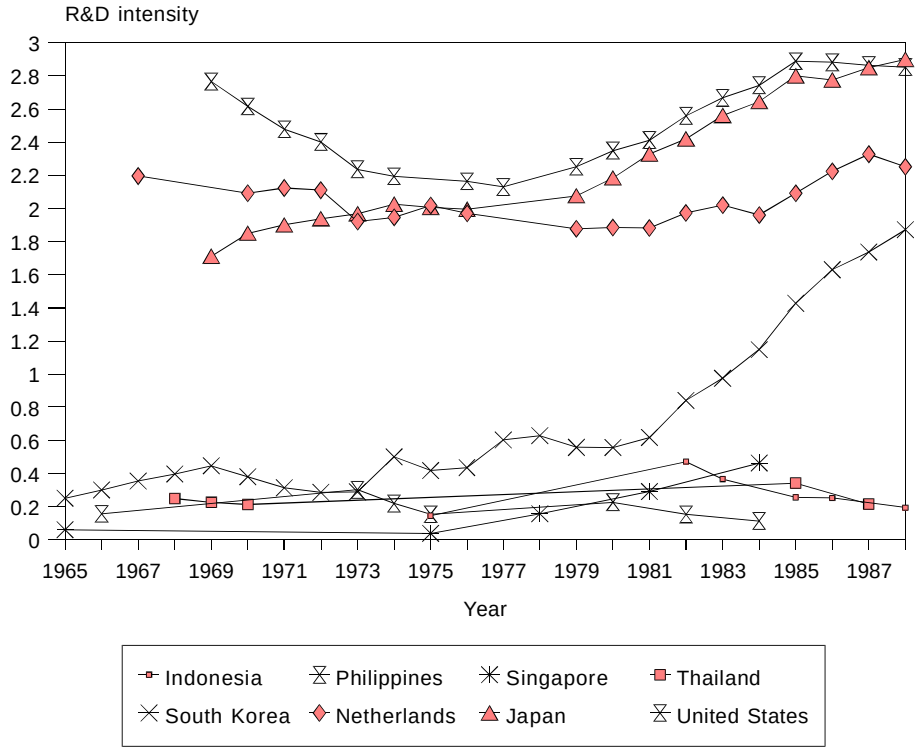
Source: Chowdhury & Islam 1993:8.

The employment in manufacturing has been rising during the last 30 years in all East Asian NIEs, except Hong Kong. The extent of the structural change, however, varies depending on the base and initial conditions. South Korea and Taiwan started with a relatively small industrial base, and subsequently experienced large absolute changes, while the opposite is true for Hong Kong and Singapore. The focus in most of these countries has changed gradually from low-technology, labour-intensive kinds of industry to capital- and skill-intensive sectors (see Chowdhury & Islam 1993:15; Suarez-Villa & Han 1990). South Korea has reached a production structure which is comparable to that of world leaders as the United States and Japan.

Growth in South Korea was supported by growing R&D expenditures as a percentage of GDP (the so-called R&D intensity). It has the highest R&D intensity of all the East Asian economies: about 1.8% in 1988 (see Figure 1), and even 2.6% in 1993

(Swinbanks 1993). In the other East Asian NIEs the R&D expenditures as a percentage of GDP hardly increased, and are still very low. Compared with other East Asian NIEs South Korea is also leading as user of numerically controlled machine tools and flexible manufacturing systems (Malecki 1991:244). Although these factors indicate the development of South Korea as a technological power, Shin & Kim (1994:37) show that there is a large gap between technology-input capability and technology-output capability.

Figure 1: R&D expenditures as a percentage of GDP, 1965-1988



Source: R&D expenditures: UNESCO database; GDP figures: Summers & Heston (PWT).

Economic growth in the NIEs has a close relation with manufactured goods exports. Export is significant for economic growth because it generates foreign exchange and thus facilitates import of raw materials and capital goods. Besides this, outward-oriented firms often benefit from foreign know-how (and hence boost innovation), and must keep up with modern technology and therefore bring managerial skills up to international standards. Exports in the East Asian NIEs are high. The growth rate of the manufactured exports is also high, higher than the developing countries and the world on average.

Table 3 displays some social indicators of development in the East Asian NIEs. In terms of infant mortality, life expectancy at birth and adult literacy rate, all four East Asian NIEs are very close to the developed world. Because of these impressive achievements the East Asian NIEs are sometimes labelled as the 'leaders in social development'.

Table 3: Social indicators of development

Economy	Infant mortality 1989 (per 1,000)	Adult literacy 1989 (%)	Life expectancy at birth 1989 (years)	Income distribution and per capita growth rank*
Hong Kong	7	88	77	4
South Korea	24	93**	70	3
Singapore	7	87	74	2
Taiwan	5	91	74	1

Source: Chowdhury & Islam 1993:9.

Note: * Rank among 34 developing countries.

** 1984.

Since the models of the 'development state' vary considerably among the East Asian NIEs and are likely to diverge even more in the coming years (Douglass 1994), this article is not dealing with the East Asian NIEs as a group, but instead is only focusing on South Korea. The aim of the article is to investigate how South Korea has organised (and is organising) its efforts to stimulate technological innovation in its productive system. Two questions are of particular interest: what are the factors behind the economic success, and can the other countries learn from South Korean technology policy? In the next section the role of historical, cultural and institutional factors in explaining this growth will be analysed. The role of government policy in South Korea will be analysed in section three. Subsequently, the role of foreign investment and the development of human resources, especially in the process of building up technological capacities, will be illustrated. Finally, the article will give a broad outlook on the economic future of the NIEs as well as the lessons that could be learned from industrial and technology policy in South Korea.

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2. Historical, cultural and institutional factors

In general, there are two main factors which are mentioned in debates on the development of East Asia NIEs. First, there is the view that these countries are special cases, i.e., the rapid economic growth is due to historical and cultural factors. Second, it is argued that these countries may have had favourable historical and cultural conditions for economic growth, but policy in these countries has converted these conditions into rapid, self-sustained growth. This section will cover an overview of the historical, institutional and cultural conditions, whereas the next sections will cover the role of policy.

Both South Korea and (particularly) Taiwan experienced a long period of Japanese colonisation before the Second World War. Some authors argue that modern economic growth in South Korea and Taiwan owe much to the era of Japanese imperialism (Chowdhury & Islam 1993:35). They argue that during the colonial period, GDP grew very fast and state-directed development started (other evidence provided by Maddison (1989), however, shows that the growth of GPD in Taiwan and South Korea between 1900-1950 was much lower than in most Latin American and European countries). They also point at large learning effects, particularly in the field of the education system (Klink 1991:19). Indeed, the Japanese invested heavily in education, infrastructure and health. However, there are several convincing counter-arguments to this opinion. First, estimates of economic growth in this period vary considerably, so that it is not possible to make confident statements. Second, although the Japanese contributed to some kind of industrial take-off, one has to consider that the industries were established to meet specific Japanese needs at home, rather than to benefit from local comparative advantages (Chowdhury & Islam 1993:38). Third, these industries hardly remained intact during the Korean War. This war took 1.5 million lives and destroyed two-thirds of the south's industrial capacity (World Bank 1993:127). Fourth, the industry which was established on the Korean peninsula by the Japanese, was highly concentrated in the North (95% of iron and steel, 80% of the coal industry and 85% of the chemical industry were located in the North (Chowdhury & Islam 1993:38)).

The massive aid East Asian nations received from the USA in the 1950s and the 1960s is another factor which has been put forward as an explanation for modern economic growth. These countries were mainly supported because they were in the front line of the battle against communism. Aid inflow assisted Taiwan and South Korea to stabilise the economies, to give local investors confidence in the viability of the regime, to help finance land reforms and to maintain large military establishments without becoming a major drain of resources. More crucial than the financial, military and technical aid, were the American advisors on broad aspects of industrial society (Vogel 1991:85). They played an important role in the shift towards export-oriented industrialisation (Chowdhury & Islam 1993:39). However, the impact of aid depends on the absorptive capacity of recipients and that aid-dependency is a well-known syndrome in many developing countries. The East Asian NIEs had the capacity to use the aid in a productive manner.

It is also very tempting to make a connection between Confucianism and economic success. Hong Kong, Singapore, Taiwan and to a lesser extent South Korea are heavily influenced by Chinese and Confucian values. The advantages of Confucianism for economic development can be seen in its strong ethical and moral basis of government, its justification of hierarchical political systems, its demand for consensus and conformity, its particular type of community-like industrial organisation and its co-operation between government and corporate interests (Chowdhury & Islam 1993; Vogel 1991). Confucianism and its social harmony and co-operation facilitate the response of entrepreneurs to policy initiatives (SaKong 1993). Furthermore, self-cultivation and self-improvement are important ingredients of Confucianism. These ingredients make sure that people put a high value on education, hard work, respect for authority and achieving success in life through moving up the social hierarchy.

However, there are also several counter-arguments that mitigate the explanatory importance of Confucian values for the economic success in East Asia. Confucianism has been around in East Asia for centuries, but the economies in this area have been prospering only since the Second World War. Confucianism was in fact often blamed for the relatively poor economic performance in the 1950s, as originally the merchant and craftsmen occupied the two lowest castes in the traditional Confucian social hierarchy (Chang 1993:150; Kim & Leipziger 1993:33). Besides, Thailand and Malaysia, as the latest East Asian NIEs, do not have a Confucian tradition (Vogel 1991:83), whereas other countries with this tradition, but with different political systems, such

as China and North Korea, are lagging behind the East Asian NIEs.

The characteristics East Asian NIEs share with Japan might also have contributed to the explanation of the modern economic growth of these countries. Examples of shared characteristics are the high population density, the lack of natural resources and the relatively high levels of literacy of the employees, making them a highly teachable work-force. These shared characteristics and the geographical proximity might have enabled the East Asian NIEs to copy parts of the Japanese Model (Vogel 1991:90). These countries knew about the strategy of Japan starting with labour-intensive industries and using the income from exports in this sector to purchase new equipment. They also saw the prominent role of government in guiding industry. Policy imitation was even an explicit aim in South Korea and Malaysia (World Bank 1993:80). For the Japanese, the geographical proximity enabled them to shift labour-intensive industries to East Asian NIEs, as local wages became relatively high in the 1980s.

All these historical, cultural and situational factors cannot be more than contributory factors to the economic success in East Asia (World Bank 1993:81), which may play their part but only when indigenous conditions are favourable (Vogel 1991:92). Industrial and technology policy, to which we turn now, are among the indigenous conditions that could facilitate economic growth. However, indigenous conditions are also influenced by historical, cultural and situational factors. Confucianism, for instance, might have had considerable impact on the institutional framework of industrial and technology policy.

3. Government policy as a means of structurally directing the growth path

The role of government in the economic process has been subject to much debate. All the main arguments in this debate, in one form or another, apply to the case of East Asian growth. In quite general terms, there are two different views on what the role of government policy should be. One view, the liberal one, argues that the only task for the government is to create a stable business environment, in which the free market can do its job. In this case, policy goals include the setting-up of institutional contexts for property-rights, labour- and capital markets, correcting 'classic' cases of market failures (such as positive or negative externalities), keeping down inflation (by a balanced government-budget and a tight monetary policy), and ensuring the exposure of domestic industry to a high enough degree of foreign competition (by

liberalising trade).

Opposed to the liberal view are a number of more or less related frameworks, theories, or even ideologies, which argue for a more active government. Arguments found in this camp stress that the free market will not necessarily lead to an optimal result, and that government has the opportunity to steer the economy in a direction which is more optimal for the country as a whole. In general, this camp sees much more opportunities for successful governmental intervention than the liberal camp.

In the debate around the East Asian miracle, the liberal camp is aware of the major role the state played in explaining the emergence of the East Asian NIEs. According to them, though, this role is confined to macroeconomic policy, in order to 'get relative prices and/or the fundamentals right'. From this point of view, macroeconomic policy in East Asian NIEs was praised for its performances by the World Bank (1993). The governments of these countries maintained internal and external balance, relatively low inflation and adjusted very quickly to external shocks, such as the oil-crises in the 1970s (Chowdhury & Islam 1993).

However, there is general consensus among the observers of the NIEs that their governments (except in Hong Kong) can be characterised as interventionists (Chowdhury & Islam 1993:24; Douglas 1994). Governments have a significant command over national income and expenditure and the contribution of public investment to gross capital formation is quite significant. In this view, East Asian states can be characterised by:

- an elite bureaucracy staffed by the best managerial talent in the system; few members of this staff are (as opposed to many developing countries) subject to corruption
- an authoritarian political system in which the bureaucracy is given sufficient scope to take policy initiatives
- close government-business co-operation in the policy-making process

Some observers regard the latter as the most important part of the East Asian state. According to this view, the close government-business co-operation converts the state into a 'quasi internal organisation', which can be considered as an institutional arrangement and generator of efficient economic policies. It operates both via the capital market and a subtle network of long-term ties (common background of

university of bureaucrats and corporate managers). The importance of this concept, however, should not be overstated (Chowdhury & Islam 1993:54), as it is a vague concept and as the role of the internal capital market in quasi internal organisation does only apply to many countries in East Asia. Furthermore, policy-making has been put too much at the core of the co-operation. In fact, it is a matter of negotiating and compromising between the state and the private sector. Government-business links in policy-making are most clearly shown in export contests and deliberation councils, to which I will turn later on.

Taking South Korea as the main example, the truth about the role of the government in the growth process lies somewhere in the middle between the two camps discussed above. The state did certainly not produce error-free policies. However, to think that Korean success showed the truth of 'laissez-faire' policies is wrong as well. The state certainly played the role of 'handmaiden of growth', as it created the optimal environment for rapid economic growth by improving an essential infrastructure. But according to Chowdhury & Islam (1993:56) and the World Bank (1993) its limits became evident as it started to intervene in industries. The correctness of these doubts will be analysed in the remainder of this section.

The central role of the South Korean state in economic development was only possible because it was a strong state which could discipline firms (Amsden 1989:14). The centralisation of economic policy-making power was in the hands of a super-ministry, the Economic Planning Board. The Economic Planning Board had three main functions: it planned and formulated economic policy programmes, it co-ordinated economic policies implemented by individual ministries, and it evaluated policy programmes implemented by individual ministries on a continuing basis (Kim & Leipziger 1993:29). What was the basis for such strong state power?

There are some historical and cultural reasons playing a role here, such as the absence of powerful social classes to contest state power, due to the land reform after the Korean War (Douglass 1994:546). In addition the Confucian tradition and the long tradition of centralisation in Korea contributed to the strength of the state. In Confucian societies, the bureaucrat has a broader responsibility than in the West, and enjoys more authority and respect than his Western counterparts (Vogel 1991:93; Kim & Leipziger 1993:32). The Confucian bureaucrat, selected on the basis of merit, has a sense of responsibility for the overall social order, including the overall moral tone of the society. They gradually developed from bureaucrats with fear for private

economic development which could undermine their political power, to bureaucrats who considered the role of government in prospering the private sector. This modern form of meritocratic bureaucracy contributed greatly to East Asia's transformation.

Conscious actions (calculated political moves and institutional innovations) taken by the leaders can also be regarded as important explanatory factors for the emergence of the strong Korean state. The military regime of Park Chung-hee, who ruled from 1961 until 1979, laid the foundation for industrial policy in South Korea with its 'guided capitalism'. As a leader, he was strongly influenced by Japanese varieties of corporatism and communism and did not pay attention to neoclassical economics. Economic policy emphasised scale economics and large firms, the care for social waste from excessive competition, the obsession with capital accumulation (reflected in an anti-consumption bias), the nationalisation of banks, the desire to develop heavy and chemical industries, the ideology of 'Renaissance of the Nation' through the building of 'Jarip Gyongjé' (independent economy) and the description of workers as 'industrial soldiers' fighting a patriotic war against poverty.

Besides general macroeconomic policy, there are basically three different domains of government action in which the South Korean government operated to lead its economy on to a high growth path; trade policy, industrial policy, and, more recently, technology policy. These three different modes will now be discussed briefly.

3.1 Trade policy

Just after the Second World War, import substitution was the main idea in South Korean trade policy. However, it soon became clear that due to the limited size of the domestic markets, this policy was doomed to fail. Therefore, as in the three other early industrialising East Asian economies, during the early and mid-1960s, a policy switch from import substitution to export-oriented industrialisation occurred (Chowdhury & Islam 1993:74).

The World Bank (1993) is very positive about the export-led policies in the East Asian NIEs. In fact, export-led policies are considered as the main policy factor in explaining the East Asian Miracle by the World Bank. The state heavily intervened to stimulate exports of certain kinds of industries with a large variety of measures, such as direct cash payments, offering low-interest loans to exporters, permission to retain foreign exchange earnings to import restricted commodities, permission to

borrow in foreign currencies and tariff exemptions. In addition, South Korean state-controlled banks increasingly used export performance as the criterion of creditworthiness. South Korea as most East Asian NIEs combined co-operative behaviour with competition by firms to meet well defined economic performance criteria (World Bank 1993:93). Both in South Korea and Taiwan export contests were organised in which competition took place to get access to credit. Using exports as a performance yardstick was broadly shared among governments in East Asian NIEs and is almost unique to the East Asian economies (World Bank 1993:98).

In fact, export stimulating policies were part of a whole set of trade policies, which also included some strict protection policies and thus import substitution. The import of machines in South Korea, for example, was heavily controlled to promote the domestic machinery industry (Chang 1993:135). Trade policy in South Korea was characterised by a subtle combination of selective import substitution and compensating export promotion (Suarez-Villa & Han 1990:274). Exporting manufacturers were supported by refraining them from paying import tariffs for capital goods they needed to import (Klink 1991:68).

In general, successful macroeconomic policies and trade liberalisation have been linked with each other in the East Asian NIEs (World Bank 1993). Exchange rate policy and the fiscal and monetary tools to carry it out became a part of an overall export-push strategy.

Both in trade policy as well as in industrial policy government-business links have been playing a significant role in devising and conducting policies in South Korea. From the mid-1960s to the early 1980s, government-business links were close, although some in the private sector argue that government was too dictatorial (World Bank 1993:183; FT 1994b). Government and business leaders met often and regularly. Government listened to business' views and included them as a critical policy component. Until the early 1980s, the main communication channels were the monthly export-promotion meetings, at which the president of South Korea himself presided over discussions between the economic ministers and top business leaders. With Korea's gradual democratisation since the mid-1980s, relations between government and business have become more distant and the meetings less frequent. There is a recognition, though, for the need to reestablish good relations but under a new form of collaboration. Relative power in that form is likely to be more balanced.

3.2 Industrial policy

Although all East Asian NIEs have some kind of industrial policies, South Korea can be regarded as the most interventionist country (Amsden 1989; Chang 1993). Chang (1993:13) stresses the priority that has been given to industrial policy by the government as he states: "macroeconomic policy measures were seen as ineffective for the rapid upgrading of the industrial structure, owing to their uncertain impact on specific sectors, and were consequently given a status secondary to industrial policy".

The South Korean government introduced so-called Five Year Plans, in which sectors with high productivity growth potential were identified as 'promising strategic industries' and were financially and technically supported. By having large control over the financial sector, the government was able to channel investment funds to these industries. In return for the support priority industries received from the government, they were also heavily controlled by the state. By using a tight performance monitoring system (with an obligatory reporting system), the state was able to collect detailed and up-to-date business information, which is essential for an effective industrial policy.

The heavy and chemical industrialisation (HCI) drive, which was launched in the third and fourth Five Year Plan (1971-1981), can be regarded as the most prominent example of 'promising strategic industries' in Five Year Plans. The impact of this drive on economic growth in South Korea has been subject to controversial discussions (Klink 1991:35; World Bank 1993). Chang (1993:137) is positive about its effects as he argues: "the (..) evidence suggests that the HCI programme, far from being a failure, produced impressive growth and trade performance, especially in the heavy industries".

As the debate around the performance of centrally planned economies has shown, an important drawback of strong state intervention in industry is that it may protect, or even encourage, inefficient producers. Indeed, South Korea is not different from other countries in that industrial policy has created many inefficient firms. "However, what differentiates Korea from other countries is that the Korean state has been willing and able to withdraw from support whenever performance has lagged" (Chang 1993:148; see also Kim 1993:363; Kim and Dahlman 1992:442 and Amsden 1992:80). The state penalised poor performance and rewarded good performance. Thus, it forced many

inefficient firms, even the economically and politically powerful large firms, into mergers or even liquidation. In fact, the state pushed and pulled firms with threats and promises (Kim 1993:363). Such state discipline, combined with the strategy of industrial upgrading, acted as a powerful incentive for firms to enhance their technological capabilities. The discipline has been a painful process of continuous bargaining and conflict between the state and the private sector, which sometimes had to be solved by forceful measures which are difficult to imagine in other countries.

Although industrial policy did not harm competitiveness and innovativeness of industries in general, there might be one (important) exception. Intervention caused some imperfections on the capital market (FT 1993b; Klink 1991:35). Banks did not search for profitable projects in non-priority industries as they knew that these industries were not supported by the state. In addition, banks tended to neglect small and medium-sized enterprises (Regnier 1993:31). Thus the development of an innovative banking sector was hampered by industrial policy.

This general picture of industrial policy in South Korea has strong similarities with the Japanese model (Klink 1991:71). Examples are the provision of credits to exporting industries, the stimulating of large firms by supporting promising strategic industries, restructuring and rationalising policies by mergers or liquidation and the strong links between government and industry. One important distinction is that in Japan banks were more powerful and autonomous than the banks in South Korea which are much more linked to the government.

3.3 Technology policy: a reaction to changing circumstances

In the 1980s, industrial interventionism in South Korea was gradually replaced by functional interventionism (Kim & Leipziger 1993). On the one hand, the government tried to deregulate the financial sector by denationalising commercial banks, although with limited success (Chang 1993:152). On the other hand, the government tried to intervene less in industries, because the economy had become too complex and the large conglomerates increased their political power. The seventh Five Year Plan (1992-1996) even aims at transferring power from government to business and make the Korean economy ’business-led’ rather than ’government-led’ (Amsden 1992:71). A policy of economic democratisation was initiated to lessen the monopolistic abuses of the large diversified conglomerates, the chaebols (FT 1993a). However, many

chaebols bought some shares in state banks and the growth of economic concentration could not be stopped. Although the government was aiming at functional interventionism, it was still rationalising and restructuring less promising industries, stimulating high-technology industries and it became more active in fostering R&D in the economy (FT 1993c).

These policy changes during the 1980s can be seen as a reaction to the challenges of the totally different economic environment South Korea was faced with. South Korea lost part of its competitiveness in low wage based labour-intensive industries. Moreover, industrialised countries became increasingly reluctant to transfer technology to South Korean industries (Swinbanks 1993). Therefore, the South Korean government had to stimulate indigenous technological and innovative capabilities (Kim 1993; Kim & Dahlman 1992). The focus of industrial policy changed from stimulating strategic industries to innovation-related activities, especially R&D and human resources. A new administrative mechanism, the quarterly Presidential Council on Science and Technology, reflected the increasing importance government was giving to innovation-related activities (Swinbanks 1993). This Council has to improve co-ordination between the two ministries involved in science and technology.

Other measures to increase competition are the bringing down of import tariffs in order to make the domestic market more competitive and the liberalisation of technology transfer policies, which enabled an increase in foreign direct investment and licensing. Furthermore, small and medium-sized enterprises, particularly technology-oriented small firms, were stimulated in order to get a more balanced size distribution in industry (Regnier 1993). The state provided special industrial parks for small and medium-sized enterprises, whereas banks were forced to provide a minimum percentage of their loans to small and medium-sized enterprises.

The South Korean science and technology infrastructure played a very small role in promoting the development of industries with mature technologies in the 1970s (Kim 1993:364). The institutes were poorly linked with industry, not only because well-trained scientific and academic researchers in these institutes lacked manufacturing know-how, but also because of the lack of relevance of research in firms in the 1970s. Industries in South Korea reversed the sequence of research, development and engineering; they started with engineering for products and processes imported from abroad, and then progressively started with development. In the 1980s public

research establishments could increase their role in basic research (Swinbanks 1993): they received 90% of research grants awarded by the government in 'new' technology areas (Kim 1993:372). In contrast, higher education institutes in South Korea do play only a minor role in (basic) research (Swinbanks 1993; Crow & Nath 1992:123).

In the 1970s, indirect instruments, such as education and export promotion, were much more effective in transferring foreign technology in the case of mature technologies, than direct instruments (promotion of R&D) (Kim & Dahlman 1992:445). In the absence of demand for technological change, direct instruments were ineffective to strengthen the supply of technological capability.

The shift in government policy to R&D, in fact the shift from industrial to technology policy, partly led to a sharp increase in R&D expenditure in the private sector in the 1980s (Kim 1993:369; Swinbanks 1993). The share of public R&D expenditure in total R&D expenditure decreased from 68% in 1971 to only 20% in 1987, whereas the share of private R&D expenditure increased (Kim 1993:370). The chaebols dominate these private R&D activities. Furthermore, employment in high-tech industries has been growing rapidly since the mid-1980s, mainly in the Seoul metropolitan region (Park 1991:423).

The South Korean government has set up an infrastructure to contribute to financing private R&D expenditure (Kim 1993:372). First, preferential financing for corporate R&D by state-controlled banks and public funds is the most important mechanism for funding corporate R&D; more than 90% of total corporate R&D financing by the state goes to this mechanism. Second, direct R&D subsidies were introduced for the first time in the 1980s. Third, tax incentives are a major indirect mechanism in making funds available for corporate R&D.

Rapid industrialisation in the 1960s and 1970s and the rise of high-tech industries in the 1980s have caused strong concentration of economic activities in the Seoul metropolitan region and therefore considerable regional disparities (Park 1994:540). In order to achieve both structural transformation of industries and a more balanced regional growth, the South Korean government started to establish science parks in the 1970s. Taeduk Science Park was established in 1973 in the neighbourhood of the city of Taejeon, south of Seoul. This Park, modelled after the research triangle of North Carolina, now has fifteen public research establishments and eight private R&D centres which employ in total 12,300 people (Park 1992:31). Although the park led to

an increase in business services in Taejeon, no significant linkages with industries in the region have been established (Park 1992:34). Another nine cities in South Korea have developed plans to set up science parks. In contrast to the South Korean science parks, science parks in Singapore and Taiwan (Hsinchu Science-Based Industrial Park) are more focused on stimulating international technology transfer (Gwynne 1993; Courtenay 1993).

The latest technology policy initiative of the South Korean government is the Highly Advanced National (HAN) programme which was launched in 1992 (Shin & Kim 1994; FT 1994b). The purpose of the project is to increase the competitiveness of domestic industries by increasing the science and technology capability. It aims to promote increased R&D activities in 11 areas of technologies, such as electric cars and high-definition television, until 2001. The HAN project should force companies to spend more on R&D and it should avoid wasting of R&D resources by stimulating co-operation between industries and research institutes on projects. The project has been criticised by companies as another example of 'command capitalism' (FT 1994b). Many scientists and business executives believe that the state should focus its funding on basic research, while allowing industry to pursue pre-competitive research with less government interference.

3.5 South Korea's big business; the chaebols

As the South Korean government only wanted to support industries with a certain minimum scale of efficient production (especially during the heavy and chemical industrialisation drive), it intentionally created large companies, the chaebols. A chaebol is a group of firms owned and controlled primarily by a single entrepreneur and usually his family members (SaKong 1993:61). The four largest chaebols are Samsung, Hyundai, Daewoo and Lucky-Goldstar. The chaebol is similar to the pre-war Japanese zaibatsu, except that it does not have its own bank. Chaebols do have large influence on the increasing number of small and medium-sized subcontractors, which are heavily dependent on them (Regnier 1993:33).

All chaebols are diversifying in the same kind of industries, so that a fierce competition between these companies takes place, also with regard to bidding for governmental support. Despite their wide diversification, chaebols are characterised by a strict hierarchy and a high degree of central control (Porter 1990). Recently the South Korean government have forced the 10 largest chaebols to reduce their broad

product range by forcing them to choose three core industries (FT 1994c).

The chaebols, the main private R&D investors in the South Korean economy, are characterised by a variety of technology sourcing strategies (Kim 1993:375). First, they have invested heavily in in-house R&D activities. The four largest chaebols accounted for most of the nation's total industrial R&D. They can recruit the top graduates from the best universities. Leading scientists and engineers at R&D centres of these chaebols are nearly all foreign-educated PhDs (Porter 1990:466). Second, they have developed closer links with local public research establishments. Third, they have set up outposts in Silicon Valley, in order to attract the knowledge of highly qualified Korean-Americans. This strategy has been used by the largest chaebols to start the production of new industries, such as semi-conductor production, microelectronics and biotechnology. These outposts are used both as 'antennae' for new research findings, and as training centres for South Korean researchers and engineers. Fourth, the chaebols have successfully developed strategic alliances with multinationals in order to benefit from their basic research (Table 4).

Table 4: Total number of strategic alliances of the largest chaebols at corporate level (including subsidiaries)

chaebol	before 1980	1980-1984	1985-1989
Hyundai	3	9	19
Lucky-Goldstar	0	15	16
Samsung	2	11	14
Daewoo	1	2	11

Source: MERIT-CATI data bank

According to Porter (1990:471), perhaps the most unique feature of South Korean large companies is an impressive willingness to take risks. The sources of this willingness may lie in its problematic history (Japanese occupation, Korean War and therefore personal hardship), which led to a feeling that there was nothing to lose. One has to take into account, however, that the government, through the banking system, was willing to allow firms to take these risks.

4. Foreign investment, human resources and technological capabilities

Thus, South Korea, under the guidance of its strongly interventionist government, built up an impressive technological basis for its economy. What was the role of foreign direct investment and technology transfer in this process? Compared with the other NIEs, the size of foreign direct investment in South Korea was very low. This reflects the explicit policy of promoting 'Jarip Gyongjé' and independence from multinationals in management control (Kim 1993:360). In South Korea, the state regards the assimilation of advanced technology by domestic firms as a vital condition for an effective industrial upgrading (Chang 1993:141; Amsden 1989:21). This meant a tight control over foreign direct investment and even (although to a lesser extent) over technological licensing. In contrast to companies in other East Asian NIEs, South Korean firms are less original equipment manufacturers-orientated and more willing to invest in marketing and in-house technology (Porter 1990:467).

Thus, foreign direct investment had a relatively small impact on the acquisition of technology in South Korea. National companies were acquiring technologies from abroad by licensing and importing machines and by the procurement of turnkey plants in the early years. The government stimulated the import of selected, and certainly not all, machines which became a major source of learning through reverse engineering by South Korean firms. Many firms in South Korea are still dependent on imports of machines and other inputs (Suarez-Villa & Han 1990:281). According to a survey among high-tech industries in South Korea in 1989, 64% of technology sophisticated materials were purchased from abroad (Park 1991:424). This dearth of supporting industries in South Korea is regarded as one of the biggest problems of the current South Korean economy (Kim 1993:382; Porter 1990:470; FT 1993a; Waitt 1993:204; Regnier 1993:33). Chaebols have mainly focused on end-products depending to a large extent on imported parts and machinery.

The insignificance of foreign direct investment implies a strong domestic basis for technological development. During the early stages of industrialisation, the importance of the group in Confucian societies helped to create an easily adapting worker, who is willing to accept a limited role for labour unions and refrain from making great personal demands (Vogel 1991:100). This gave South Korea, as well as other NIEs and Japan, a major cost-advantage in international markets, and thus helped to build up its strong position in low-tech industries. However, as governments and industry saw the need to gradually shift from labour-intensive, low-

tech industries to more skill-intensive, high-tech industries, investments in education were needed at the same time, in order to improve the stock and quality of human resources (Chowdhury & Islam 1993:19). The South Korean government certainly succeeded in developing human capital, as it is regarded as the most important factor in building up a strong domestic basis for technological development. According to Kim & Dahlman (1992:441) "a large part of South Korea's success in acquiring, diffusing, improving and developing technology in the mature stage is due to its heavy investment in human resources".

The Confucian moral helped developing human capital, as it induced people to make great efforts in educating themselves. The 'examination hell' does not only count for Japan, but for many East Asian NIEs. Young people in these countries tend to study hard, as they know about the specific link between entrance examinations and good jobs (Vogel 1991:97). They get good jobs, not because of their family or property, but through passing examinations. School systems are measured by the success of their graduates in passing examinations, which pushes them to high quality teaching. By breaking down the feudal connections, the exam systems allow all members of the society to feel that they have access to high positions (Vogel 1991:98). This ensures that the most talented people in the society are trained and channelled into key positions. Porter (1990:465) states that among the industrialised countries South Korea is characterised by the strongest commitment to education by parents and the private sector (see also Malecki 1991:365).

Although the share of education in the government budget in the East Asian NIEs has increased, the total expenditure on education as a percentage of GNP has not been higher than elsewhere (World Bank 1993:198). The difference is the high share of public expenditure on education allocated to basic education. This has been consistently higher than elsewhere. By giving priority to expanding primary and secondary bases of the educational pyramid, East Asian governments stimulated the demand for higher education, while relying to a large extent on the private sector to satisfy that demand. In contrast, many other low- and middle-income economies stressed public subsidies to university education. Because of the higher concentration on basic education in East Asia, public funds for education are more likely to benefit children of low-income families. Despite the large efforts of the South Korean government in establishing a sound educational system, Kim (1993:371) observes too much emphasis on teaching and neglected research. Giving the teaching orientation, there is a fundamental lack of interplay between the universities and the private

sector (Kim 1993:374).

The relatively high expenditures on primary and secondary education are reflected in the rise in enrolment figures for South Korea and other East Asian NIEs (Table 5). The East Asian economies have also been faster to close the gap between male and female enrolments (World Bank 1993:45). A measure of school quality is the performance of children on tests of cognitive skills. East Asian children tend to perform better than children from other developing regions and even, recently, better than children from high-income economies (World Bank 1993:70).

Table 5: Human resource development

	Number enroled (% of age group)(*)			
	Primary		Secondary	
	1965	1987/1988	1965	1987/1988
South Korea	101	101	35	88
Hong Kong	103	106	29	74
Singapore	101	104	45	69
Malaysia	90	102	28	59
Thailand	78	95	14	28
India	-	-	27	41
Brazil	-	-	16	38
UK	-	-	66	83
Japan	-	-	82	95

Sources: World Bank 1993:45,46; Chowdhury & Islam 1993:20; SaKong 1993:236.

(*) = The numbers can be above 100, as some pupils in school for an extra year do not belong to the age group any more.

5. Future outlook and policy lessons

According to Porter (1990: 685), South Korea can be seen as the most advanced country of the East Asian NIEs when it comes to his development model. Whereas other countries are still in the factor-driven phase, South Korea is in the investment-driven stage, as South Korean firms aggressively invest in modern process technology

and large-scale production. In fact, South Korea is even on the threshold to the innovation-driven stage. The key challenge lies in how to achieve innovation-driven development. This is not only a matter of changing firms and industries, but also of the internal institutional framework. The strong state has facilitated the development from factor-driven to investment-driven development, albeit with considerable social costs. This framework seems in some ways appropriate and in other ways inappropriate in contributing to the ongoing innovation-driven development.

A distinction must be made here between macropolitics and micropolitics. The latter focuses on the firm (relations between workers and managers). The distinction between mass production and flexible specialisation can be put forward in this respect (Piore & Sable 1984). Mass production is the feature of factor- and investment-driven development, flexible specialisation is the feature of the innovation-driven development. Mass production is characterised by hierarchical relationships, both between managers and workers and between firms and suppliers (top-down governance structure). Flexible specialisation is characterised by more autonomy of the worker and therefore higher skill requirements (decentralised governance structure). Chaebols are managed in a manner that reminds us of the management of mass production companies in the 1960s, i.e., companies are hierarchical and characterised by a high degree of central control. It is questionable whether this corporate structure will benefit the South Korean national competitive advantage in the future (Porter 1990:473).

With regard to macropolitics, the strong state fits well with the characteristics of mass production firms, but the transition of firms into flexible specialisation has to be accompanied by a transition of the institutional framework. Chowdhury & Islam (1993:254) state with regard to this respect: "Emphasis has to shift from mass production to flexible specialisation, from hierarchical control to decentralised governance, both at the level of the state and at the level of the firm". The state has to create an environment in which firms can be innovative and dynamic. Its role has to change from actor and decision-maker to facilitator, signaller and pusher, which means that it has to decrease direct intervention. It is hard for any government accustomed to an activist role to make this change. Decentralised governance not only means a less interventionist central state, it also means a geographical decentralisation of power to regions, as it can be seen in the theories of Fordism and post-Fordism.

Whether East Asian NIEs can face the challenge of innovation-driven development

depends on the ability to transform micro- as well as macropolitics from hierarchical in a more decentralised and networking governance. Each of the NIEs are now at its own crossroads (Douglass 1994:558). Whether these countries can get into this new phase depends on the success of democratisation movements in creating an institutional environment which encourages diversity and creativity (Chowdhury & Islam 1993:27). Although current unrest among the labour force in South Korea point at some frictions arising from the problems of adjusting to success, the recent democratisation process, which was put forward by president Kim Young-sam, gives hope for the future (FT 1993a; FT 1994a).

Despite the fact that policies are in a transition phase, some lessons on fruitful communication between business and government could be learned from NIEs. The World Bank (1993:185) states in its East Asian Miracle report on the possibilities of copying forms of government-business communication: "deliberation councils (formal institutions that facilitate communications and co-operation between the private and public sector) naturally reflect the history and culture of the society in which they operate. Even so, the experience in the high-performing Asian economies suggest that their applicability is not limited, as some analysts may suggest, to the Confucian cultures of Northeast Asia".

In Korea, regular talks between captain of industries and bureaucrats take place, so that policy measures can aim at the needs of large firms. The establishing of public research establishments which are closely linked to the needs of the chaebol is an important example of the impact of these talks. Also in other countries, such as the Netherlands and Germany, regular consultation between policy-makers and business takes place. However, in these countries deliberation takes place between institutions which are representing employers and employees, whereas in South Korea deliberation councils consist of captains of industry and policy-makers. Because of the direct consultation between captains of industry and policy-makers in South Korea, industrial and technology policy is biased towards large enterprises, whereas in Germany and the Netherlands technology policy has been criticised for neglecting specific needs of large enterprises.

Despite the strong influence of business opinion on policy-making, South Korean policy-makers are not afraid of changing a certain strategy without consulting businesses as soon as the strategy seems to be a failure. This attitude is possible because of the powerful position bureaucrats South Korean have in society. In

Western Europe, bureaucrats do not have this position. The South Korean model could be regarded as a top-down model with strong bottom-up inputs.

However, policy-makers in other countries could not only learn from Korean industrial and technology policy, the Koreans could also learn from policy in other countries. The Korean policy-makers could particularly look at policies in Western Europe focused on small and medium-sized enterprises. The strong influence of captains of industries in deliberation councils in Korea led to the neglecting of small and medium-sized enterprises in industrial and technology policy (Regnier 1993). The technological upgrading of these enterprises in Korea could be stimulated by financial programmes and regionalised technology transfer networks set up in order to foster the diffusion of new technologies.

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