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Evolution of Industrial Policies and Economic Growth in Korea: Challenges, Crises and Responses

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This paper¹ examines the evolution of industrial policies and economic growth in Korea by focusing on the effects of two economic crises in 1997 and 2008. Korea successfully surpassed the two big economic crises with the support of the industrial restructuring policies and the appropriate responses of private and public actors. Past Korean economic growth resulted from the development of manufacturing for export, which were driven by the high growth of Korean conglomerates, *chaebols*. Active infrastructure investment, such as social overhead capitals and industrial complexes played pivotal roles at the beginning of the economic development. Although input-driven growth strategy led during the initial stage of economic development, innovation-driven industrial policies were magnified later in the focus on R&D and technological progress. In addition, the implementation of region-based industrial innovation policies, such as industrial cluster policies, obtained relatively successful results.

Industrial policy, Economic growth, Government, Financial crisis in 1997, Global financial crisis in 2008, Export manufacturing, *Chaebol*, Industrial cluster, Innovation-driven strategy, Korea

1. Introduction

Industrial policy has diverse definitions according to its scope and focus. The definitions often include policies of industrial foundation, structure, and organization. Industrial policy can be regarded as a whole industry-related policy in a broad sense, which refers to policies affecting industrial activities directly or indirectly. This policy can include various kinds of public policies, such as macroeconomic, monetary, tax, trade, and income redistribution policies. In a more narrow perspective, another definition notes a policy of industrial structure or a policy of special support for specific industrial sectors. In spite of the diversity of the definition and scope of industrial policies, the necessity of implementing industrial policies is no longer a controversial issue. In particular, policy drivers and the driving forces are needed in the economic development of developing countries.

In the 1960s, Korea was one of the poorest countries, and showed under a \$100 gross **national income** (GNI) per capita. However, in 2012, the Korean nominal GNI per capita reached \$22,708, which ranked the country at 34th place, and its gross domestic production (GDP) ranked 15th in the world. This high degree of short-term economic growth, which happened within half-century, resulted from the implementation of industrial policy. In addition, when the economic shock attacked, Korea was able to overcome both the 1997 financial crisis and the 2008 global financial crisis with quick timely responses because of the significant role of appropriate policies.

This paper examines the evolution of industrial policies and economic growth in Korea by focusing on two economic crises and the corresponding responses. Following this introduction, Section 2 describes the change of industrial policies and structure until the 1990s. Section 3 discusses the industrial policies and restructuring after the 1997 and 2008 economic crises. Section 4 analyzes the dynamics of economic development and the effects of industrial policies on this success based on the three characteristics of growth of export

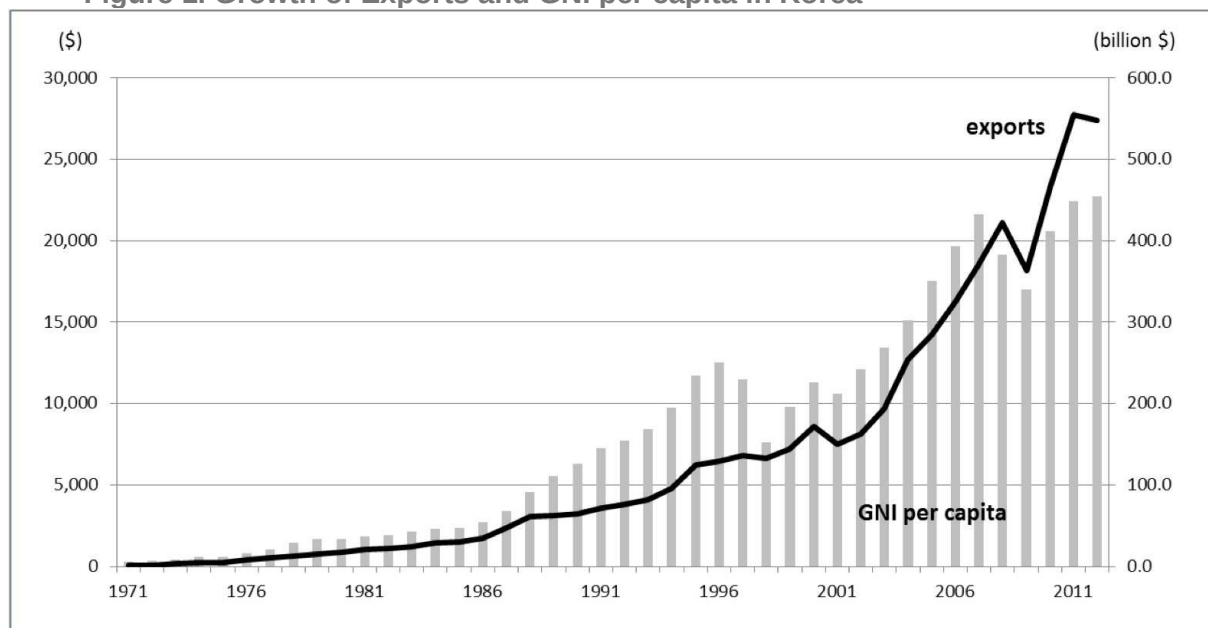
¹ This work was supported by Research Settlement Fund for the new faculty of SNU.

manufacturing conglomerates, active infrastructure investment and industrial cluster support by Korean government, and input- to innovation-driven policy strategy.

2. Change of Industrial Policies and Industrial Structure

The world respected the rapid growth of Korean economy, and cited the phenomenal growth as the “Miracle of Han River” and the country as one of the “Asian Tigers.” The actual economic development was launched in 1962 with the first Five-Year Economic Development Plan (1962 to 1966). Since then, Korea has accomplished a remarkable annual growth rate of 7.3% and has enabled a high speed growth in about 45 years by recording a GNI per capita of US\$20,000 in 2007 (KICOX, 2011). In 1971, Korean GNI per capita was US\$291, but in 1977, the GNI per capita topped US\$1,000 with the success of exports reaching US\$10 billion. The figure topped US\$20,000 first in 2007, and despite the drop after the 2008 crisis, the GNI per capita reached US\$20,000 again in 2010. Although Figure 1 shows a profound fall after the 1997 and 2008 crises, the GNI per capita has increased significantly with industrial development. A large portion of this success was attributed to the tremendous growth of exports. The amount of exports was over US\$500 billion in 2011, while exports were only over US\$1 billion in 1971, US\$10 billion in 1977, and US\$100 billion in 1995 (Figure 1). This rapid growth was attributed to the strong industrial policies of the Korean government.

Figure 1. Growth of Exports and GNI per capita in Korea



Sources: Korea International Trade Association (<http://www.kita.net>); Economic Statistics System of the Bank of Korea (<http://ecos.bok.or.kr>)

2.1. Industrial Policies until the 1990s

Industrial policies in the 1960s and 1970s were characterized as selective promotions of particular industrial sectors with artificial allocation of resources by national government intervention. Directly after the Korean War in the 1950s, industrial policies focused on the import substitution strategy. In the early 1960s, at the beginning of first Five-Year Economic Development Plan during the Park Chung-hee administration (1961 to 1979), Korea established an export-driven industrialization policy that focused on light industry products. This policy promoted the expansion of labor-intensive activities in the manufacturing of textiles, garments, and footwear, in which Korea had a comparative advantage derived in part from low wages (Park, 1991). Some measures of export incentive mechanism included

halving the value of the Korean currency won, increasing tax incentives to exports, providing export credits at concessional interest rates, providing various export subsidies, and introducing an export-import link system, which was a permission system of importing materials assumed to be used by products for export (Park, 1991).

However, due to the wage increase and growing demand for imported intermediate goods, machinery and equipment, major investment shifted to capital-intensive industries, such as steel, petrochemical, machinery, motors, shipbuilding, and electronics, after the late 1960s. Thus, policy emphasis on heavy and chemical industries started during the second Five-Year Economic Development Plan (1967 to 1971), and reached full-scale from 1973 with the strong export drive policy. Some laws to promote specific industries had been enacted, such as Machinery Industry Promotion Act (1967), Shipbuilding Industry Promotion Act (1967), Textile Industry Modernization Act (1967), Steel Industry Promotion Act (1969), Electronics Industry Promotion Act (1969), Petrochemical Industry Promotion Act (1970), and Nonferrous Metal Producing Business Act (1971) (Sakong and Koh, 2010). The government organized the Heavy and Chemical Industry Drive Committee and presented the plan in 1973. Six strategic industries were selected, namely, steel, nonferrous metal, machinery, shipbuilding, electronics, and chemical engineering. Some key measures included providing long-term credit from a specially created National Investment Fund charged low interest rate, prioritizing government financing to infrastructure investment, waiving or reducing tax liabilities, and allowing duty-free importation of machinery and materials for new or enlarged industrial premises (Park, 1991). In addition, high protective barriers for infant industries and permission of monopolistic production in several industries were established. The government established and expanded vocational schools and training centers to supply skilled manpower, and created government-funded research institutions to conduct R&D activities as a public good (Sakong and Koh, 2010). Mining and manufacturing sectors developed sharply from the early 1960s to the late 1980s, and from 8.7% in 1963, the sector peaked to the highest level of 28.5% in 1988 in employment figures (Figure 2). The heavy and chemical industries increased their share of total manufacturing production from 43% in 1971 to 60% in 1981, and their share of manufacturing employment rose from 39% to 53% during the same period (Park, 1991).

These kinds of selective promotion policies had some negative impact on the balanced development and competitiveness of industry, which was mainly due to the capacity excess and low profitability of heavy and chemical industries. During the 1980s and the early 1990s, the main target of industrial policy was at the industrial rationalization that focused on unpromising industries and insolvent enterprises. The government attempted to change policy direction by consolidating growth based on the stability of the private sector-led growth (Sakong and Koh, 2010). An investment coordination plan was set out as part of the Comprehensive Economic Stabilization Program in 1980. The program merged enterprises to reduce excessive capacity or new investments in sectors, such as power generators, automobiles, and construction and heavy electric machinery (Sakong and Koh, 2010). Several structural transformation programs were implemented to improve the competitiveness of the industries. In addition, the industrial policy changed from previous selective and directed intervention to industry-neutral and functional industrial policies in the 1980s (Jeon *et al.*, 2009). Accordingly, the Industry Promotion Act was established in 1986 as the unification and substitution of seven specific industries promotion acts, such as machinery, electronics, textile, and so on. The government tried to support small and medium-sized enterprises (SMEs) to rectify structural imbalances created by the previous discriminatory investment policy (Park, 1991). SMEs have increased the weights of employment and value-added ratio in the 1980s and the 1990s, although there was a slight decrease caused by the 1997 financial crisis (Table 1). Different from protection-based perspectives until the 1970s, SMEs

promoting policies in the 1980s aimed for self-sustained growth based on the economic efficiency. Some acts related to SMEs had the purpose of strengthening competitiveness base, consolidating cooperative relations with large firms, guaranteeing stable business activities, supporting technological development, promoting local industry, and supporting exports and overseas expansion during in this period. Meanwhile, the late 1980s saw the implementation of a vast array of regulations on conglomerates, such as cross-shareholding regulation, and cross-debt guarantees.

Table 1. Share of SMEs in Manufacturing Firms

Year	1980	1985	1990	1997	2000
# of firms (share in total manufacturing firms)	29,779 (96.6%)	42,950 (97.5%)	67,679 (98.3%)	91,324 (99.1%)	94,212 (99.2%)
# of employees (thousand) (share in total employees)	1,000 (49.6%)	1,368 (56.1%)	1,864 (61.7%)	1,870 (69.3%)	1,849 (69.7%)
Value-added (billion\) (share in total value-added)	4,168 (35.2%)	10,059 (37.6%)	31,432 (44.3%)	84,148 (46.5%)	92,124 (41.9%)

Notes: manufacturing firms by employment of 5–300

Sources: Korean Statistical Information Service of Statistics Korea (<http://www.kosis.kr>)

From the 1990s, market opening was accelerated with the increasing trend of liberalization and globalization, and thus, industrial restructuring became active based on the market economy mechanism. In the early 1990s, SMEs had undergone industrial restructuring strategies in order to survive under severe competitive environments of the international market. Soaring wages in Korea resulted in severe labor disputes from 1987 to 1989. Because of the relentless labor movement in the late 1980s, most SMEs in Korea pursued industrial restructuring strategies, such as flexible labor, subcontracting, relocating to foreign countries (especially in China), and technological development (Park, 1994; 1995). Despite the industrial restructuring of SMEs in the early 1990s, the Korean economy faced a tremendous economic shock in the late 1990s, which was indicated by the financial crisis in 1997. However, Korea completed comprehensive industrial restructuring programs mainly for large conglomerates after the crisis. These steps will be explained in the next section in detail.

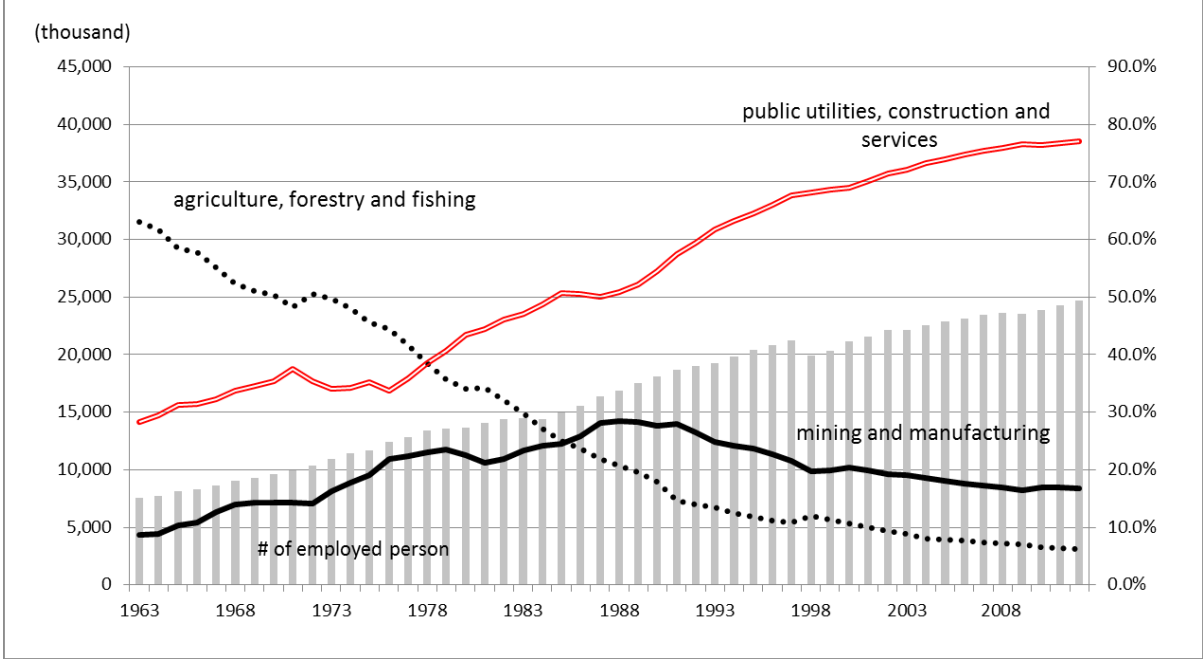
2.2. Change of Industrial Structure

The above evolution of industrial policies influenced the change of industrial structure of Korea. In the early 1960s, the share of agriculture, forestry, and fishing in terms of employment was over 60%, whereas that of mining and manufacturing was only about 10% (Figure 2). Mining and manufacturing sectors started to expand in the 1960s and recorded the highest share of over 25% during the late 1980s and the early 1990s. Then, the figures started to decrease from the early 1990s, and finally, showed 16.7% in 2012. This structural change of an increasing and decreasing pattern was largely the same as in other developed countries during the industrial era. However, the difference from other advanced countries is the speed with which it achieved its structural changes (Sakong and Koh, 2010). If industrialization were defined as the process during which the employment share of agriculture fell from above 50% to below 20% (Yoo, 1997), then, Korea only took 19 years to achieve industrialization. Other advanced countries took longer. For instance, Japan took 39 years, the US took 54 years, and Germany took 68 years to achieve industrialization based on the definition (Sakong and Koh, 2010).

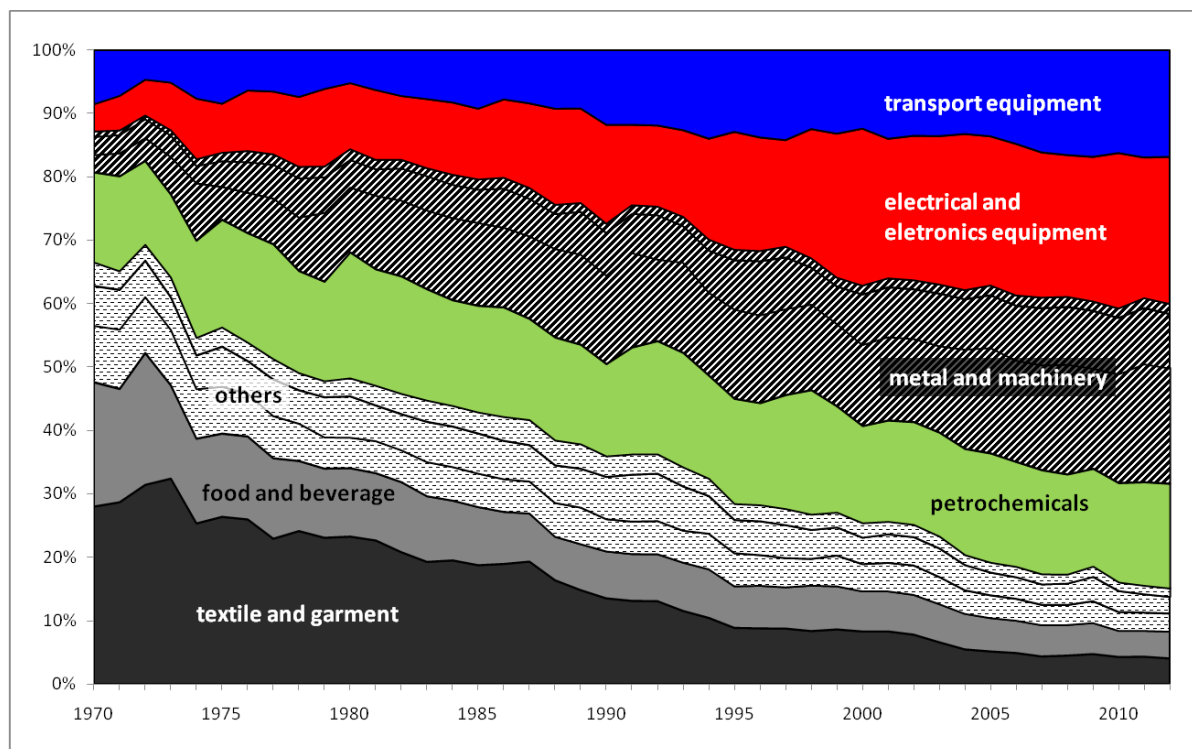
The structure of manufacturing sectors and their changes reflected the effect of the policy (Figure 3). In the early 1970s, within manufacturing sectors, light industries, such as textile and garment as well as food and beverage, covered over 50% of the gross value-added of Korea. In 1973, textile and garment sectors accounted for 32.4% of gross value-added, but its

share decreased continuously since the mid-1970s, and indicated only 4.0% in 2012. Heavy and chemical industries have increased their share since the 1970s with the help of the policy on heavy and chemical industries promotion. Electrical and electronics equipment manufacturing had a growth range of only 4.3% in 1970 to 24.8% in 2000. Transport equipment covered 4.7% of gross value-added in 1972 and 17.0% in 2011. In the end, heavy and chemical industries, which include petrochemicals, metal and machinery as well as electrical and electronics, and transport equipment, accounted for more than 80% of gross value-added in the 2010s.

Figure 2. Change of Industrial Structure / Share in Total Employment by Sectors



Notes: grey bar means the number of employed person (thousand)
 Sources: Korean Statistical Information Service of Statistics Korea (<http://www.kosis.kr>)
Figure 3. Share in Value-added by Manufacturing Sectors



Sources: Economic Statistics System of the Bank of Korea (<http://ecos.bok.or.kr>)

Export items have changed a great deal over the past 50 years, and showed the impact of industrial policy changes on the structural changes (Institute for International Trade, 2013; Sakong and Koh, 2010). Top rank items included iron ore (13.0% share in total exports) and tungsten (12.6%) in 1961, textile (40.8%), plywood (11.0%) and wigs (10.8%) in 1970, and garments (16.0%) and steel plate-rolled products (5.4%) in 1980 (Institute for International Trade, 2013). Before the start of the intensive industrial policy, raw materials were the main items of exports in the early 1960s. Those export items were changed to labor-intensive light industry products, such as textile, wigs, and plywood in the mid-1960s. Heavy machinery goods, such as steel products, ships, and audio/video equipment, appeared as the main items in the 1970s and 1980s, although garments and footwear were still in the high ranks. However, export items changed drastically to technology-intensive products in the 1990s. Top rank items were garments (11.7%) and semiconductors (7.0%) in 1990, and semiconductors (15.1%), computers (8.5%), automobiles (7.7%), petroleum products (5.3%), and ships (4.9%) in 2000. This development is the result of the heavy and chemical industrial policy in the 1970s, and technology-intensive industrial policy in the 1980s. In 2008, ships and ship components (10.2%), petroleum products (8.9%), mobile phone equipment (8.5%), automobiles (8.3%), and semiconductors (7.8%) were recorded in the top ranks, while in 2012, petroleum products (10.2%), semiconductors (9.2%), general machinery (8.7%), and automobiles (8.6%) were included among the top performers (Institute for International Trade, 2013). In the late 2000s, export items were restructured to technology- and R&D-intensive industries and products.

3. Industrial Policies and Restructuring after the Crisis

3.1. Financial Crisis in 1997 and Industrial Restructuring

From the beginning of the 1990s, the priority of government policy shifted to industrial restructuring based on market economy mechanism. However, with the advent of the financial crisis in 1997, economic, industrial, and social policies and capacities focused on the recovery from the crisis of the public and private sectors. The 1997 financial crisis began in November

1997 as international creditors started to withdraw funds from domestic banks, and consequently, the Korean economy entered an unprecedented crisis. Since then, bankruptcy and unemployment soared with main economic indexes, such as exports, employment, and GDP, and even R&D expenditures dropped radically in 1998 (Table 2, Figure 1, 2). Although the crisis was mainly due to the vulnerability of finance and foreign currency, the potential risks have been accumulated for a long period of time having roots in the economic and industrial structures.

Table 2. Economic Indicators around 1997 Financial Crisis

Year	GDP (billion\$)	GNI per capita (\$)	Exports (billion\$)	Employed person (thousand)	Unemployment rate (%)	Consumer price inflation (%)	Real effective exchange rate (year2005=100)	Private company R&D expenditure (billion)
1996	572.8	12,518	129.7	20,853	2.0	4.9	101.2	7,964
1997	532.3	11,505	136.2	21,214	2.6	4.4	107.9	8,845
1998	358.2	7,607	132.3	19,938	7.0	7.5	142.1	7,972
1999	461.6	9,778	143.7	20,291	6.3	0.8	124.6	8,511
2000	533.5	11,292	172.3	21,156	4.1	2.3	115.6	10,255

Sources: Korea International Trade Association (<http://www.kita.net>); Economic Statistics System of the Bank of Korea (<http://ecos.bok.or.kr>); Korean Statistical Information Service of Statistics Korea (<http://www.kosis.kr>); National Science & Technology Information Service of Ministry of Science, ICT and Future Planning (<http://sts.ntis.go.kr>); Sakong and Koh, 2010: 61

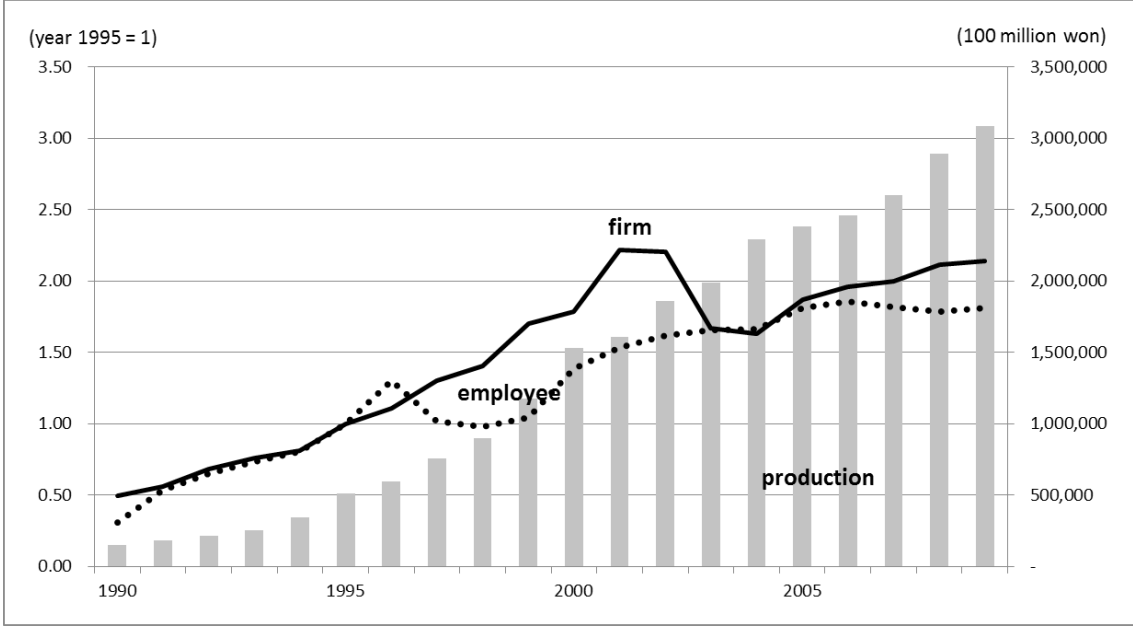
Active economic and industrial restructuring started in 1998 with the establishment of the Kim Dae-jung administration (1998 to 2003). Various reform policies and programs were implemented in several fields. Among these policies, the core of restructuring policy centered on both corporate and finance sectors (Cho *et al.*, 2010). The former focused on closing down insolvent enterprises in the short run, and strengthening corporate efficiency and market economy in the long run. Meanwhile, the latter focused on restoring paralyzed financial systems in the short run, and improving financial stability and the soundness of financial institutions in the long run.

The corporate sector reform had two objectives: the first objective was to restructure insolvent firms that could not repay their debts, and the second objective was to strengthen market discipline to prevent future crises (Sakong and Koh, 2010). Two representative emergency measures among various restructuring efforts were “big deal” and “workout.” “Big deal” referred to the business restructuring by swapping business lines among large conglomerates with the arrangement and enforcement of the government. “Workout” centered on the corporate improvement work by supporting programs for the prevention of the bankruptcy of firms based on cooperative negotiations among creditors and debtors. In addition, the corporate sector restructuring especially for the top 30 conglomerates was based on “5 principles.” These principles included: (1) enhancing the transparency of corporate management, (2) eliminating cross-debt guarantees, (3) improving the capital structure considerably, (4) focusing on core lines of business and strengthening cooperation with SMEs, and (5) increasing the accountability of controlling shareholders and managers (Jeon *et al.*, 2009; Sakong and Koh, 2010). Meanwhile, in the labor sector, the Korea Tripartite Commission (of labor, management, and government) was composed in 1998 and the layoff system was introduced by a law revision based on a social pact.

Although economic and industrial recession caused by financial crisis in 1997 had been so severe, overcoming the hardship was comparatively successful as shown in some economic

indicators (Table 2). The role of government policy on the restructuring was significant in the short run, but this recovery and extended growth were due to the sustained efforts mostly of the private sector. To support the private sector, the Industrial Development Act was enacted in 1999, which was a substitute for the Industrial Development Act of 1986, to include all kinds of industries in the industrial development. Although the 1986 Act mainly focused on the manufacturing sectors, the new 1999 Act contained the provision for targeting both manufacturing and non-manufacturing sectors. This act had the purpose of advancement in industrial structure, enhancement of competitiveness, and the promotion of new industry creation.

Figure 4. Growth of ICT Industry



Notes: ICT industry includes information and communication services (broadcasting and communications included), information and communication equipment manufacturing, and software and computer-related service
 Sources: Korea Association for ICT Promotion, 2011

Particularly, the power of recovery from the crisis was evaluated from the technological progress and industrial development related information and communication technologies (ICTs). Beginning in the 1990s, especially after the financial crisis, the government exerted a great deal of effort to promote technology- and knowledge-intensive industries, to open up the country to trade and capital movements, to restructure the economy including the financial sector, and to make the labor market flexible (Park and Koo, 2013). SMEs with high technology and new ideas, such as venture firms, had a great role in this development. In 1997, the Special Act on Venture Firm Promotion was established with the purpose of supporting newly established venture SMEs. The support came in the form of reduction of foundation capital, permission of plants in the university and institute, allowance of concurrent position of professors or researcher with venture firm managers and employers, and provision for information related management. Venture firms comprised ICT-related firms and industries. Figure 4 presents the increase in the number of firms in the ICT industry. The figure doubled from 3,579 in 1990 to 7,226 in 1995. In 2001, the growth increased to 16,053, and indicated more than two times compared with that of 1995. ICT industry production rose steadily and considerably from about 15,299 billion won in 1990 to 308,483 billion won in 2009, which was more than 20 times growth for about 20 years.

The rapid economic growth of Korea in only about half century has been evaluated mainly driven by the expansion of inputs together with government intervention. When both public and private sectors recognized the limitation of such growth strategies, especially after the

1997 financial crisis, they shifted to innovation-driven economy in the 2000s. Therefore, The Roh Moo-hyun administration (2003 to 2008) emphasized innovation and balanced national development by promoting regional innovation and cluster policies. The four major policies for regional innovation are (1) providing the basis for the establishment of RIS (Regional Innovation System), (2) strengthening the innovation capacity of universities in provinces, (3) promoting science and technology in provincial regions, and (4) establishing industry-university-research institution networks (Park and Koo, 2013).

In the perspective of industrial policy, the most representative projects were the promotion of regional strategic industries and the creation of innovative clusters. Both projects were interrelated and based on the improvement of local and regional competitiveness as balanced national development. In the case of the former, each of the 16 provincial administrative regions, including one special city of Seoul, six metropolitan cities, and nine provinces (*do*), selected and promoted its own four strategic industries based on present capabilities and potential. The latter was related to the industrial complexes. Since the early 1960s, the national and regional governments constructed and managed Korean industrial complexes, which have had significant roles in industrial development. However, this physical agglomeration of firms and factories has faced a challenge with the advent of innovative and knowledge-based economy especially since the late 1990s. Thus, a policy for upgrading industrial complexes into innovative clusters, Industrial Complex Cluster Program (ICCP), was launched in 2004 with a variety of projects related to industrial clusters (Park and Koo, 2013). In addition, various kinds of small-scale local-based industries were encouraged and supported with the purpose of constructing regional innovation systems.

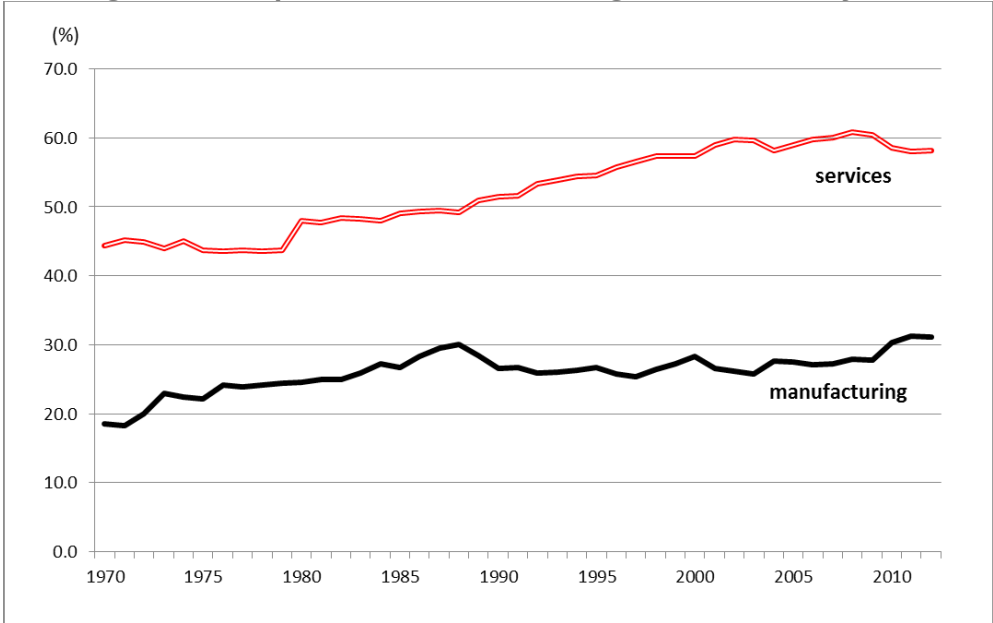
3.2. Global Financial Crisis in 2008 and New Growth Engines

Immediately after the establishment of the Lee Myung-bak administration (2008 to 2013), Korea was faced with the second major shock of the 2008 global financial crisis, which started with the fall in housing prices in the United States and expanded globally with the bankruptcy of Lehman Brothers. However, the shock was milder than that during the 1997 crisis as output turned to positive growth in the first quarter of 2009 (Sakong and Koh, 2010). The reasons for the mild effect are the previous successful restructuring in the 1990s and the improvement of economic soundness. After the 2008 global financial crisis, many countries – even the developed economies adopting the principle of minimal market intervention – promoted economic stimulus packages actively and established new industrial policies. Particularly, some market-friendly policies were delivered with an active response to external opening, such as the Free Trade Agreement after the 2008 crisis.

Entering into the 2000s, the search for new growth engines became more and more important along with innovation. Policies for finding and promoting next-generation growth industries began, especially on green industry, high-tech convergence, and high value-added services (MKE, 2013). First, in the Lee administration, core sectors such as environmental or clean technology, solar energy generation, new renewable energy, and upgrading production facilities became the major policy targets with the slogan of “low-carbon green growth.” This concept included not only industry promotion but also the meaning of job creation, investment of technology, corporate competitiveness improvement, and country remodeling with concern for global climate change. Second, the convergence and integration of technologies and industries became the focus of next-generation growth, and future economic productivity depended more on technology convergence. Economic productivity was not limited to only high technologies or industries but expanded to both manufacturing and service sectors. In particular, next-generation growth engine industries received policy attention in 2003 with the development of high technologies, that is, the so-called 6T: information, bio-, nano-, space, environment, and cultural technologies. The 10 industries

were as follows: digital TV broadcasting, display, intelligent robot, future car, next-generation semiconductors, next-generation mobile communication, intelligent home network, digital content and software solutions, next-generation batteries, and biomedical products. Third, knowledge-based and high value-added services gradually strengthened their position in the Korean economy with the new paradigm of the knowledge-based economy in the 21st century. These knowledge-based services were considered the solutions to employment problems in the post-industrial and post-manufacturing society. Therefore, the government has prepared comprehensive measures to improve the competitiveness of service industries since the mid-2000s (Sakong and Koh, 2010). Services including public utilities and construction consistently increased their share in employment from the 1960s and increased to over 70% in 2001 (Figure 2). Conversely, the manufacturing sectors, including mining, reached their peak in the late 1980s and the early 1990s, and declined by the late 2000s. However, the indicator of value-added between manufacturing and services has a slightly different story (Figure 5). Value-added by manufacturing maintained their portion in the 1990s and the 2000s, showing about 25% to 28% after peaking at 30.1% in the late 1980s. Its portion increased after the 2008 crisis and was about 31.1% in 2012. This phenomenon is evaluated as the key manufacturing industries and new growth industries having upgraded their capacities and expanded their exports (Cho *et al.*, 2010). Therefore, the manufacturing sectors and their knowledge integration still have a great role in the development of the Korean economy, unlike in other advanced economies.

Figure 5. Comparison of Manufacturing and Services by Value-added



Sources: Economic Statistics System of the Bank of Korea (<http://ecos.bok.or.kr>)

The cohabitation plan for both large corporations and SMEs was launched with the increasing importance of the industrial ecosystem. Thus, in 2010, the National Committee for Corporate Partnership was formed with representatives from both conglomerates and small firms. The committee suggested that big companies should tread lightly in about 100 designated sectors. From the perspective of regional and spatial policies related to industrial development, the ICCP was reformed into the Pan Regional Cluster Program in 2010. This change accompanied the policy of the Regional Economic Area (REA), which is similar to the Mega region (Park and Koo, 2013).

In the beginning of the Park Geun-hye administration in 2013, the slogan of “creative economy” attracted public attention with the real coming of an age of austerity. The government explained the creative economy as the economy that creates new value-added, jobs, and growth engines with the core value of creativity. It sets out to produce new growth

engines and jobs by creating new value-added with the convergence of personal creativity, scientific technology, and ICT. However, these policies were also criticized because of the vagueness of the term “creative economy” and the policy target. To retain and upgrade competitiveness, a number of key industries, namely, flagship industries such as automobiles, shipbuilding, semiconductors, steel, general machines, textiles, and parts and materials, developed their own strategies with the continuity of the past policies. Some policies are being developed to create decent and high-quality jobs. Examples of these policies are upgrading existing industries along with the convergence of other industries or technologies, promoting global professional corporations with a cooperative ecosystem, and vitalizing regional economy by upgrading region- and local-based industries.

4. Impact of the Dynamics of Industrial Policies on the Korean Economy

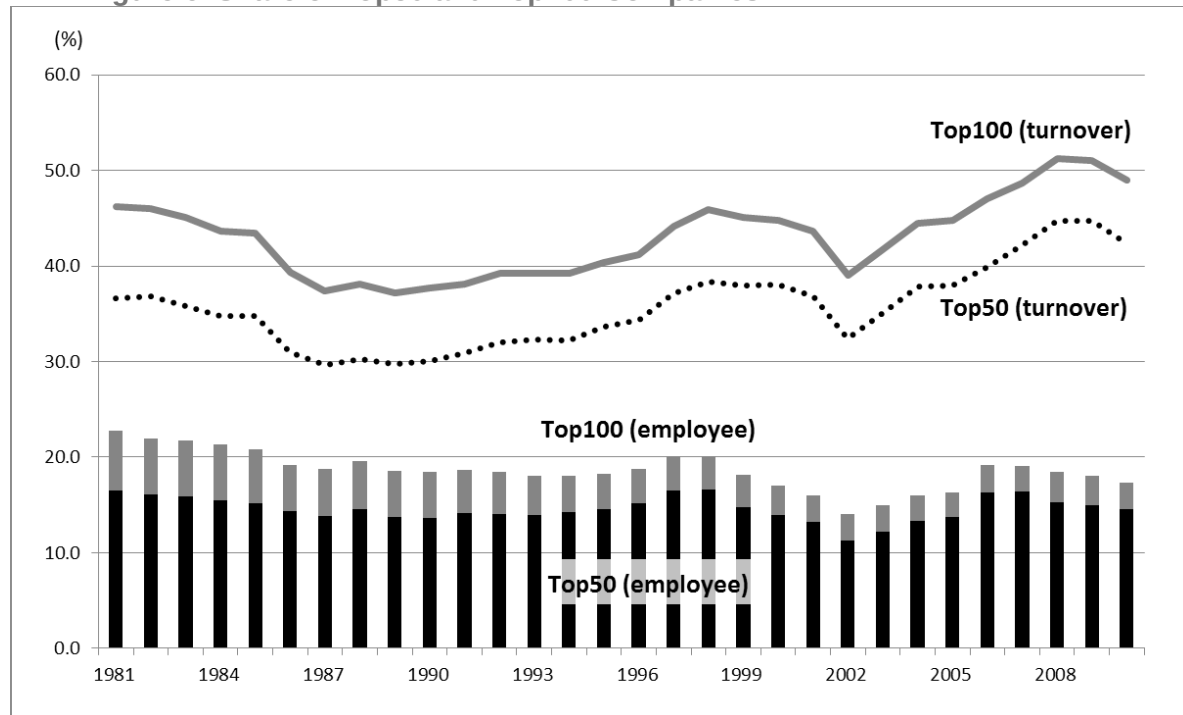
4.1. Export-driven Growth by Manufacturing Conglomerates (*Chaebols*)

The Korean economy can be summarized as the development of export manufacturing from the perspective of industrial structure and the growth of conglomerates from the perspective of industrial organization. The national government has taken a leading role in managing industrial policies and economic growth. One of other powerful actors is the *chaebols*, Korean conglomerates composed of different sectoral companies. Specifically, the heavy and chemical industrial policies from the mid-1970s contributed to the growth of *chaebols* and the evolution of their system (Park, 2000). The government led the drive of confining its role to providing financial and tax incentives but left the actual implementation of production to the private sector (Sakong and Koh, 2010). Acting as vehicles for the export drive focused on heavy and chemical industries, *chaebols* further increased their power in the Korean economy. Accordingly, the automobile, shipbuilding, petrochemical, and electronic industries managed by *chaebols* became the leading ones and the core exported goods. Moreover, the industrial rationalization program in the 1980s accelerated the concentration of economic power to *chaebols*, which were the only business enterprises with the financial resources to take over troubled companies (Sakong and Koh, 2010). Many Korean big-name companies, such as Hyundai, Samsung, and LG, grew and expanded with the support of these policies.

In the early 1980s, the top 100 companies accounted for over 20% of all manufacturing companies by the number of employees and for over 40% by turnover (Figure 6). The concentration of the top 100 companies by the number of employees decreased gradually until the mid-1990s. The turnover of the top 100 companies began to increase in the early 1990s. However, the concentration by both indexes drastically reduced after the economic shock in the late 1990s. The concentration reached the lowest level of about 14% by the number of employees in 2002 because of the chain of bankruptcy and big deals of some *chaebols*, such as Daewoo, Kia, Hanbo, Halla, and Jinro, among others. The uncontrolled expansion of these large enterprises was also the cause of the 1997 crisis. However, the turnover of the top 100 companies rapidly increased again, accounting for over 50% of all manufacturing sectors at the time of the outbreak of the 2008 crisis. Over the past 30 years, although the share of the top 100 companies seemed to decrease, that of the top 50 showed no significant variation in terms of the number of employees. Moreover, the share of turnover considerably increased in both the top 100 and the top 50 companies. Specifically, in 2010, the top 10 companies accounted for 8.0% of all manufacturing companies in terms of employment and 24.7% in terms of turnover (Korea Fair Trade Commission, 2011). Moreover, in 2012, large companies

accounted for 66% of the total amount of export, whereas middle-standing companies and SMEs accounted for only about 15% and 19%, respectively (Institute for International Trade, 2013).

Figure 6. Share of Top50 and Top100 Companies



Sources: Korea Fair Trade Commission, 2011, Market Structure Investigation: Mining and Manufacturing (<http://www.kosis.kr>)

The Korean economy became increasingly dependent on the two major *chaebols*, Samsung Group (17 listed companies) and Hyundai Motor Group (10 listed companies), after the 2008 global financial crisis. According to the report of a local corporate consultant (CEO Score, 2014), in the stock market in 2012, the aggregate market value of both groups accounted for 36.5% of the total despite only accounting for 1.6% by the number. Their aggregate market value share increased by 14.6% points as the value was 21.9% in 2008. Moreover, corporate taxes paid by the two groups accounted for 20.6% of the combined total from 482,574 companies in 2012, whereas their taxes accounted for only 7.1% in 2008. As Korea's economic dependence on the two conglomerates is increasing, the entire economy can become vulnerable if the profits of the two groups decrease or if the two groups encounter other problems.

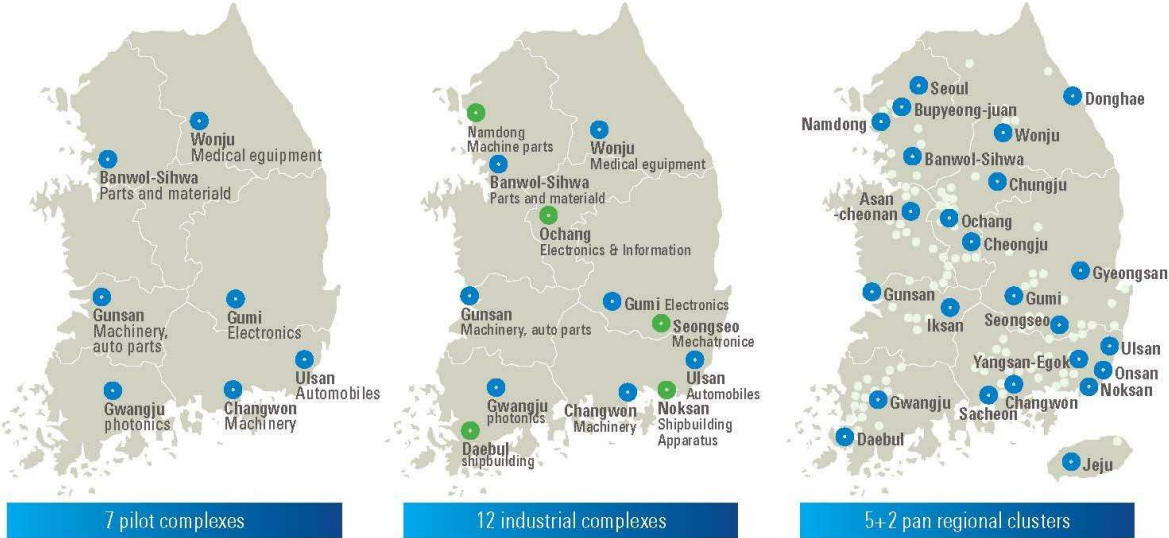
4.2. Infrastructure Investment and Industrial Cluster Support by the Government

From the perspective of industrial foundation, Korea's economic growth and industrial development have been considerably supported by active infrastructure investment by the national government. As a result of continuous investment in roads, railways, seaports, and airports since the 1960s, the country's transport network has been densely developed. Although the construction of railways started from the 1900s during the colonial period of Japan, railway investment continued after the independence in 1945 and at the end of the Korean War in 1953. After the establishment of the Park administration in the early 1960s, social overhead capital investment was accelerated with the support of policies, such as the Five-Year Economic Development Plans. Accordingly, the first toll expressway, the Seoul–Incheon Expressway, opened in 1968. The Seoul–Busan Expressway, the major backbone of the country, was completed in 1970 and Honam Expressway was opened in 1973. Moreover,

electric power development projects were carried out from 1962, and the supply of electric power exceeded demand in the mid-1960s (Sakong and Koh, 2010).

One of the most important and direct spatial policies related to the industrial development was the construction of planned industrial locations, particularly the creation of industrial complexes. The government started the construction of industrial parks in the early 1960s, focusing on export-driven industrial parks in major large cities, namely, the Ulsan Industrial Center in Ulsan, which is located in the southeast of Korea, and the Korea Export Industrial Parks in Guro-dong, Seoul. During the period of the first Five-Year Economic Development Plan, 10.7% of the government investment was used to build the industrial locations (KICOX, 2011). Large-scale industrial complexes were built and formed the industrial belt in the southeast coastal regions to support the heavy and chemical industries in the 1970s. In addition, some small and medium-sized local and rural industrial parks were constructed nationwide by national and regional governments. Therefore, until the late 2000s, these industrial complexes accounted for over 70% of all manufacturing exports, about 60% of production, and over 40% of employment in Korea (Park and Koo, 2013). They played pivotal roles in the industrial development and economic growth of Korea but gradually lost their competitiveness because of their lack of R&D capabilities, insufficient knowledge-based services, difficulty in attracting high-quality human resources, and low level of networking activities (Park and Koo, 2013). Thus, in the early 2000s, a variety of projects were conducted to improve previous industrial complexes only as physical agglomerations of firms and factories into innovative clusters.

Figure 7. Industrial Complex Cluster Program



Source: MKE and KICOX, 2011

Among various industrial cluster-related policies, the ICCP was representative and successful. It was first initiated in 2004 as one of the balanced national development policies. In the beginning of the program, seven pilot complexes were selected in 2005, and their specialized sectors were as follows: Banwol-Sihwa (parts and materials), Ulsan (automobiles), Changwon (machinery), Gumi (electronics), Gwangju (photonics), Gunsan (machinery and auto parts), and Wonju (medical equipment) (Koo *et al.*, 2010) (Figure 7). Additional five complexes were designated in 2008, such as Namdong (machine parts), Ochang (electronics and information), Seongseo (mechatronics), Noksan (shipbuilding equipment), and Daebul (shipbuilding). In the process of building networks and implementing the ICCP, a mini-cluster project played an important role (Park and Koo, 2013). A mini-cluster is an industry–university–research institution alliance built according to industrial or technical fields. Such an alliance continuously develops mutual cooperation, joint learning, and

information sharing with the participation of innovative actors in the region, such as large firms, SMEs, universities, research institutions, supporting organizations, and local government units (MKE and KICOX, 2011). In the 12 hub complexes, three to seven mini-clusters were grouped by their industrial and technological fields. After the establishment of the Lee administration, the ICCP was reformed into the Pan Regional Cluster Program with the policy of 5+2 REA in 2010. The program was based on the hub-and-spoke type regional clusters to spread out the accomplishment of the hub complexes to other industrial parks and locations nationwide (Park and Koo, 2013).

4.3. From Input- to Innovation-driven Industrial Policies

The past industrial policies focused on the promotion of some major industries that significantly affected forward and backward linkages. Such imbalanced industrial strategies fueled the rapid growth of exports of manufacturing products especially during the 1970s and the 1980s. This economic growth was evaluated as the result of expansion of inputs, labor, and finance. Although these kinds of input-driven growth strategies contributed to the industrial development of Korea, they reached their limit when the knowledge-based society began to emerge. One of the most significant problems of the Korean economy is the relatively low productivity and that the total factor productivity (TFP) growth rate has been lower than that of other developed countries (Oh *et al.*, 2011). For 25 years from 1981 to 2005, the TFP growth rate of Korea was lower than that of other advanced countries (Table 3). Korea's annual average growth rate of TFP was 0.25% in all industries compared with 0.40% of the United States and 0.34% of EU10 countries. Thus, Korea's TFP contribution rate to the gross output growth was much lower than that of other advanced countries. Moreover, except in some cases, almost all industrial sectors showed a decline in TFP in the 2000s unlike during the highest period in the 1990s (Table 4). The productivity of the representative key export industries, such as shipbuilding, telecommunication equipment, and computing-related machinery, even decreased despite the growth of exports. Thus, the overall improvement of productivity and innovativeness seemed to be urgent and important in the Korean economy at that time.

Table 3. Annual Average Growth Rate of Total Factor Productivity by Sectors (1981-2005)

	TFP growth rate (%)				TFP contribution rate (%)			
	Manufac- turing	Service (market service)		All industries	Manufac- turing	Service (market service)		All industries
Korea	0.74	-0.41	(0.55)	0.25	7.94	-5.84	(7.04)	3.18
US	1.13	0.22	(0.41)	0.40	46.89	6.71	(10.68)	14.49
Japan	0.38	0.10	(0.46)	0.17	19.59	3.24	(14.74)	7.33
EU10	0.55	0.16	(0.12)	0.34	31.61	5.35	(3.49)	14.35

Notes: TFP contribution rate = TFP growth rate / Gross output growth rate * 100

Sources: Korea Productivity Center, 2011 (<http://www.kpc.or.kr>)

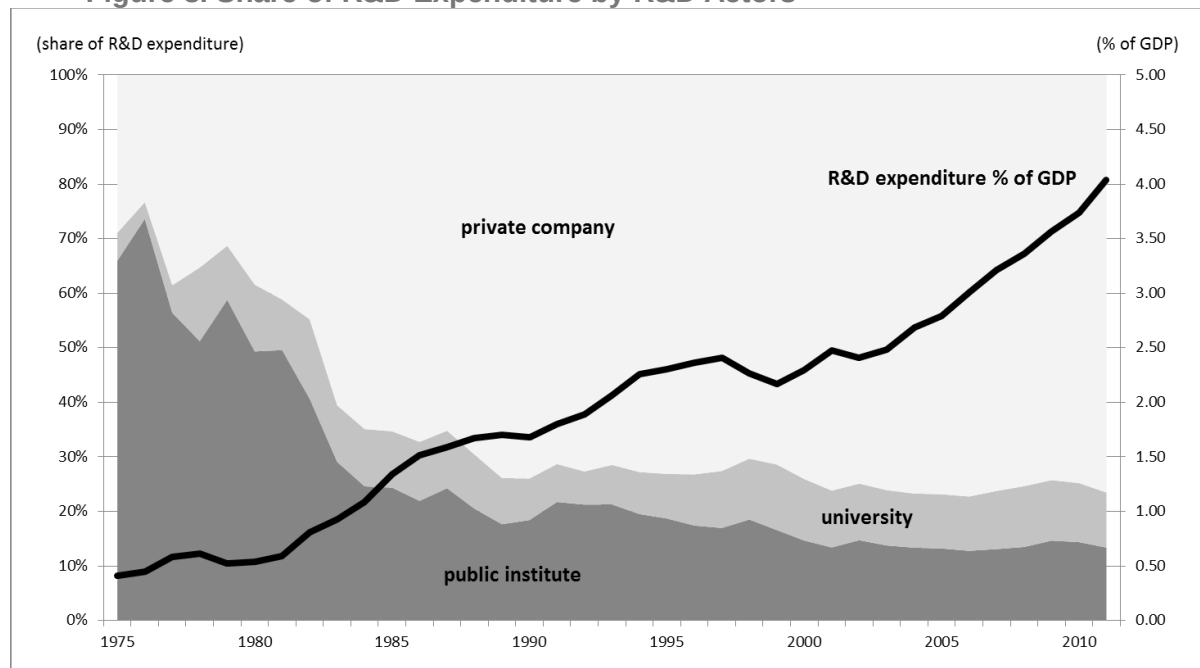
Table 4. Annual Average Growth Rate of Total Factor Productivity by Periods

Industry	1971~ 1980	1981~ 1990	1991~ 2000	2001~ 2010	40 years (1971~ 2010)
Textiles	1.66	-0.08	0.06	-0.88	0.19
Chemicals	3.34	0.14	1.20	0.47	1.29

Motor vehicles, trailers and semi-trailers					
Shipbuilding	0.74	0.32	2.15	1.85	1.27
Office, accounting and computing machinery	1.89	1.57	5.70	-0.04	2.28
Electrical machinery and apparatus	6.01	2.67	1.52	0.53	2.68
Telecommunication equipment	2.71	0.90	4.09	2.83	2.63

Sources: Korea Productivity Center, 2011 (<http://www.kpc.or.kr>)

Figure 8. Share of R&D Expenditure by R&D Actors



Sources: National Science & Technology Information Service of Ministry of Science, ICT and Future Planning (<http://sts.ntis.go.kr>); Economic Statistics System of the Bank of Korea (<http://ecos.bok.or.kr>)

From the perspective of R&D, industrial policy began to place great emphasis on improving the industrial technology by increasing R&D investment in the 1980s (Park, 1991). Although the government took the national innovation system initiative earlier in the 1970s, it was mainly directed by the government's science and technology policy that supports technology transfer to firms and the learning process of imported technology (Park and Koo, 2013). Government-funded research institutions set up in the 1960s and the 1970s took the lead in developing technologies in the 1980s. The share of the GDP devoted to R&D increased from 0.54% in 1980 to 1.34% in 1985 and 1.68% in 1990 (Figure 8). The emphasis on technology-intensive industries considerably increased the R&D expenditure after the 1990s. The expenditure increased to over 2% in 1993, over 3% in 2006, and over 4% in 2011. In particular, the major role of R&D and innovation began to shift from the government to private companies in the mid-1980s (Park and Koo, 2013). Companies that had begun R&D activities by participating in some national R&D projects expanded their own R&D effort by building a number of private research institutes (Sakong and Koh, 2010). The share of R&D expenditure of public institutes was over 50% in the late 1970s, but it decreased drastically from the early 1980s and sustained about 13% to 14% after the 2000s. Conversely, the share of private companies started from about 30% in the late 1970s and increased rapidly in the 1980s, reaching about 75% in 2011. In 2011, the R&D expenditure of private companies was about 38,183 billion won, much more than that of 12 billion won in 1975. The R&D

expenditure of private companies grew by about 3,100 times, and the whole R&D expenditure grew by about 1,170 times.

Since the 1990s, the regional innovation networks have begun to evolve beyond the national innovation systems with the development of regional clusters of SMEs in technology-intensive sectors (Park and Koo, 2013). In the beginning of the Roh administration, the regional innovation system-related policies became the major position of the industrial policy. It means that the industrial policy focus shifted from hardware support to software systems. The effort to strengthen the regional innovation networks progressed with the organization of regional innovation councils that played the role of both innovators and coordinators at each 16 provincial level (Park and Koo, 2013). For example, the programs of Inno Cafés and Network Hubs, which were the places for innovation diffusion through interaction and face-to-face meetings of regional specialists, were implemented. Regional innovation networks of industry–university–research institution were also established and strengthened by different programs, such as Connect Korea, which had the objective of promoting technology transfer from universities and public research centers. These policies contributed not only to the development of innovative SMEs and their networks but also to the local and regional endogenous economic development.

5. Conclusion

The global financial and economic crisis may well have redrawn the economic coastline in dramatic ways (Dicken, 2011), but great variations have occurred in countries and regions not only in terms of the impact of the economic crises but also in the solution to overcome them. Korean industrial development and economic growth were considerably indebted to government policies, which also became the main cause of the crises. Nevertheless, despite facing these difficulties, the way Korea overcame the crises has been evaluated as relatively successful through the help of appropriate industrial policies.

Korean economic growth in the past 60 years can be summarized as the development of export manufacturing from the perspective of industrial structure and the growth of Korean conglomerates, *chaebols*, from the perspective of industrial organization. In the beginning of the development, active infrastructure investment to social overhead capitals, industrial locations, and complexes played a pivotal role from the perspective of industrial foundation. Although input-driven growth strategy took the lead in the initial stage of economic development, innovation-driven industrial policies were magnified after the 1990s. These policies focused on productivity improvement through R&D and technological progress. Moreover, some regional scale industrial innovation policies, for example, the regional innovation systems and the industrial cluster policies, are being developed and are receiving successful reviews.

The creative economy with the core value on the creativity of the people is receiving more attention recently. The convergence of creativity with scientific technology and ICT is becoming more important in the industrial policy. Although the previous Korean industrial development was primarily referred to as the development of the manufacturing sectors, the current policies focus much on the knowledge-intensive service sectors. Nevertheless, traditional manufacturing industries remain vital and account for a great portion in the Korean economy. Upgrading these industries to innovative industries is necessary, and emphasis should be given to technological convergence and creativity. The previous industrial policies seem to have deepened the economic polarization between firms and industrial sectors, and they have continuously widened the disparity. The shared growth between large corporations and SMEs is becoming more and more crucial in the aspect of specialization and industrial cooperation. Building a valuable global production network is also important from the

globalized perspective. Moreover, making existing industries more environment-friendly and energy-efficient is important in the era of climate change.

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