

Policy-augmented Human Capital: A Key Factor to the Rapid Economic Development in Korea*

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Abstract

This paper aims to examine the policy and institutional implications of “policy-augmented human capital” on Korea’s industrial revolution and rapid economic development. The important factor that drives economic development is a function of the spirit of development and the capacity of “policy-augmented human capital.” *Policy-augmented human capital* refers to the ability of competent leaders and bureaucrats to craft economic development plans and concrete measures. The *multiplied combination* of this human capital with effective policies leads to rapid economic development by both awakening dormant development capabilities and creating an environment that enables the unleashing of a country’s economic potential. In the process of Korea’s rapid economic development, the policy-augmented human capital played a key role in determining the specialization of output, the nature and direction of trade, and the pace of economic growth. In addition, this unique human capital contributed to the size and composition of the ‘industrial portfolio’ which helps to identify and promote industries that can achieve future comparative advantages and economies of scale.

Key words: Korean Industrial Revolution, Hoffmann’s ratio,
Policy-augmented human capital, Developmental spirit,
Pyramid-type catch-up model, Industrial portfolio.

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I. Introduction

The way in which Korea designed and implemented a new economic institution and policies for its economic development has been seen as “uniquely Korean” and not dominated by any specific Western economic ideas. Unlike the “Western Industrial Revolution,” which was largely based on individual inventions and technological innovation under a laissez-faire market system, Korea’s market was not fully formed at the beginning of its economic development. As a result, the government took over the function of the market.¹⁾ In the face of a desperate need to “lift people out of poverty” and a shortage of experienced capitalists, the government acted as an *industrial manager*, accumulating superior human capital to build and operate modern factories. In the case of South Korea, rapid economic development was an urgent necessity in order to lift the people out of poverty, confront military threats from North Korea, and strengthen national defense capabilities.

Whereas the European Industrial Revolution was driven competitively by private companies over a period of 150~250 years, Korea’s First, Second, and Third Industrial Revolutions occurred simultaneously in the 1960s under a carefully planned *government-led* program. Also, whereas the European Industrial Revolution was based on the demand of farmers who were beneficiaries of industrialization using rural surplus labor, Korea’s was an *export-led industrialization* using rural surplus labor.

Before World War II (1939~45), the nature and scope of the industrialization process in non-European countries were similar to what took place during the Industrial Revolutions in European countries, which occurred before those in Asia. In addition, the pace of growth in the later industrialized countries was naturally faster because they had access to the experience of the European countries. After World War II, more than 140 new countries pursued their industrialization by imitating the experiences of advanced European countries, but most of them languished in the early stages of industrialization. In Korea, however, the average annual economic growth rate from 1962 to 1979 was 9% (Oh, Wonchul, 2003), and the average annual per capita output of East

1) This type of government has been called “market-augmented government” by Lee, Sung-Kyu (2015).

Asian countries from 1962 to 1985 was 5.7%. In contrast, from 1820 to 1980, including the Industrial Revolution, the economic growth rate of the West was only 1.6% (Kwon, 2004). When UNCTAD declared South Korea the 32nd most developed country in 2021, it marked the first such case among the more than 140 newly independent countries created after World War II.

Korea achieved rapid economic development by establishing and implementing *its own path to growth* at a time when there was no clearly defined economic development model other than the so-called Neoclassical economic model. Therefore, Korea's developmental experience can be considered *unique* from a historical perspective. In particular, Korea's experience is *unique* in the sense that it pursued an *export-led industrialization* that was clearly different from the Neoclassical school of economic thought during the era of protectionism and import substitution. Korea is a virtually miraculous and surprising case of how a backward economy was rapidly transformed and developed into an *industrial economy* in a short period of time. Therefore, it is of great significance to examine how Korea succeeded in its Industrial Revolution.

From this perspective, the purpose of this paper is to focus on three central points. First, it aims to shed light on the Industrial Revolution from a historical perspective in Korea in Section II; second, it aims to examine how South Korea developed from a backward, agricultural-based 'subsistence economy' in the 1960s and 70s to an 'industrial economy' through the Industrial Revolution in Section II; and third, it aims to examine, in detail, the role of "policy-augmented human capital" in its proper context in Section III. Finally, it deals with the process and characteristics of the Korean Industrial Revolution based on the *Pyramid-type* economic development strategy in Section IV.

II. Definition and Types of Industrial Revolution

1. Definition of Industrial Revolution

The Industrial Revolution,²⁾ also known as the *Industrialization*, is a process

2) The term "Industrial Revolution" first appeared in economic historian Arnold Toynbee's *Lectures on the Industrial Revolution of the Eighteenth Century in England*. In it, Toynbee defined the Industrial Revolution of the period comprising 1760-1830 as "the period when modern political economy began."

consisting of a quantum leap in economic development in which rapid increases in productivity are achieved through the productive and efficient use of physical resources in the production of goods and services. Specifically, the Industrial Revolution that originated in the mid-18th century in England is defined as the transition from an *agricultural society* to an *industrial society* through not only technological innovation and convergence, but also a structural transformation of politics, economics, society, and culture. The Industrial Revolution began in England and Europe expanded to the United States, Russia, and Japan, and finally spread to Asia, Africa, and South America in the second half of the 20th century.

2. Hoffmann Ratio

When only conceptual explanations of the Industrial Revolution existed, Hoffmann (1958, pp. 2~8) defined the Industrial Revolution in terms of value added as follows:

$$\text{Hoffmann's ratio (\%)} = \frac{\text{Output of consumer goods industry}}{\text{Output of investment goods industry}}$$

Next, Hoffmann found that this ratio decreases with the progress of industrialization, and based on this, he had divided industrialization into four stages. Firstly, if the Hoffmann ratio was $5 \pm 1\%$, the country was classified as a *first-stage industrialized country* (underdeveloped country). Secondly, if the ratio was $2.5 \pm 1\%$, the country was classified as a *second-stage industrialized country* (a country with some industrial development). Thirdly, if it was $1 \pm 0.5\%$, the country was classified as a *third-stage industrialized country* (a country that is beginning to develop machinery and metal industries). Fourthly, a Hoffmann ratio of 0.5% or less meant that the country was classified as a *fourth-stage industrialized country* (an advanced or highly industrialized country). Based on these ratios, the *Industrial Revolution* is defined as the *transformation of an underdeveloped country in the first stage into an advanced industrialized country in the fourth stage*. In particular, advanced industrialized countries of the fourth stage consist of heavy and chemical industries (relating to machinery, metals, chemicals, etc.) that are more than twice as large as their

light industries.³⁾ Then, Oh, Wonchul (2003) calculated the Hoffman ratio for Korea by replacing the consumer goods industry with “light industry,” and the production goods industry with “heavy industry” based on the Korean statistical classification:

$$\text{Hoffmann's ratio(\%)} \text{ for Korea} = \frac{\text{Output of light industry}}{\text{Output of heavy industry}}$$

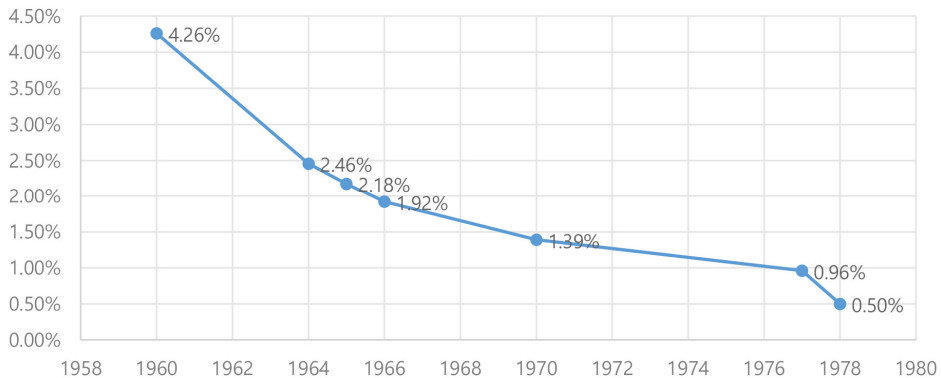
South Korea's *Hoffmann ratio* was 4.26% in 1960. However, when exports reached 100 million dollars in 1964, the Hoffmann ratio dropped to 2.46%, marking the beginning of the First Industrial Revolution in Korea. In 1965, exports exceeded 300 million dollars and the Hoffmann ratio was 2.18%, which led W. Rostow to conclude that South Korea had entered the leapfrog stage. In 1966, the Hoffmann ratio was 1.92%, and the export industry began to develop in earnest at this time. In 1970, the long-awaited 1 billion dollars in exports was achieved, and the Hoffmann ratio dropped to 1.39%. This means that South Korea ended the start-up stage of its Industrial Revolution (stages 1 and 2) and entered the third industrialized country stage (with a Hoffmann ratio of 1.5%~0.5%). South Korea began to develop its machinery and metal industries at this time and entered a period of full-scale growth, with exports growing at an average annual rate of more than 40% from 1964 to 1970. In 1977, South Korea reached a Hoffmann ratio of 0.96%, as heavy and chemical industries overtook light industry, exports reached 10 billion dollars, and GNP per capita reached 1,000 dollars. After 1977, the Hoffmann ratio fell below 0.5%. Since then, South Korea has entered the fourth stage. It has expanded its industrial scale to first-class factories, and attained exports of more than 100 billion dollars. This was achieved through quality upgrading, fostering precision industries, and exporting plants. In addition, its national income per capita has exceeded 10,000 dollars.

3) See Oh, Wonchul (2003), pp. 5-6.

<Table 1> Hoffmann Ratio and Stage in Korea

Year	Hoffman ratio	Stage
1960	4.26%	-
1964	2.46%	Began the first Industrial Revolution.
1965	2.18%	Entered the second Industrial Revolution
1966	1.92%	Began to develop export industry.
1970	1.39%	Ended start-up stage of the Industrial Revolution. Entered the third industrialized country stage.
1977	0.96%	Heavy and chemical industries overtook light industry.
After 1977	below 0.50%	Entered the fourth industrialized stage.

<Figure 1> Hoffmann Ratio in Korea



On the other hand, Kim, Myungja (2019) comprehensively defines the Industrial Revolution as a *bloodless revolution* in which the convergence between general-purpose technologies becomes diverse and complex as the stage of the Industrial Revolution is higher. This results in not only innovations in technology and production but also disruptive innovations in all sectors, including economy, society, and culture, ultimately changing the value system.⁴⁾

3. Types of Industrial Revolution

In the history of modern industrialization, countries that favored technicians, skilled workers, and entrepreneurs became advanced.⁵⁾ By favoring technicians

4) See Kim, Myungja (2019), pp. 18-20.

5) Until the 17th century, France was the center of Europe. In 1685, however, Louis XIV revoked the Edict of Nantes, which allowed religious freedom, and deported Protestants, the lower-class

and entrepreneurs, England became a leader in the textile industry, and the First Industrial Revolution (1760~1830) began in England and spread to Europe by the 1830s. The First Industrial Revolution in Britain and Europe was driven by (i) increased food production and population growth, which created the conditions for the creation of new industries; (ii) the introduction and spread of coal-fired steam engines in the 1760s; (iii) the mechanization of the cotton textile industry with improved spinning machines; (iv) the production of steam-powered trains in 1815; (v) innovations in iron smelting to meet the demand for machinery and the construction of railroads for transportation; (vi) political and institutional innovations; (vii) the factory system of machine production; (viii) entrepreneurship; and (ix) innovations in university education. Technological innovation at this time was not novel innovation based on basic scientific research, but rather it consisted of *improvements to existing industries*. However, this led to an explosion in productivity. In addition, a key driver of technological innovation was “entrepreneurship,” the taking of present risks in the hope of reaping future economic benefits. The main components of the First Industrial Revolution included the mechanical revolution, the textile industry, light industry, cotton textiles, steelmaking, improved spinning machinery, the birth of the theory of capitalism, the birth of Marxism, and the fulfillment of human physiological needs. On the one hand, the mechanization and mass production of the First Industrial Revolution led to the establishment of corporate organizations, transforming production activities. On the other hand, however, it also led to the emergence of new classes of capitalists and workers.

The British Industrial Revolution spread to the United States around 1825~1830, and by 1855, innovation had taken place across all industries.⁶⁾ The U.S.-led “Second Industrial Revolution”⁷⁾ was achieved through the

merchants called “Huguenots”, abroad. In the Netherlands, where most of the Huguenots emigrated, the economy flourished. William III, who captured London and became king of England, brought many Dutch merchants and nobles to England and gave them preferential treatment.

6) At the time, Germany was a backward country of more than 2,000 lordly lands and free cities, with many modern roads built by the invader Napoleon in 1807. On the other hand, the starting point of Japan’s modernization was the *Meiji Restoration* in 1868, when 100 of the country’s highest paid officials were all foreign technical advisors.

7) The term “Second Industrial Revolution” (1870~1930) was first used in 1913 in Sir Patrick Geddes’s *Cities in Evolution*, and was introduced as an academic term in 1969 in *The Unbound Prometheus*

“Electrical Revolution,” which created the service industry and established the mass production system. The core drivers of the American Industrial Revolution were petroleum, the chemical industry, the internal combustion engine, the conveyor belt, electricity, and the automobile. In addition, its main components were communication, the heavy chemical industry, steel, aviation, shipbuilding, petrochemicals, and the satisfaction of the public’s safety needs (see <Table 2>).

<Table 2> Key Elements of the Industrial Revolutions

Type	First Industrial Revolution (1750~1830)	Second Industrial Revolution (1870~1930)	Third Industrial Revolution (Late 1960s~early 21st Century)	Fourth Industrial Revolution (2010 ~)
Trends	Mechanical Revolution (Factory system of mechanical production)	Electrical Revolution (Mass production)	Information Revolution or Internet Revolution (Cooperative production system)	Intelligence Revolution (Digitalization of manufacturing industry)
Core drivers	Coal, spinning mills, canals and roads, steam engines, coking plants, railroads, political and institutional innovation, introduction of the factory system, entrepreneurship, innovation in higher education	Petroleum, chemical industry, internal combustion engine, conveyor belt, electricity, automobile	Electronics, information, knowledge, networking, convergence	Virtual physical systems, artificial intelligence control, superintelligence revolution, SW, Convergence of real and virtual worlds
Main areas	Textile industry, Light industry, Cotton textiles, Steel, Improved spinning machines, Birth of capitalist theory, Marxism is born, Fulfillment of physiological needs	Heavy chemical industry, Steel, Automobiles, Aviation, Shipbuilding, Petrochemicals, Meeting safety needs	Convergence of new technologies, Service-oriented manufacturing, New materials, New energy, Fulfillment of social attribution needs	AI, IoT, Robots, Drones, 3D printing, Virtual reality, Autonomous vehicles, Sharing economy, Self-actualization and honor needs

Source: Author’s rewriting based on Yoon, Byungkyu (2013, p. 35) and Kim, Myungja (2019).

The *Third Industrial Revolution* (1970~2010) consists of the “Information and Communication Technology (or Network) Revolution” that has been underway since the late 1960s.⁸⁾ In the 21st century, technological innovations

by American economic historian, David Landes.

8) The title “Third Industrial Revolution” was coined by Jeremy Rifkin in 2011 when he published a book emphasizing the convergence of digital technology and renewable energy.

based on computers, the Internet, and mobile phones have led to the rapid digitization of the manufacturing industry, resulting in a collaborative production system between manufacturing and service industries.⁹⁾ This has led to the emergence of new technology convergence industries as well as new material industries as main industries. In addition, these developments have led to the rise of service-oriented manufacturing becoming a global network, creating a huge manufacturing network connected to 3D printers and factories around the world. It has also heralded the rise of individual manufacturing and brought many comparative advantages to many SMEs for the future. The key drivers of the Third Industrial Revolution were electronics, information, knowledge, networking, digitalization, and convergence. Its main components were the convergence of new technologies, service-oriented manufacturing, new materials, new energy, and the satisfaction of society's needs. As a result of the rapid progress of the Third Industrial Revolution, which was defined by the expansion of Information and Communication Technology (ICT) and the resulting automation of production, the Fourth Industrial Revolution has emerged.

The *Fourth Industrial Revolution* is an "Intellectual Revolution" that refers to the digitalization of the manufacturing industry. The convergences occurring in the world has led to the creation of a real (offline) world and a virtual (online) world, just as the "Mechanical and Electrical Revolutions" of the First and Second Industrial Revolutions gave way to the "Internet Revolution" of the Third Industrial Revolution. The Fourth Industrial Revolution can be defined as the convergence of the real and virtual worlds to fulfill human desires. The convergence process consists of (i) a *digital transformation* from the real world to the virtual world, and (ii) an *analogue transformation* from the virtual world to the real world. The key drivers of the Fourth Industrial Revolution are virtual physical systems, artificial intelligence control, the super-intelligence revolution, and software. Its main components are the intelligence revolution, artificial intelligence (AI), IoT, robots, drones, 3D printing, virtual reality, autonomous vehicles, networks and cooperation, platforms, and the fulfillment of

9) "Collaborative production" is a system in which producers, buyers, users, and investors cooperate with each other using IT-based online communities such as SNS and the Internet to create new ideas for products, commercialize them, and share profits.

self-actualization and honor-based needs.

In 2021, the United Kingdom, a leader in the First Industrial Revolution, had a GDP of 3,124.6 billion dollars, ranking fifth in the world. Meanwhile, Germany, a laggard in the Industrial Revolution, had a GDP of 4,319.3 billion dollars, ranked fourth. Japan, with a GDP of 5,378.1 billion dollars, ranked third. In 2021, South Korea had a GDP of 1,806.7 billion dollars, ranking 10th in the world. Britain was the “economic teacher” of Germany and Japan during the late Industrial Revolution. Germany innovated on British-imported ironmaking technology to become a leader in the Steel Age, while Japan took over the market that Britain once dominated, with products made on British-made textile machinery. Korea was a laggard, as it was 200 years behind the Industrial Revolution that created the modern capitalist world. However, it quickly caught up by using the experiences of the United States, Japan, and Germany as its textbooks.

III. Policy-augmented Human Capital

1. *Types of Human Capital*

The fundamental factors that drive economic development are (i) the ability to recognize and seize opportunities and (ii) the motivation to take advantage of them. Economic development theory is based on the theory of policy-augmented human capital. *Policy-augmented human capital* is the ability to recognize, seize, and fulfill opportunities. Specifically, it is the ability to acquire and digest information as well as the capacity of people to use this information to achieve economic development. These capabilities are not only for entrepreneurs, workers, bureaucrats, and politicians, but also for each citizen.¹⁰⁾

These capabilities are influenced by prevailing institutions, knowledge and skill levels, habits, and the overall value system of a society. Furthermore, even when opportunities are recognized, if people lack the motivation to take advantage of them (that is, if the private benefits of effort are too small or uncertain relative to the risks), they are unlikely to seize and exploit these opportunities. The ways in which underdeveloped economies close the gap in

10) For more information, see Kwon (1998) and Kang, Jung Mo (2018, pp. 296-305).

human capital activation and motivation through individual or collective effort are through investment in human capital, open economic policies, and export orientation. Open economic policies create a competitive environment that fosters learning through the absorption of new technologies, and export orientation is an important factor in narrowing the gap in human capital activation by promoting the quality of human and physical capital and creating new sources of motivation. In this process, governments must provide political and economic institutions that not only facilitate the rapid dissemination of knowledge and information to all citizens, but also create additional sources of motivation.

Human capital in the traditional sense refers to education, training, etc. and is an important long-term factor in the process of economic development.¹¹⁾ In the case of Korea, the rapid growth of traditional human capital has played an important role in the rapid economic development process. Education expenditures per student have increased by 355% in South Korea, 64% in Mexico, 38% in Kenya, and 13% in Pakistan during 1970~1989. Birdsall and Sabor (1993) argued that the quality of education, based on international test performance, is more important than its quantity. South Korea has excelled in international comparisons of student achievement; its primary school enrollment rate was comparable to that of industrialized countries in 1980, its secondary school enrollment rate was at the level of industrialized countries, and its higher education (colleges and universities) enrollment rate was much larger than that of Western industrialized countries. Creativity and innovation emerge from fierce competition. Moreover, their foundations lie in the level of human capital in a society, the right values, rational institutions, and customs.

2. Policy-augmented Human Capital

However, a “new” human capital concept, “policy-augmented human capital,” is even more important for rapid economic development than traditional conceptions of human capital. Policy-augmented human capital signifies human capital with a roadmap and a competent leader. The roadmap of this human capital involves (i) the direction of trade and product specialization, and (ii) a range of cooperative endeavors between business and government. These

11) See Schultz (1962) and Behrman and Schneider (1992).

include pooling human resources, risk sharing, and coordination between public and private sectors to implement many economic activities to accelerate economic growth.¹²⁾ This *multiplier* combination of policy-augmented human capital and effective policies tends to awaken the dormant spirit of development, creating an engine that can unleash a country's economic potential. In particular, Korea's policy-augmented human capital and performance-based industrial policy have played an important role in its endeavor to catch up with advanced economies.

Policy-augmented human capital is also the ability to formulate and implement effective development strategies to achieve rapid economic development. In a broad sense, it is the ability of political leaders and bureaucrats to achieve effective economic development under adverse conditions, such as external threats and internal vested interests (Rostow, 1960). In addition, policy-augmented human capital is the ability to select industries with high growth potential in uncertain markets and to coordinate physical resources and investments. Thus, policy-augmented human capital is the ability to clearly define performance standards, formalize known rules, and delegate the achievement of goals with certainty. The role of government in this case is to ensure property rights guaranteed by predictable and reliable laws and contracts. The World Bank, on the other hand, has limited the role of governments in order to maintain macroeconomic stability and fiscal soundness and provide economic infrastructure.¹³⁾ Thus, the role of government under a policy-augmented human capital system implies *expanding the role of government* beyond the World Bank's market-friendly framework.

At the dawn of its Industrialization, South Korea had very little physical capital but an *abundant* human capital compared to other backward countries (World Bank, 1993). This initial comparative advantage in policy-augmented human capital contributed significantly to Korea's rapid economic development through effective policy formulation and implementation, despite the lack of natural resources, scarcity of physical capital, and limited domestic market size. Therefore, policy-augmented human capital, along with economic discrimination,

12) For more details, see Kwon, Jene K. and Jung Mo Kang (2011), and Kang, Jung Mo (2018), pp. 301-303.

13) See Amsden (2001) and Wade (1990).

a spirit of development, and political and social stability can properly explain why some countries succeed in economic development while others fail.

IV. Process and Characteristics of the Korean Industrial Revolution

1. Pyramid-type Economic Development Strategy

When South Korea established its First Five-Year Economic Development Plan in 1962, the government took the lead in proposing and implementing economic development directions and methods because there was no domestic market and private companies lacked capacity. The government had adopted a *pyramid-type economic development model*, starting with the end product and moving up to intermediate goods and raw materials, and actively encouraged export competitiveness at every stage. The government also directed factories to be built, and dictated their priorities, funding, and industrial protection. Where the private sector was unable, the government took the initiative to build the factories itself. In particular, the government provided *selective support* for industries to become export-competitive by dividing the five stages: (i) direct protection, (ii) prioritized support, (iii) self-reliant development, (iv) international competition, and (v) progressing into the first-class stage. As a result, the government was able to reduce prices and increase quality by achieving an appropriate factory size, introducing the latest technology and machinery, and encouraging technological innovation and cost reduction. These stages of industrialization were as follows.

The first stage was the *direct protection stage*, where the government planned and implemented the economic development plan, providing subsidies as it marked the beginning of the economic development stage. The second stage was the *prioritized support stage*, at which there was a lack of competitiveness and diseconomies of scale, so the government implemented a combination of import suppression and export support policies to protect the domestic market. The third stage was the *self-reliant development stage*, where the government encouraged private initiative and supported the private sector to achieve optimal economies of scale in increasing competitiveness. Finally, in the fourth and fifth stages, South Korea entered the *international competition stage* (stage 4) and *becoming the first-class stage* (stage 5) by actively advancing in the

international arena in terms of its industrial development. In other words, once industry grew to an international scale, the government would only help it until it became internationally competitive, and then it would switch to private initiative and manage only statistical operations. During this industrialization process, Korea's economic policy was a *micro-industrial policy* in the first stage, and then switched to *macro-statistical management* in the fifth stage. This strategy can be likened to students who are under the tutelage of their teachers while they are in school, but after graduation, they become independent (see <Table 3>).

<Table 3> Industrialization Development Stages and Policies

Stages of industrialization	Self-reliant development			Entering the international arena	
	(1) Direct protection	(2) Prioritized support	(3) Self-reliant development	(4) International competition	(5) Becoming the first class
Policies	Government plans, Government Support	Government plan, Domestic sales protection, Export support	Private initiative, International scale	-	-
Industrial stage	Backward industrialized countries	→			Advanced industrialized countries
Economic development method	Economic construction	→			Economic management
Example	Elementary school	Middle school	High school	College and university	Liberal economics (Social life)
Economic policy	Micro-individual industrial policy	→			Macro-statistical management
Initiative	Government-led	→			Private-led

Source: Adapted from Oh, Wonchul (2003, p. 507).

In the early stages of Korea's economic development, the government led the way, but there were significant differences in the stages of development among industries. First, plywood, cotton spinning, footwear, cement, sugar, and

flour mills were already in the second stage (prioritized support stage) and beyond the first stage (direct protection stage) during the First Five-Year Plan. Next, in 1971, at the end of the Second Five-Year Plan period, footwear, cement, sugar, flour, and oil refineries reached the third stage (self-reliant development stage). In 1972, the foundation of light industry was laid, and the industrial structure was being finalized by adding heavy chemical industry, which is at the top of the pyramid-type industrial development. On the other hand, the six key heavy industries --- electronics, shipbuilding, petrochemicals, iron and steel, machinery (including automobiles), and non-ferrous metals --- were still in the first stage, and the goal was to bring them to the third stage by the end of the Fourth Five-Year Plan in 1982. Only in the second half of the self-reliant development stage did these sectors become international-scale units and become privately oriented, and the backward and forward linkages were so large that they contributed significantly to the development of all industries.¹⁴⁾

2. Contributions to Policy-augmented Human Capital

Since it takes a long time for economic development to occur naturally and is inefficient, South Korea has been forced to establish a *government-led* economic development plan and establish new institutions and effective policies to support it. If the direction (goal) and method (means) of an economic development plan are not correct, then no results can be expected and irreparable mistakes can be made. Therefore, the success of economic development depends on the *perfection* of the government's economic development plan. When the government draws up a *roadmap* of what businesses are to do and what factories to build from a national perspective, it should consider the backward and forward linkages between each business and each industry. The roadmap serves to suggest an implementation plan that organically combines several policies. These include determining leading industries, setting priorities, enhancing competitiveness, improving technology, enacting measures for raw materials and energy, establishing domestic and foreign financing, assessing export potential, accumulating foreign currency earnings or savings, and identifying lagging industries among existing industries. During its development stage, Korea's

14) See Oh, Wonchul (2003), Chapter 14.

technical bureaucrats were well-trained and especially equipped with *policy-augmented human capital*, so they succeeded in rapid economic development in cooperation with the private sector.

One of the most important issues for Korea to compete and survive in the international market is how to establish the optimal factory size. If a factory is built without an appropriate economic unit, the unit cost will be so high as to hinder exports and cause damage to the people and the country. Moreover, when starting to produce a new product, competing countries may engage in sabotage activities such as dumping, so it was necessary to avoid building a factory that is not reaching up to the *international competitive unit* from the outset. In this regard, we considered the following five points.

The first point concerns the issues of economies of scale, competition, and monopolies. In order to cheaply build an automated international-scale factory using the latest technology based on insufficient domestic demand, and to produce and export products at internationally competitive prices, the government must *create and support a monopoly*. Based on this logic, the government has implemented a *step-by-step policy* of temporarily allowing monopolies in the early stages of industrialization to quickly expand internationally and enter the competitive system. In addition, the way to mitigate mutual dumping caused by competition is to develop overseas markets. The government supervised and guided monopolies to promote rationalization of corporate management, curb excessive profits, and improve quality.

The second point concerns the issues of demand, timing, pace, and persistence. Demand is usually divided into domestic demand and export demand. Korea has a small domestic market, so it has to rely on export demand rather than domestic demand. Since exports have to compete in the international market, they must have international-level quality, pricing, factory size, and production facilities. In other words, management and productivity must be *internationalized*, and related industries must be developed and nurtured. Factory construction also requires the ability to capture just-in-time production to achieve the greatest impact. To this end, the government postponed factory construction until the pace of demand growth accelerated, even if there was some domestic demand. In order to generate demand at a steady pace once the factories are

built, six major industries in the heavy chemical industry were *internationalized* by building industrial complexes and moving in.

When fostering a new industry, it is necessary to have a skeleton of the country's basic industrial structure, even if it does not meet international standards. In this regard, the government has taken measures to protect the *fragile system* that is prone to collapse in the early stages due to a lack of funds. The means are timely and appropriate administrative guidance, administrative measures, and legislative measures. To this end, the government established a system of monthly economic trend reports, trade expansion meetings, quarterly screening analyses, and regular presidential visits. The president attended the implementation of these systems to understand the situation and to provide prompt and efficient correction, supplementation, and support when problems occurred.

The third point is the difficulty of planning. Developed countries only need to operate and manage an economy with industry, while developing countries need to build an economy from scratch. Therefore, the situation between developed and developing countries is completely different. For example, in the case of apartment construction, underdeveloped countries have to build new apartments by locating prospective areas, zoning these areas, financing the construction, and purchasing materials before finally constructing the apartments. Meanwhile, developed countries have to operate and manage completed apartment complexes, making the circumstances in both types of countries completely different.

The fourth point is the issue of implementation. The primary gateway to industrialization in a backward country requires a *technocrat* who is fully aware of domestic and international conditions and world affairs, and is experienced and competent. Such a technocrat embodies human capital augmented by policy. Korea's attempt to build a heavy chemical industry with many interrelated and complex facets was a great challenge, the first of its kind in world history. To accomplish this, South Korea created the Second Chief Economic Secretary under the President to coordinate the efforts of the various ministries.

The final point is the promotion of the Korea Limited Company. The success of the policy-augmented human capital was made possible by the united efforts

of patriotic and motivated entrepreneurs and citizens in the form of the so-called “Korea Limited Company” (KLC). The goal of the KLC was only to increase national power and modernize the country, but personal self-interest and political purposes were thoroughly rejected. Above all, the more backward countries are in need of *good leaders* and *strong leadership*. Strong leadership by a good leader is essential to the success of economic development. Korea’s success can be attributed to the foundation laid by President Rhee Sungman and the outstanding leadership of President Park Chunghee. Taken together, these five factors suggest that Korea’s rapid economic development is fundamentally due to the contribution of “policy-augmented human capital”.

V. Some Implications and Conclusion

During the industrialization era (the 1960s and 1970s), South Korea achieved rapid economic development through a *government-led* strategy by (i) designing economic development plans, (ii) establishing new institutions and policies to support them, and investing material factors of production --- such as labor, capital, and raw materials --- in an efficient manner. During this process, South Korea pursued a *pyramid-type catch-up economic growth strategy*¹⁵. A pyramid-type strategy is a process that starts with the end product and works backwards to intermediates and raw materials. The pyramid-type catch-up economic growth strategy is summarized as follows.

First, construction of the factory began by building only a part of it according to the appropriate size due to insufficient domestic demand, later expanding its scale. In the early stages of industrialization, even if the government was accused of monopolization, the government adopted a *step-by-step policy* of temporarily allowing monopolies to build and then quickly expand them to an international scale and enable them to enter a competitive system. The way to mitigate mutual dumping caused by competition was to build international-scale factories, switch to a competitive system, and explore overseas markets. Monopolies were supervised and guided by the government to promote rationalization of enterprise management, curb excessive profits, and improve

15) See Hong (2002) and Lee (2014).

quality, while industries that were not important for economic development were encouraged to compete boldly even if they were not on the level of an international scale.

Second, monopolies were forced to rely on export demand, so management and productivity were internationalized and related industries were developed and cultivated. The construction of factories also requires technology to capture production effects at the right time when it has the greatest impact. Thus, before the pace of demand growth accelerated, the construction of factories was postponed even if there was some domestic demand, and after the construction of factories, the government helped to generate demand at a steady pace. When fostering the heavy chemical industry, the government built industrial complexes for all six major industries and let them move into them, so that they could be internationalized. When fostering new industries, even if they do not meet international standards, they are fragile and prone to collapse in the early stages in order to form the framework of the country's basic industrial structure. Because of this, the government took precautionary measures and protected them through appropriate administrative guidance and legislative measures. In this way, Korea's industrialization was planned and executed by experienced and competent technical bureaucrats, or policy-augmented human capital, who fully grasped domestic and international conditions and were aware of world affairs.

In order to effectively promote the pyramid-type catch-up growth strategy, Korea's government has divided the industries with *dynamic comparative advantage* into five stages: (i) Direct protection → (ii) Prioritized support → (iii) Self-reliant development → (iii) International competition → (iv) Becoming the first class. By continuously transforming the "industrial portfolio" and promoting the appropriate scale, modern technology and new machinery, technological innovation, and cost reduction, the government has achieved rapidly *compressed growth* in a short period of time by increasing export competitiveness.

To accomplish this strategy, the first step was to effectively formulate and implement an economic construction plan. The effective formulation and implementation of the economic construction plan determined the success of economic development. The economic construction plan was effectively

formulated and implemented as follows. First, the government considered the *backward and forward linkages* between each business and each industry from time to time as the situation changed, and captured the start and completion of factory construction in a timely manner to meet the production and demand of products. Second, the government proposed an implementation plan that organically combined several policies. These policies involved determining leading industries, setting priorities, enhancing price and quality competitiveness, improving technology, enacting raw material and energy measures, securing domestic and foreign financing, assessing export potential, accumulating foreign currency earnings and savings, and identifying lagging industries among existing industries.

Next, the carefully formulated economic construction plan was implemented by “policy-augmented human capital.” At that time, well-trained technical bureaucrats cooperated with the private sector during the process of planning, as well as the implementation of economic development. In addition, competent technical bureaucrats refused to build factories from the beginning that were not up to *internationally competitive units* in order to achieve economies of scale. Above all, the technical bureaucrats focused on the modernization and economic development of the country and thoroughly rejected goals related to self-interest and politics.

We will now outline the Korean industrial revolution by suggesting *five propositions*:

<**Proposition 1**> South Korea’s rapid economic development is a product of “policy-augmented human capital.” Policy-augmented human capital has played an important role in determining the specialization of products, the nature and direction of trade, and the pace of economic growth. A country’s economic development is a function of its *policy-augmented human capital*, which determines the size and composition of the promising industry portfolio that enables economic development. In a world where physical capital moves virtually freely, the specialization of production by policy-augmented human capital is not affected or constrained by the initial availability of physical factors of production or the size of the domestic market (Forgel, 2009). In addition,

policy-augmented human capital is increased or decreased depending on the abilities of bureaucrats, entrepreneurs, managers, workers, and politicians (Romer, 1986, 1990; Stiglitz, 1999; Kwon and Kang, 2011). In South Korea, “policy-augmented human capital” has determined the specialization of output and the nature and direction of trade.

<Proposition 2> Policy-augmented human capital plays a role in the composition of the industrial portfolio in a development-oriented way. The size and composition of an *industrial portfolio* in a country does not happen on its own, but is determined by *policy-augmented human capital*. The basic premise of an industrial policy is to identify and promote industries that can achieve future comparative advantages and economies of scale. If the domestic market is small, the development of export markets is essential to achieve economies of scale. To develop export markets, the *import substitution system* should be transformed into an *export promotion system*. In order to have a large industry portfolio that promotes economic development, it is necessary to combine a strategy of *catching up* with a strategy of *leading* economic development based on creativity and innovation. This must require (1) convergence of production technology and information technology, (2) fostering ventures and small and medium-sized enterprises through win-win cooperation and collaboration, and (3) shifting from cost-oriented management to value-oriented management.

<Proposition 3> A *spirit of development* is necessary. A requirement for economic development is the “spirit of development.” To achieve economic development, it is necessary to find a motivation and incentive system that can generate the spirit of human development. On the contrary, egalitarianism is a sufficient condition for economic stagnation and recession. This spirit of development lies in the *economic discrimination by market, firms, and government*. Economic discrimination refers to treating people or companies differently by rewarding them more favorably based on their economic performance. President Park Chunghee once said to emphasize the punishment and reward principle, “The heavens help those who work hard. For the lazy, there is only poverty.”

<**Proposition 4**> The *prosperity first, democracy later* paradigm promotes economic development by *activating policy-augmented human capital*. In this paradigm, economic prosperity is more likely to lead to political democracy. South Korea is an example of a country that achieved economic prosperity and then transitioned to democracy.

<**Proposition 5**> *Political and social stability* is necessary for the stable establishment of “policy-augmented human capital.” If policy-augmented human capital is a necessary condition for economic development, then political and social stability is a sufficient condition for economic development. Even in countries with high levels of policy-augmented human capital, irrational policies or political and social unrest caused by social friction between classes would tend to stagnate economic development.¹⁶⁾

16) Kwon and Kang (2011) and Krueger (1974, 1990) call this tendency “government failure”.

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<한글초록>

**정책으로 증강된 인적자본이
한국 경제발전에 미친 영향**

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본 논문은 ‘정책으로 증강된 인적자본’(policy-augmented human capital)이 한국의 산업혁명과 경제발전에 미친 영향을 정책 및 제도적 측면에서 고찰하는 데 있다. 경제발전을 촉진하는 가장 중요한 요인은 기회를 인식하고 포착하는 능력과 기회를 이용하려는 유인에 있다. 개방경제에서 기회 포착은 발전 정신과 ‘정책으로 증강된 인적자본’의 역량에 따라 주어지는 것이기 때문에 내생적이다. ‘정책으로 증강된 인적자본’이란 경제발전 계획과 구체적 방안을 가진 유능한 지도자와 관료들의 능력을 말한다. 이러한 정책 증강적 인적자본과 효과적인 정책의 승수적 결합(multiplied combination)은 잠자던 발전 능력을 일깨워 국가의 경제적 잠재력을 분출할 환경을 조성함으로써 급속한 경제발전을 이룩할 수 있었다. 특히 한국의 급속한 경제발전 과정에서 ‘정책으로 증강된 인적자본’은 생산물의 전문화, 무역의 본질과 방향, 경제성장의 속도를 결정하는 데 핵심적인 역할을 수행하였다. 또한, 정책으로 증강된 인적자본은 미래의 비교우위와 규모의 경제를 달성할 수 있는 산업들을 발견하고 육성하는 ‘산업 포트폴리오’(industrial portfolio)의 크기와 구성에도 큰 영향을 미쳤다.

주제어(key words): 한국의 경제발전, 호프만 비율, 정책으로 증강된 인적자본, 산업 포트폴리오, 피라미드형 추격 경제발전모형.

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