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Achieving Inclusive Growth and Prosperity by Bolstering Human Capital: Lessons from Korea



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**Achieving Inclusive Growth and Prosperity by
Bolstering Human Capital:**

Lessons from Korea

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
I. Introduction	4
II. Human Capital and Sustainable Development	6
III. Human Capital Development in Korea	8
1. Sequential expansion from basic to higher education	9
2. Linking Schools with Jobs	12
3. The Role of Family and Culture in Education	15
4. Nurturing Brains for National Innovation	17
5. Limits and Reforms	21
IV. Lessons and Implications	23

LIST OF TABLES

Table 1: Human Development Index by Region

Table 2: Enrolment Rates and Other Educational Conditions by Region

Table 3: Major Educational Policies by Period in Korea

LIST OF FIGURES

Figure 1: Enrolment Rates by School Level: 1948-2010

Figure 2: R&D Expenditure as Percentage of GDP by Performing Sector in Korea

Figure 3: Number of Researchers (FTE) per million inhabitants

LIST OF BOXES

BOX 1: Partnership For Skills in Applied Sciences, Engineering and Technology (PASET)

EXECUTIVE SUMMARY

In the recent years, Africa has been experiencing rapid economic growth. However, it has been quite difficult to ensure that the benefits from this growth reach all segments of society and contribute to an inclusive and sustainable development strategy. To this end, well designed and sequenced policies are needed that ensure the attainment of all SDGs. A fundamental prerequisite for sustainable development is enhancing human capital. Key instruments for this are universal access to quality schooling, especially to attain basic literacy, skills training fostering national innovation, and providing effective healthcare for all citizens. However, in Africa, education quality, including the reliable availability of good teachers, facilities, and financing, remains a chronic concern. And in terms of the Human Development Index (HDI) Sub-Saharan Africa is lagging behind other regions in all aspects.

However, african countries are experiencing in parallel to the rapid economic growth, a rapid demographic growth, and possess a young working force. This represents both a challenge and an opportunity for prosperity. Indeed, if those young children can find good education and health conditions, and—when they grow up—decent jobs, then they will be the driving force of the development of their country. This will require an effective transition to manufacturing and a knowledge-based economy. To this end, the government needs to provide basic skills to all, and cutting-edge skills for the modern sectors, and implement active industrial and investment policies that can bring more and better employment opportunities.

This report will hence focus on the Korean experience of education, vocational training and human resource management during the development period from 1950s to 1980s, and additionally, recent trends since 1990s, and how that experience can contribute positively to African countries to follow a similar path. After reviewing the concept of human capital, it summarises the strategies that the Korean government employed and highlights essential policies and programs to implement those strategies. It also offers lessons and policy implications for emerging African countries.

According to human capital theory, differences in long-term per capita income growth stem primarily from differences in the rates of growth of human capital. Human capital is the engine of growth, and should go hand in hand with technological advancements. Many studies support this argument, which emphasises the role of education and R&D investment-based knowledge, in addition to physical capital to economic growth. Research shows that

investment in education made significant contributions to Korea's economic growth. And they support the view that Korea's high growth is attained by its high degree of adaptability to rapidly changing technology as well as by its entrepreneurship and the ability to exploit new opportunities, facilitated by rising educational attainment.

Although Korea started industrialisation much later than the West, it has simultaneously achieved rapid economic development and a transition to a democratic political system, thanks mainly to its investment in people. The Korean development experience represents an exceptional case of sustained growth, driven largely by the initial surge in the formation of human capital and subsequent sustained investments in it. Within a decade compulsory primary schooling was successfully universalised and subsequently, the government steadily expanded the provision of education to secondary, vocational, and tertiary education. Today, Korea is widely recognized as having the highest rate of enrolment in higher education in the world.

Korea's remarkable accumulation of human capital can be explained through the lens of three pillars of human capital development: general education, vocational education and training, and nurturing brains for national innovation.

The Korean government also effectively utilised financial and human resources from foreign countries for setting up the basic infrastructure and building capacity to prepare sustainable conditions for growth. The limited domestic financial resources for education were supported by foreign aid and technical assistance. From 1959 to 1999, 4.6% of public loans were for human capital in areas such as education, R&D, and healthcare. Instead of relying on direct subsidies or implementing ineffective projects, the government stayed focused on industrialisation and the accumulation of human capital.

Another important aspect in the role of human capital in Korea's development was made through an effective advocacy in vocational training. Indeed, strong support for vocational education attracted many talented students, especially from underprivileged families and rural areas, and opened up new career paths for technicians. Those technicians played an important role during the industrialisation period as skilled workers in manufacturing sectors, including heavy industry. Rewarded with stable pay-checks and job security, they strengthened the middle class in Korean society. Furthermore, by guaranteeing economic advantages and socially preferential treatment to certificate holders, this system bridged the deeply-rooted disdain for crafts or manual work, and shaped social respect for technicians and skilled workers.

Tripartite partnership and close coordination among industry, education and government is key for effective skills development. Since it would be too difficult to build effective partnerships in whole sectors of industry, the government can strategically select certain

sectors to mobilise resources and young talents to make a few successful cases as good examples. Multinational or global companies can be great partners to sponsor such programs that aim to change formal schooling and vocational education.

Furthermore, top talented brains are indispensable for national innovation, and their education and training should be relied upon other advanced countries especially at the initial stage to some extent. This can help establish a virtuous cycle for human capital accumulation and sustainable growth.

Given developing countries' unique politico-economic structures and development stages, the Korean experience cannot be a best practice or best match for many of them in their original form. However, since Korea's dynamic process of transformation happened as a laborious outcome of iterative trial and learning from failures, the Korean experience may provide useful insights for addressing chronic problems in other regions. While lessons from the experience of other countries are available, every country needs their own creative and cooperative solutions. The problem-solving process involves some trials, errors and failures, but this is an inescapable feature of learning by doing in development.

I. Introduction

Many African countries have experienced rapid economic growth, often driven by extractive industries. To ensure that the fruits of that growth reach all segments of society, as well as future generations, it needs to become inclusive and sustainable. To this end, well designed and sequenced policies are needed that ensure the attainment of all SDGs.

Meanwhile, many countries in Africa still remain in a vicious circle of poverty and underdevelopment. “Afro-pessimist” researchers point to development failure, citing institutional, cultural, and climate constraints (Acemoglu, Johnson, and Robinson, 2001¹, Easterly and Levine, 1997², Sachs and Warner, 2001³). But many African countries have overcome those constraints through strategic policy reforms and investments (Chang, 2015⁴); many more have the potential to do so (Ahlers et al., 2014⁵).

A fundamental prerequisite for sustainable development is enhancing human capital. Key instruments for this are universal access to quality schooling, especially to attain basic literacy, skills training fostering national innovation, and providing effective healthcare for all citizens.

During the Millennium Development Goals (MDGs) era, the enrolment rate rose significantly, but millions of African children are still dropping out of primary schools before completing it. The primary school dropout rate of almost 38 percent is impeding the rapid improvement of adult literacy, and also depresses the secondary and tertiary enrolment rates. Education quality, including the reliable availability of good teachers, facilities, and financing remains a chronic concern. In fact, the problem is broader. The Human Development Index (HDI), calculated using life expectancy, years of schooling and income, shows that Sub-Saharan Africa is lagging behind other regions in all three aspects (Table 1).

¹ Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). Reversal of fortune: Geography and institutions in the making of the modern world income distribution (No. w8460). National bureau of economic research.

² Easterly, W., & Levine, R. (1997). Africa's growth tragedy: policies and ethnic divisions. *The Quarterly Journal of Economics*, 1203-1250.

³ Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European economic review*, 45(4), 827-838.

⁴ Chang, H. J. (2015). Is Industrial Policy Necessary And Feasible In Africa? Theoretical considerations and historical lessons. In Noman, A., & Stiglitz, J. E. (Eds.). (2015). *Industrial policy and economic transformation in Africa*. Columbia University Press.

⁵ Ahlers, T., Kato, H., Kohli, H. S., Madavo, C., & Sood, A. (2014). *Africa 2050: Realizing the Continent's Full Potential*. Oxford University Press.

Table 1 Human Development Index by Region

Regions	Human Development Index (HDI)	Life Expectancy at Birth	Expected Years of Schooling	Mean Years of Schooling	Gross National Income (GNI) per capita
Arab States	0.686	70.6	12.0	6.4	15,722
East Asia and the Pacific	0.710	74.0	12.7	7.5	11,449
Europe and Central Asia	0.748	72.3	13.6	10.0	12,791
Latin America	0.748	75.0	14.0	8.2	14,242
South Asia	0.607	68.4	11.2	5.5	5,605
Sub-Saharan Africa	0.518	58.5	9.6	5.2	3,363

Source: UNDP (2016) HDR 2015

Table 2 Enrolment Rates and Other Educational Conditions by Region

Regions	Adult Literacy Rate	Gross Enrolment Rate			Primary School Dropout Rate	Pupil-Teacher Ratio for Primary School	Public Expenditure on Education (% of GDP)
		Primary	Secondary	Tertiary			
Arab States	78.0	104	74	29	8.8	23	4.3
East Asia and Pacific	94.5	118	85	28	17.3	19	4.9
Europe and Central Asia	98.0	100	93	51	3.7	17	3.4
Latin America	92.3	114	94	38	13.8	22	5.5
South Asia	62.5	111	64	23	22.8	35	3.5
Sub-Saharan Africa	58.4	101	43	8	37.9	42	5.1

Source: UNDP (2016) HDR 2015

The population of Africa, especially in the Sub-Saharan region, is projected to remain very young—a fundamental reason why the region has to come up with a workable strategy of effective human capital investment. The population aged 5-14 in Africa is expected to increase by 71 percent by 2050 (Ahlers et al. [2014]). This demographic challenge can be turned into an opportunity for prosperity only if those young children can find good education and health conditions, and—when they grow up—decent jobs.

This will require an effective transition to manufacturing and a knowledge-based economy. To this end, the government needs to provide basic skills to all, and cutting-edge skills for the modern sectors, and implement active industrial and investment policies that can bring more and better employment opportunities. This approach can bring more children into the classroom, give them the reasons to stay in school, and advance their learning.

As background for devising Africa's strategy for successful and sustainable human development, this paper will describe the Korean experience of education, vocational training and human resource management during the development period from 1950s to 1980s, and additionally, recent trends since 1990s. After reviewing the concept of human capital, it summarizes the strategies that the Korean government employed and highlights essential policies and programs to implement those strategies. It also offers lessons and policy implications for emerging African countries.

II. Human Capital and Sustainable Development

Human capital can be defined as the “stock of embodied and disembodied knowledge, comprising education, information, health, entrepreneurship, productive and innovation skills that are formed through investments in schooling, job training, and health, as well as through research and development projects, and informal knowledge transfer” (Ehrlich & Murphy, 2007⁶, Ehrlich, 2007⁷). Knowledge embodied in workers, or skill, augments the productivity of labor and physical capital inputs at a point in time. Disembodied knowledge comprises productive information in papers, books, patents, and algorithms that contribute to inventions, innovations, scientific discoveries, fostering technological advances at the industry and firm levels. Importantly, technological change is not exogenous, but rather results from schooling, job training, on-the-job learning, and R&D investment of government and firms. According to human capital theory, differences in long-term per capita income growth stem primarily not from variances in physical capital, including land and/or other

⁶ Ehrlich, I., & Murphy, K. M. (2007). Why does human capital need a journal?. *Journal of Human Capital*, 1(1), 1-7.

⁷ Ehrlich, I. (2007). The mystery of human capital as engine of growth, or why the US became the economic superpower in the 20th century (No. w12868). National Bureau of Economic Research.

natural resources, but also from differences in the rates of growth of human capital (Ehrlich, 2007).

In endogenous growth theory, human capital is the engine of growth, and technological advance is also part of it. Many studies provide evidence for this argument, which emphasizes the role of education, and R&D investment-based knowledge, in addition to physical capital. Human capital formation, usually measured by schooling attainment or years of schooling (Barro & Lee, 2013⁸), or educational investment (Ehrlich & Kim, 2007⁹), is positively correlated with long-term growth rates of per-capita income.

Many studies show that investment in education made special contributions to Korea's economic growth (Krueger, 1995¹⁰, Amsden, 1989¹¹, Suh and Chen, 2007¹², Eichengreen et al., 2012¹³). Those studies indicate that the contribution made by education to GNP was greater than the proportion of educational expenditures in GNP (Lee, K.W., 2010¹⁴). These findings support the view that Korea's high growth is attained by its high degree of adaptability to rapidly changing technology as well as by its entrepreneurship and the ability to exploit new opportunities, facilitated by rising educational attainment.

⁸ Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of development economics*, 104, 184-198.

⁹ Ehrlich, I., & Kim, J. (2007). Social security and demographic trends: Theory and evidence from the international experience. *Review of Economic Dynamics*, 10(1), 55-77.

¹⁰ Krueger, A. O. (1995). East Asian experience and endogenous growth theory. In *Growth Theories in Light of the East Asian Experience, NBER-EASE Volume 4* (pp. 9-36). University of Chicago Press.

¹¹ Amsden, A.H. (1989). *Asia's Next Giant: South Korea and Late Industrialization*. New York:Oxford University Press.

¹² Suh, JH. & Chen, D. H. C. (eds.) (2007). *Korea as a Knowledge Economy: Evolutionary Process and Lessons Learned*, Korea Development Institute and World Bank Institute, Washington, DC.: World Bank.

¹³ Eichengreen, B. J., Perkins, D. H., & Sin, K. H. (2012). *From miracle to maturity: The growth of the Korean economy*. Harvard University Asia Center, and distributed by Harvard University Press.

¹⁴ Lee, K. W. (2010). Borrowing from the World Bank for education: lessons from Korea and Mexico. *Journal of International Cooperation in Education*, 13(2), 49-91.

III. Human Capital Development in Korea ¹⁵

Although Korea started industrialization much later than the West, it has simultaneously achieved rapid economic development and a transition to a democratic political system, thanks mainly to its investment in people. The Korean development experience represents an exceptional case of sustained growth, driven largely by the initial surge in the formation of human capital and subsequent sustained investments in it.

Within a decade of the establishment of the South Korean government in 1948, compulsory primary schooling was successfully universalized despite the civil war from 1950 to 1953. Subsequently, the Korean government steadily expanded the provision of education to secondary, vocational, and tertiary education, as shown in (Figure 1). More than 80 percent of each cohort of children attended secondary schools from the mid-1980s, and more than half of high school graduates advanced to tertiary education from the mid-90s.

Today, Korea is widely-recognized as having the highest rate of enrolment in higher education in the world. In addition, in terms of the average years of schooling for the population aged between 15 and 34, Korea is second at 13.4 years, behind only New Zealand at 13.7 years.

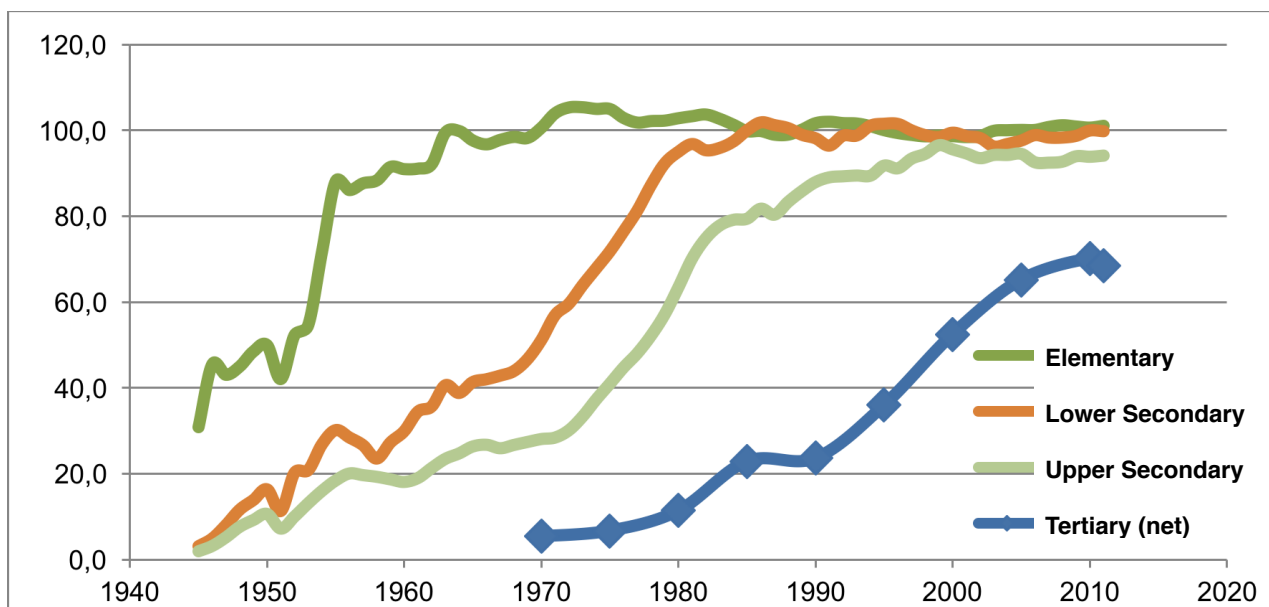
Consequently, the composition of the workforce has changed dramatically. In 1980, more than half of all workers had finished elementary school or less. By 1995, the proportion of persons with only elementary school education fell to 20%, and about 44% of workers finished high school. Today, the majority has finished college.

Korea shows a good record in the quality of its education as well. Korean students remain at the top of the list along with those of Finland and Hong Kong in the Program for International Student Assessment (PISA), which evaluates 15-year-old students on their academic achievements in OECD countries every three years. In addition to the high academic performance of Korean students, the socio-economic status of students is not significantly related to their test scores, which can be interpreted as proof that Korea has a comparatively equitable system of education (Lee, Jeong & Hong, 2014¹⁶).

¹⁵ This part is excerpted mainly from Hong, S. C., and Lee, J. H. (2016). "Accumulating Human Capital for Sustainable Development in Korea." *Background Paper for the Education Commission*. Korea Development Institute (KDI).

¹⁶ Lee, J. H., Jeong, H., & Hong, S. C. (2014). "Is Korea Number One in Human Capital Accumulation? Education Bubble Formation and its Labor Market Evidence (August 1, 2014). KDI School of Public Policy & Management Paper, (14-03).

FIGURE 1 Enrolment Rates by School Level: 1948-2010



Note: Enrolment Rate = (number of students in school level)/(number of population of certain ages) X 100

Source: MOE, Yearbook of Educational Statistics, each year; UNESCO data center. Hong & Lee [2016]

Korea's remarkable accumulation of human capital can be explained through the lens of three pillars of human capital development: 1) general education, 2) vocational education and training, and 3) nurturing brains for national innovation.

1. Sequential Expansion from Basic to Higher Education

Korea expanded the opportunities of general basic to tertiary education in a comparatively fair manner with continuous enhancement of quality. After liberation from Japan, the Korean government implemented a strong literacy education drive by combining mandatory education for students with literacy education for adults.

In the 1950s, many parents were reluctant to send their children to school. Many families wanted their children to supply the labor to feed families, and in fact could not afford to pay tuition for their children. Often the sons, usually the eldest one, had priority, while daughters and other siblings were not given chances of schooling. To fix this problem, the government actively pushed for mandatory education based upon the Six-year Compulsory Education Expansion Plan from 1954 to 1959, and enforced it resolutely with strong administrative power. If parents or guardians did not send their children to school, they were fined or

punished. The government allocated about 80 percent of the educational budget for compulsory education, and most of the foreign aid for education was spent to repair or build classrooms. The Plan was successful, and the enrolment rate passed 90% in 1957 and reached 96.4% in 1959.

The Korean government also strongly promoted literacy education for adults. Citizenship Training Schools were established all over the country, especially for adults in rural areas. As a result, the illiteracy rate dropped massively, from 80% in 1945 to 4.1% by 1958.

It is not an easy task to ensure that every child and adult attains a basic education. Needless to say, there should be enough classrooms, teachers, textbooks, and so on. However, what is much more important is the hope and belief of the people that schooling is the most important way to free the next generation from ignorance and poverty. It was the belief in education that brought children to the classroom. In Korea, the active role of the government was matched by a popular enthusiasm for learning, prompting the emergence of a universal education system within a short period of time.

After successfully universalizing basic education, the government expanded the provision of education to secondary, vocational, and tertiary education. The increasing enrolment in elementary education in the 1950s resulted in an increasing demand for secondary education, making the entrance highly competitive. Parents who could afford to hire private tutors paid extra money for their children to prepare for the middle school entrance examinations in the 1960s. Similar competition and private tutoring happened when they advanced to high school in the 1960s and 70s; and remains an entrenched fact of life today.

In order to relieve the burden of private tutoring and to prevent unfair admission practices, the government introduced an equalization policy by replacing the entrance examination system administered by individual schools with a lottery assignment for middle schools from 1969 and for general high schools from 1974.

This equalization policy prompted advancement to secondary schools. More than 90% of elementary graduates advanced directly to middle schools from 1979, and the same ratio of middle school graduates did to high schools from 1985. The universalized secondary education guaranteed access to education for all people, which in turn provided Korean society with more equitable access to opportunities, and also provided the economy with accumulated human capital. However, to some extent, this rapid expansion of opportunity was initially at the expense of the quality and diversification of education.

The government gradually expanded higher education, especially junior colleges, in response to the increasing industrial demands for advanced technicians from the late 1970s. However, the still-limited access to higher education pushed the explosively-increasing number of high school graduates and their families into fierce competition for college

entrance. Most households were forced to pay for private tutoring, which aggravated the rift between educational opportunity and social equity. Educational policy makers and political leaders were pressured to tackle this problem.

In July 1980, with the endorsement of the new military government, comprehensive education reform measures, including a graduation quota system that substituted the freshmen quota system, was swiftly announced. In the academic year of 1981, 130 percent of the regular quota was permitted to enrol as freshmen, consequently, the total number of students in tertiary education grew by 29.4 % over the previous year.

The reform measures also banned private tutoring and abolished written tests administered by individual universities, in order to relieve students and families from the heavy burden of study and extra educational spending. As a result, the net enrolment rate in tertiary education jumped from 6.7% in 1975 to 11.4% in 1980, and 22.9% in 1985. Deregulation later in the 1990s raised the rate to 52.5% by 2000, which can be regarded as the stage where tertiary education was universalised. The expansion of higher education opportunities in response to increasing economic and social demands in the 1980s contributed to greater economic growth and social mobility.

Universalised higher education promoted the monitoring of political powers and encouraged democratic participation in community activities, both critical for sustainable development. The peaceful transition of government in 1988 and the launch of a civilian government in 1993 is linked with the increase of intellectuals through higher education.

To secure educational financing, Korea adopted the Education Grant Act that automatically linked a certain percentage of national tax revenue to the education budget from 1971. To enhance educational equality between regions and to secure a stable education budget, the central government provided most of the funding for elementary and secondary schooling by linking the education resources to the internal tax revenue. The rate allocating the general education budget from total internal tax revenue stood 13% during 1971-2000, and rose to 20.3% by 2010, reflecting changing socio-economic demands.

Even through this unique financing system, the resources available to government or public sectors would not be sufficient to teach and train all people for free at once. The rest of the financial burden was shared by regular households and private donors¹⁷. Active participation

¹⁷ Education expenses of households are as much as the public education budget. In 2008, in addition to the 4.5% of GDP that was invested through the government's education budget, another 2% of GDP was paid by households for tuition. On top of that, Korean parents were spending another 2% of GDP for private tutoring.

of private foundations, especially in secondary and higher educations, helped the government to focus on basic schooling¹⁸.

The Korean government also effectively utilised financial and human resources from foreign countries for setting up the basic infrastructure and building capacity to prepare sustainable conditions. The limited domestic financial resources for education were supported by foreign aid and technical assistance. From the 1960s, the Korean government used loans, rather than relying upon foreign aid. Borrowing for investment in people was not small when compared to borrowing for other purposes. From 1959 to 1999, 4.6% of public loans were for human capital in areas such as education, R&D, and healthcare. Instead of relying on direct subsidies or implementing ineffective projects, the government stayed focused on industrialization and the accumulation of human capital.

2. Linking Schools with Jobs

While industry lacked skilled workers and had difficulty running their businesses, most families looked down on vocational education or technical training, similarly to those in many other developing countries at the initial stage of economic development. Even worse, the unemployed college graduates were a noteworthy social issue and big headache for the government by the late 1950s and early 1960s¹⁹.

To tackle these problems, the government employed strategies to link education with the economy. The most symbolic action was matching Economic Development Plans with Manpower Development Plans. Whenever the plans were announced by the Economic Planning Board (EPB), each line ministry also prepared detailed implementation plans to put those ambitious plans into practice. The Economic Development Plans from 1962 to 1997

¹⁸ Many people donated land and assets to build schools, especially middle and high schools, and colleges. In fact, from 1955 to 1967, the number of private schools established equaled that of public schools. The repressed enthusiasm for learning and teaching during colonial rule was turned into a national wave of private education right after liberation. From 1946 to 1960, 32 new private universities were established, ten of them in 1946, and 18 before 1950. The government encouraged this by giving tax advantages to the land owned by private school foundations. So the land reform contributed to the formation of human capital in various ways. Owing to the donations from the private sector, 74% of college students and 59% of high school students were enrolled in private schools in 1980.

¹⁹ A report examining the education system prepared by the Ministry of Science and Technology in 1972 indicated inherent problems with skills-development schemes and qualification systems. The report pointed out the following problems: a lack of skills education for primary school graduates who did not move on to secondary education; lack of a practical way to utilize secondary school graduates as professional technicians; the unclear function and role of vocational high schools; and lastly, the need to revise the system to allow practical education and field experience in tertiary educational institutions, along with acquisition of facilities.

were each backed by Manpower Development Plans (MDP) and related policies of manpower and vocational education.

For example, the Ministry of Science and Technology (MOST), Ministry of Labor (MOL), and the Ministry of Education (MOE) had to forecast the demands and supply of manpower of craftsmen, technicians, and engineers for every industry, and filled the gaps by controlling the number of graduates from high schools and colleges. To foster a more available supply of manpower, policymakers formulated predictions on future demands and prepared a supply plan to meet those needs.

Progress of the plans was monitored on a monthly basis by all stakeholders: government officials, businessmen and experts in various fields. This monitoring and coordinating mechanism was much more important than the plan itself. In coordinating higher education with Korean industries, a unique featured tool was the 'freshmen quota system'. The Ministry of Education decided on the number of freshmen for each department in each university after reviewing the applications from each higher education institution.

In addition, to strengthen the link between educational institutions and industry, the Industrial Education Promotion Act was legislated in 1963. It promoted vocational education by central and local government, provided expenses for experiments and practice and for the qualifications and compensations of teachers, and created scholarships. It also established the Central Industrial Education Council, to which the government invited experts from various industries to give voice to industry in shaping curricula.

In 1973, to utilise vocational education and training more directly to promote strategic heavy and chemical industries, the presidential office initiated a very ambitious project called "Specialisation Initiatives for Technical High Schools (SITHS)". The quality of vocational schools in those days was not high enough to produce the skilled workers needed on industrial sites, and policy makers found it difficult to enhance the quality of all schools at the same time. Thus, the government rejected a one-size-fits-all approach and employed a 'selection and concentration' strategy. With limited time and financial resources, the

government strategically invested its resources in a small number of institutions to bring about a tangible outcome with a higher chance of success²⁰.

Strong support for vocational education attracted many talented students, especially from underprivileged families and rural areas, and opened up new career paths for technicians. Technical high school graduates played important roles during the industrialisation period as skilled workers in manufacturing sectors, including heavy industry. Rewarded with stable pay-checks and job security, they strengthened the middle class in Korean society.

To encourage people to equip themselves with modern technology and respect technical personnel, the government prepared young technicians to participate in the World Skills Competitions, beginning in 1967. Medalists were hailed as heroes and heroines, taking part in a car parade from the airport to the city, and welcomed by the President. This contributed to a change in the mindset of the Korean people.

A more substantial tool to promote vocational and technical training was the establishment of the National Technical Qualification system in 1973. This system categorised technical students into engineers and technicians, and all students of technical colleges and technical high schools, as well as vocational trainees had to pass a qualification examination before graduating. Those who passed were offered employment opportunities. By guaranteeing economic advantages and socially preferential treatment to certificate holders, this system bridged the deeply-rooted disdain for crafts or manual work, and shaped social respect for technicians and skilled workers.

Because of the lack of skilled workers in industry, upgrading the skills of workers in various industrial fields was an important issue. As of 1967, companies and business were induced to train their employees through government subsidies backed by the Vocational Training Act. This new enactment mandated the qualifications and training of instructors, and the establishment of public training institutes along with in-company training facilities.

In the 1970s, to tackle the shortage of financial resources and technical expertise, the government set up vocational training centers with grant support from Germany, Japan, and Belgium, as well as loans from the Asian Development Bank, and the World Bank (Ra &

²⁰ SITHS divided technical high schools into mechanical schools, experimental schools, specialized schools, and generalized high schools—each with a different educational purpose and specialized curricula. Some new vocational high schools were established with state-of-the-art equipment financed by foreign loans. Some students of vocational schools benefited from full scholarships, dormitory residences, and even stipends. The *Blue House* was a strong supporter of vocational education: President Park often visited these schools to encourage students and teachers, and also awarded presidential scholarships. In 1977, government spending on vocational education almost matched that on higher education. With 555,000 students a year enrolled in vocational and technical high schools, 90,000 in two-year vocational colleges, and 257,000 in four-year universities, government spending per vocational student was two thirds of that in higher education.

Kang, 2012: p. 36-39). These institutions were also utilized to develop curricula and train instructors, as well as workers.

The importance of in-plant training of workers and the limited public financial resources created another pilot policy, the Vocational Training Special Measures Act, which made the training mandatory and ended subsidies for training in private companies. The new measure was designed to strengthen the roles of employers in training their workers, so that they could supply the necessary skilled workers on their own.

The new business environment with globalization and the knowledge economy of the 1990s modified viewpoints on skills development for both government and businesses. The Industrial Manpower Supply and Skills Development Restructuring Plan was drafted by the civilian government in 1994 and assumed voluntary participation in training programs by private enterprises, which the government would support through an incentive system. The new plan was followed by the historic introduction of the Employment Insurance System in 1995, which incorporated vocational skills development, but made it no longer mandatory.

Furthermore, the focus of skills development shifted from training for a new skilled workforce to upgrading incumbent workers and supporting their lifelong skills development. As with the training levy systems, the obligation to pay vocational training levies was imposed on all enterprises, but the new system was unique in that all enterprises had to pay the levies up front, and then be refunded upon their provision of training.

The 1976 reform even reinforced the obligation of businesses. The scope was extended to those companies with 300 employees or more, and the number of trainees for each company (by industry) was set up annually by the government, aiming to attain a minimum of 10% share for skilled workers of the business. Under this scheme, enterprises could pay training levies instead of providing in-plant training

3. The Role of Family and Culture in Education

Another important aspect to take into account in the successful development of Human Capital in Korea, and its impact on economic development is the role of family and culture. Indeed, Korean society has been greatly influenced by Confucian values. Confucianism played an important role not only in the way the society is organized, but also in the way people discipline themselves to behave both in the private and professional setting²¹.

²¹ Lee, J. K. (2001). Confucian Thought Affecting Leadership and Organizational Culture of Korean Higher Education. *Online Submission*.

Korea, like many african countries is representative of a collectivist society. The difference being that in Korea that ideal of collectivism is deeply rooted within confucianism. Historically, Korea has emphasised collective and social interests (such as the idea of loyalty and piety), collective action and interpersonal relationships. This often implied that the goals and needs of the individual were to be sacrificed for the greater good of society and the community²².

In this regard, confucian values strongly affected the morals of the parents that are educating their children. It also played an important role in helping strengthen the government policies towards encouraging vocational trainings, which were keys in boosting the economic take off of the 1960s. Build on the ideals of loyalty, respect of authority and elders, discipline and hard work, dedication to duty, and the importance of education and diligence the Korean society was armed with the necessary moral tools to support the investments the government made in the education system, and efficiently increase human capital.

Furthermore, Koreans take a great pride in their economic development and the “miracle” they achieved. They impose very high standards on themselves, and work hard at competing with other countries. This strong sense of national pride, was also often used in the domestic setting, and served as an incentive for parents to push their kids towards greater academic achievement to be ranked high in the society and be part of the economic development process²³. Again, following on the Korean confucian tradition it is important to invest in education for the greater good of the country and the community as a whole.

We can further see how this confucian tradition of dedication to education and hard work penetrate the family values of Korea by the increased amount of investment they dedicate to private tutoring. Indeed, Korean society is what scholars call an “educational enthusiast” country²⁴. This is mainly due to the important impact education has had on economic development. Because of that, a strong desire was embedded in the parents to ensure that their kids get the best possible education to ensure they can attend the best schools, and

²² Ibid

²³ Chung, K., & Choe, H. (2008). South Korean national pride: determinants, changes, and suggestions. *Asian Perspective*, 99-127.

²⁴Shin, J. C. (2012). Higher education development in Korea: Western university ideas, Confucian tradition, and economic development. *Higher Education*, 64(1), 59-72.

Hun Lim, D., Choi, M., & Hoon Song, J. (2012). Work-family enrichment in Korea: Construct validation and status. *Leadership & Organization Development Journal*, 33(3), 282-299.

subsequently get a high position in the society²⁵. This resulted in parents dedicating an increasing amount of their income and budget to private tutoring, and “shadow education system”²⁶. This investment equates to 56% of the national budget for education, and around 10% of the family’s budget²⁷. Furthermore according to the same paper, between 2005 and 2007, private tutoring increased by 78%, with 72,6% of all students being involved in some form of private tutoring.

All of which is justified by an increase in competition both within and outside of Korea for excellence but also - going back to the confucian values- to an increase in parents expectations for their children as they have themselves higher levels of education, and fewer children. This is coupled with the worry that if they don’t put this extra investment in parallel forms of education their kids will fall behind.

In this respect, we see that government policies towards the expansion of human capital, were made possible by a strong collective and confucian based society, that strengthened at the family level the commitment towards the value of education as a mean to promote economic growth and prosperity.

4. Nurturing Brains for National Innovation

During the initial stages of development, brain drain was a serious problem for Korean society. A significant number of people left to study abroad, and even after the end of the Korean war in 1953, increasing numbers of Korean students went abroad to study especially to United States. Between 1953 and 1967, 7,958 persons left, which was about 6.4% of all students enrolled in higher education in 1967, only 12.2% of whom returned. The government considered ways to turn those educated and trained abroad into valuable assets for modernization.

A salient examples is the Seoul National University (SNU) project (1955-1961). The Korean and American governments initiated the aid project in 1955. The US government hired the

²⁵ Lee, C. J., Lee, H., & Jang, H. M. (2010). The history of policy responses to shadow education in South Korea: Implications for the next cycle of policy responses. *Asia Pacific Education Review*, 11(1), 97-108

²⁶Dawson, W. (2010). Private tutoring and mass schooling in East Asia: Reflections of inequality in Japan, South Korea, and Cambodia. *Asia Pacific Education Review*, 11(1), 14-24.

The shadow education system, is a system of private tutoring that provides an additional curriculum to children, often after the classes are over. This system is widely spread in East Asia, and is operated within the system of private tutoring academies. It has been criticised by the Korean government as being detrimental to the the development of the children well being.

²⁷ Ibid

University of Minnesota (UMN) to undertake this large-scale project. The consultants, American professors with appropriate teaching and management experience in the US, resided in Korea, converting the domestic institutions into a modernized and globalized university. They oversaw the construction of buildings, and procured necessary equipment and research materials. Another important mission of the consultants was to select Korean professors to receive an American education that would bring them up-to-date with current research, legitimize their expertise, and identify them as conduits of modern education.

The program took place over six academic years, with the first class entering in the academic year 1955-1956 and the last entering 1960-1961. The first phase involved the training of the teaching staff at SNU's schools of medicine, agriculture, and engineering, with veterinary medicine and nursing as subfields. The second phase of the project worked to establish the School of Public Administration, which included the recruiting and training of its new faculty members. UMN professors were contracted to develop the new department and choose its first faculty members, who were immediately sent to UMN for training. Participants for the second phase came from Korean bureaucratic offices and various universities in Korea²⁸.

With the transferring of advanced knowledge and practices from the US, Korea was able to comprise a critical mass of reform-minded academic elites, who primed the pump for active academic and political exchanges between the two countries. The project also contributed to laying the groundwork for the nation-building of liberal democracy.

Another key project was the Korea Advanced Institute of Science (KAIS) project. While preparing for industrial restructuring, the government realized that high caliber scientists and engineers were still very scarce. Meanwhile, education in domestic universities focused more on theory than practical training. There was a growing need for a new institution to foster talented brains with the technologies and skills that domestic industrial fields desperately needed. Based upon the investigations and recommendations of Frederic E. Terman, former Vice President of Stanford University, known as the father of Silicon Valley, the Korea Advanced Institute of Science (KAIS) was established in the Seoul Research Development Park in Hong-neung, and commenced operation in April 1971²⁹.

SNU and KAIS functioned as brain trusts for leading opinions for national reforms and upgrading of science and technology. Those faculty members who had experiences of advanced societies guided domestic education to global standards and practices with a long-term perspective, disseminating a new wave of teaching, evaluation and laboratory systems.

²⁸ Together, the two phases of the SNU Project enabled 226 members of the SNU faculty to study at the University of Minnesota.

²⁹ KAIS hired 40 professors and officially opened in September 1973.

Furthermore, these institutions contributed to promoting national innovation and effective human resource management, working as conduits that bridged the relatively small domestic society with international communities.

There was yet another ambitious breakthrough project: the Korea Institute of Science and Technology (KIST), established in 1966 with US government support. As Korea's first modern comprehensive applied research institute, it provided the fundamentals for science and technology catch-up and self-reliance by developing domestic R&D capabilities. KIST played a role at the center of adoption, absorption, and assimilation of modern technology and championed the improvement of imported technologies and self-reliance in technological development. KIST ran an innovative operation system at that time. By the special law of "the Promotion of Korean Institute of Science and Technology" enacted in 1966 and the revision in 1967, the institute was guaranteed both financial support and autonomy with very limited interference from the government.

After the successful foundation of KIST, the entrepreneurial policy was extended to enhance the research and policy capacity of economic and social development. Korea Development Institute (KDI), a comprehensive policy think tank, was also legitimated by a special act, guaranteeing its autonomy and public financial support with strong support from the presidential leadership. The exceptional unit contributed to brain returns and effective economic planning and policy formulation for national development.

Following those experimental projects, government-funded research institutions (GRIs) were copied and established in every field and sector of society. They supported the government in planning, implementing, and monitoring policies, and worked as brain reservoirs in each field. Government-funded research institutes provided an opportunity to entice many Korean scientists and specialists living abroad to come back home. They contributed to the localization of advanced technologies, and took a leading role in modern scientific and technological development in Korea.

The large-scale repatriation of brains to Korean universities and institutes assisted scientists and engineers to rise quickly to the top rank of sociopolitical strata in Korea. At the same time, scientific planning and monitoring by capable professional researchers in the policy-making process strengthened the ability of the government and its officials. In turn, competitive rewards for foreign-trained doctorates and researchers encouraged young students to invest more in their education.

Table 3 summarizes the major educational and related policies and their backgrounds by periods.

TABLE 3 Major Educational Policies by Periods in Korea

Periods	EDPs	Socioeconomic circumstances	Economic Development Strategy	Manpower Policy	Major Educational Policies	Vocational education
1950		Vicious cycle of poverty; Destruction of industrial basis			One-for-one education; Established high school curriculum (including vocational high school) ('55)	Implementation of comprehensive high school ('54); The Five-Year Vocational and Technical Education Plan ('57)
1960	1st (62-66)	Vicious cycle of poverty; Destruction of industrial basis; High unemployment rate	Structuring basis for industrialization; Unequal growth; Export-oriented economic growth	First Technology Promotion Plan ('62); securing technicians and engineers	Expansion of compulsory education	Industrial Education Promotion Act ('63); Vocational high school curriculum with more than 55% of specialized subject ('66)
	2nd (67-71)	Beginning of development on light-industry; Impoverished conditions in rural area; High unemployment rate	Structuring basis for industrialization; Unequal growth; Export-oriented economic growth	Second Technology Promotion Plan ('66); Ministry of Science and Technology, KIST ('67), Vocational Education, Industry-Education cooperation, KAIST (71)	The Charter of National Education ('68); Science Education Promotion Act ('68); Middle School Equalization Policy ('69)	The Five-Year Science and Technology Education Plan ('67~'71)
1970	3rd (72-76)	Development of light-industry; 1st Oil Shock	Enhancement of industrial structure; External-oriented growth; Harmonization between growth and stability	Establishment of brain development system; Securing specialized manpower; National Technical Qualification System ('74)	Long-term educational plan ('72); KEDI ('72); High School Equalization Policy ('74)	Vocational education for heavy and chemical industry ('73); Mandatory field training; specialization of technical high schools; mandatory qualifying examination for vocational high school
	4th (77-81)	2nd Oil Shock; Increasing demand for equal development between urban and rural	Promotion of technology-intensive industry; External-oriented growth; Equal growth	Training for scientific technician; Fostering skilled technicians; Creating conditions to develop technical manpower; Stabilize labor-management relations	Long-term manpower supply plan ('77); Future prospects on educational development ('78); Reorganization of technical colleges and increasing enrollment quota ('78)	Benefits in advancing to same sector ('77); increasing enrollment quota for technical colleges ('78); Abolishing preferential treatment in entering universities
1980	5th (82-86)	Price instability; Increasing demand for democracy and welfare	Foundation for stability; Fostering knowledge-information industry; Equal growth	Preferential treatment to science and technology manpower; Establishment of science high schools ('83~)	University graduation quota system ('80); Prohibit private tutoring, abolish examinations; Establish Open University ('82); Establish foreign language high schools ('85)	Abolish technical qualification system in vocational high schools ('81); Abolish specialisation initiatives on technical high school
	6th (87-91)	Achieve democracy; Vitalization of labor movements; Disclose problems of economic development by the government	Sophistication in industrial structure; Free and competition; Openness and internationalization; Balanced growth	Secure high science and technology manpower; Reinforce vocational education; Supply plan for industrial manpower ('90)	Science and technology education; Long-term plan ('86); Vitalization of career path education ('90)	Plan to expand vocational high school share 50%; technical high school share 45% ('90)
1990	New Economy Plan (93-97)	High cost, low efficiency; Launch of WTO regime; Rapid globalization; Beginning of knowledge and information society	Low cost, high efficiency; Establish free and fair economic order		5.31 Economic Reform ('95)	Technical high school-industry 2+1 ('94); Expansion of vocational high schools; Vocational education in general high schools

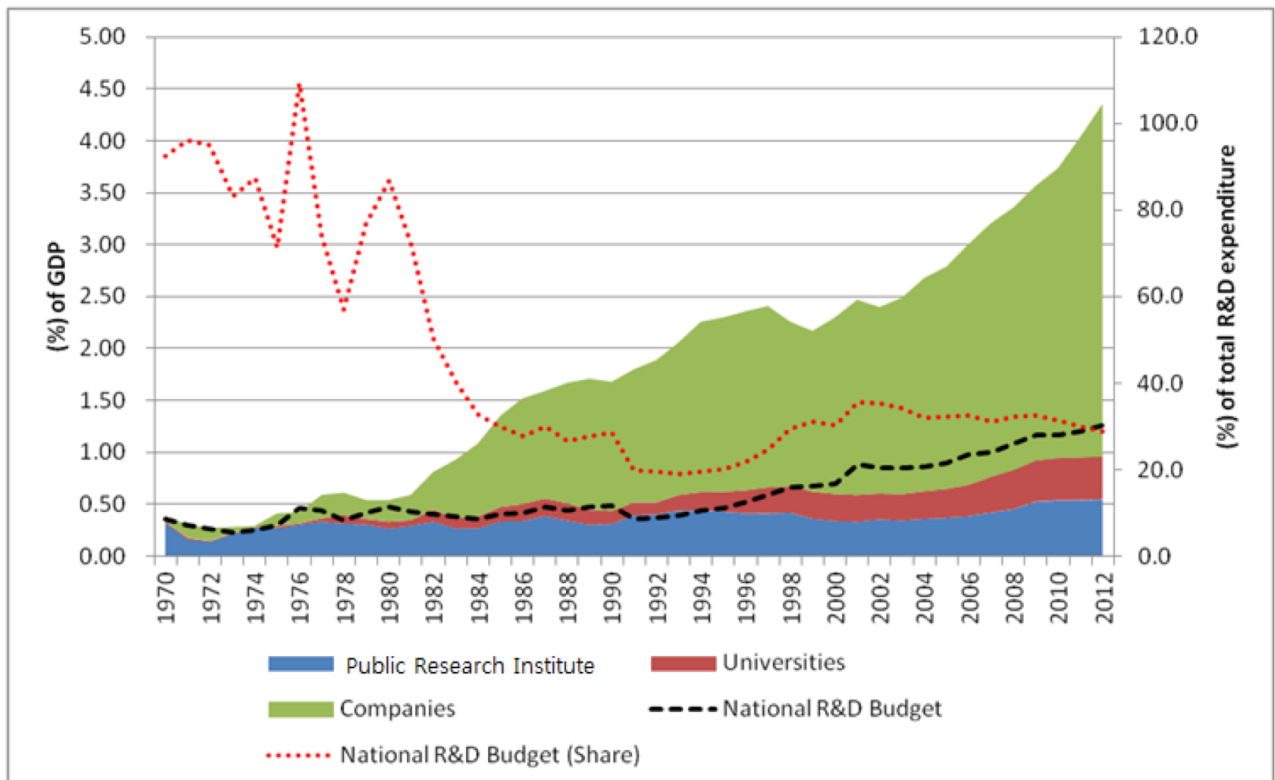
Source: Lee & Hong [2013]

5. Limits and Reforms

After transforming itself from an agricultural to an industrialised nation by the 1980s, Korea strengthened its high-tech industries and proceeded to become a knowledge-based economy through sustained investment in human capital for national innovation. These innovative knowledge institutions worked as incentives for the virtuous circle of human capital improvement, and as conduits bridging the relatively closed domestic society with international communities, while continuing to act as catalysts for social innovation.

As presented in <Figure 2>, Korea's investment in R&D was initially led by the government and remained minimal until the 1970s. However, as the investment by the private sector and universities began increasing rapidly from the 1980s and the government's R&D budget has also constantly increased, the total volume of national R&D investment reached 4.36% of GDP in 2012. This number surpassed that of Israel (4.20%) and made Korea number one in the world.

FIGURE 2 R&D Expenditure as Percentage of GDP by Performing Sectors in Korea



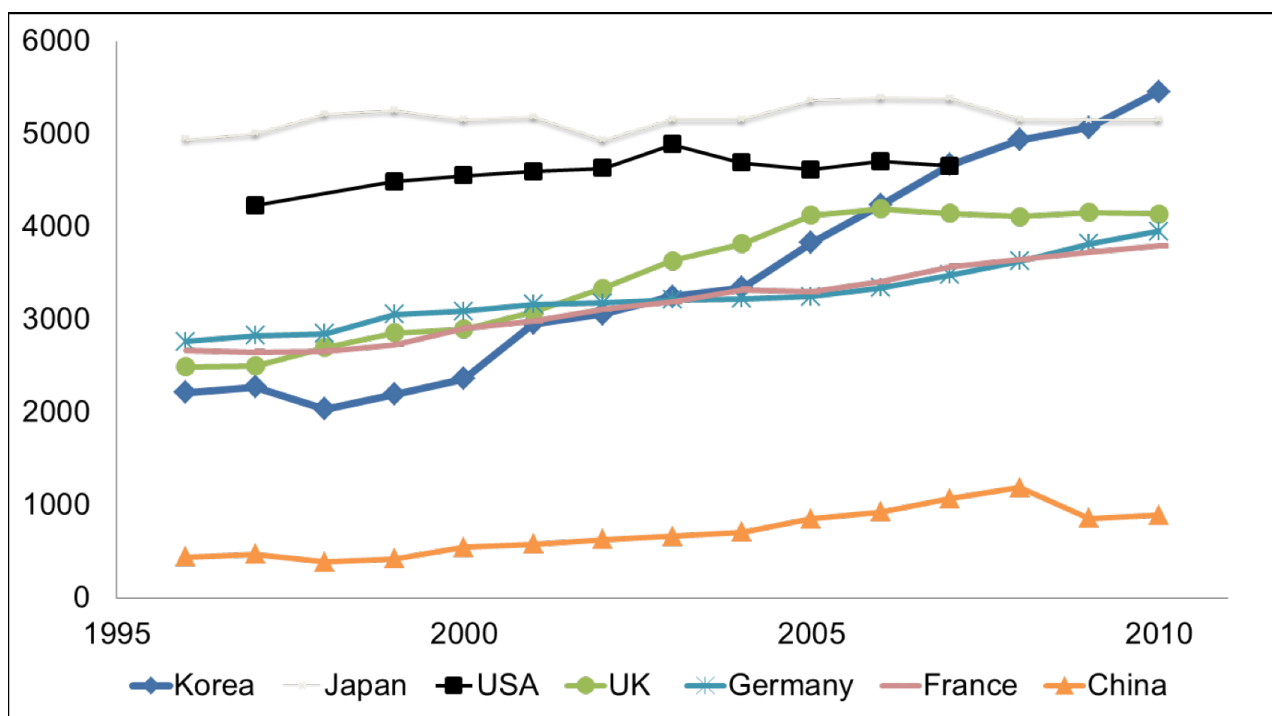
Source: NTIS (<http://open.ntis.go.kr/>), Lee et al. (2015)³⁰

³⁰ Lee, J. H., Kim, K., Hong, S. C., & Yoon, J. H. (2015). Can Bureaucrats Stimulate High-Risk High-Payoff Research? *KDI School of Public Policy & Management Paper*, (15-06).

In terms of researchers, Korea also shows rapid growth. By mid-1990s, Korea's number of researchers per inhabitant was smaller than those of other advanced countries, but Korea surpassed most of them in 2010. In terms of number of researchers per million inhabitants, Korea has the highest ratio among the countries with high R&D spending³¹.

The comparison of number of PCT patent applications by country showed that Korea was ranked 5th in the world after the United States, Japan, Germany, and China. Korea outnumbered other advanced countries such as France, the United Kingdom, and the Netherlands. Among applicants, the business sector was the most active accounting for 79.3% of total application in 2011, while that of universities and public sectors was 10.63% and 10.12%, respectively. The large share in R&D of business shown in <Figure 2> can explain the high share of patent application. Recent rising trend of universities' share of patent application suggested that the R&D partnership of companies which had previously been led by government research institutes (GRIs) has moved to universities, partly reflecting measures to promote links between universities and industry.

FIGURE 3 Number of Researchers (FTE) per million inhabitants



SOURCE: UNESCO (<http://data.uis.unesco.org/>), Lee et al. (2015)

However, the rapid quantitative expansion of researches and investment on R&D has produced few innovations, and there has been growing concerns about the quality of research outcomes. Universities are also criticised for their weak global competitiveness and

³¹ Ahead of Korea (5,451) are Finland (7,717), Demark (6,774), and Singapore (6,307) in 2010.

inactive linkage with industries and businesses. More fundamentally, many people raise questions about old rote learning and uniform teaching practices in primary and secondary schools, which seem to demoralise creative and critical thinking of students. Even worse, some argue that there was an *education bubble* in which persistent increases in educational expenditures have failed to contribute to human capital accumulation. During the period from 1990 to 2009, the total private educational expenditure increased by more than four times; the advancement rate of high school graduates to college rapidly increased from 33.3% in 1990 to 83.9% in 2008; the share of vocational high school graduates taking jobs sharply decreased from 80.1% in 1991 to 16.8% in 2009; and the expansion of the low-quality 2-year and 4-year colleges under vertical differentiation was intensified (Lee, Jeong, and Hong, 2014³²).

To revitalise the whole education system and enhance the global competitiveness of universities and the R&D system, every administration has put human capital policy on the top of the reform agenda. Even though the strategies of each administration differed by their ideological and policy orientation, the government has consistently pursued the policy direction of more investment in early childhood, creative school education, fair admission review for a diverse student mix, strengthening TVET education and career coaching, and higher education restructuring for specialisation and more accountability³³.

IV. Lessons and Implications

Given developing countries' unique politico- economic structures and development stages, the Korean experience cannot be best practice or best match for many of them in their original form. Especially for those countries in Africa with large physical distances, highly diverse cultural backgrounds and dissimilar social structures, changes on the other side of the planet may seem too extraneous to be incorporated into their systems. However, since Korea's dynamic process of transformation happened as a laborious outcome of iterative trial and learning from failures, the Korean experience may provide useful insights for addressing chronic problems in other regions.

Some key lessons from Korea's case include the following. Human capital is a critical factor of economic growth, and, therefore, its policy should closely correspond with economic and

³² Lee, J. H., Jeong, H., & Hong, S. C. (2014). Is Korea Number One in Human Capital Accumulation? Education Bubble Formation and its Labor Market Evidence. *Education Bubble Formation and Its Labor Market Evidence (August 1, 2014)*. KDI School of Public Policy & Management Paper, (14-03).

³³ For more detailed explanation see: Lee, J. H. (Ed.). (2013). Positive Changes: The Education, Science & Technology Policies of Korea. Updated edition. Korean Economic Daily and Business Publications.

industrial policies. Coordinated and twinned policy of human and industrial development can bring about effective outcomes of both policy areas. The balanced and sequential development of general, vocational, and tertiary education can improve equity of opportunity and effectiveness of investment. Top talented brains are indispensable for national innovation, and their education and training should be relied upon other advanced countries especially at the initial stage to some extent. This can help establish a virtuous cycle for human capital accumulation and sustainable growth.

Considering the ethnic diversities and often domestic conflicts in the African region, mandatory schooling and reconciling national curriculum should be at the top of the to-do list for educational authorities of the region. Education should equip the next generation with a unified national identity, right understanding of history and the economic system, and build character and skills to lead in a knowledge-based global society. Primary schooling can usefully emphasise self-reliance, trust, and patriotism. Education authorities partnering with national leaders can introduce these social demands into school education to lay the groundwork for the future and destiny of their countries. Specifically, they need to focus on (i) establishing a comprehensive and balanced curriculum, (ii) securing competent and dedicated teachers to deliver the curriculum, and (iii) enhancing administrative capability to raise the completion rate of primary schooling. In-depth review and diagnosis focused on those areas and global comparative studies would help to formulate and adopt a consistent and effective policy package.

In addition to establishing such a curriculum, universalising primary education by raising its completion rate is another urgent task that the countries have to tackle. Despite high rate of enrolment rate in primary schools, many students drop out of schools. The reasons why many promising future minds give up their learning need to be carefully investigated. Many students and their parents in developing countries are not convinced by their educational system and their ability to secure a future career after schooling. Investment in classrooms, textbooks, and teachers are not enough to persuade people to attend schools. Synchronised intervention in both economic and educational policies can lead inclusive economic growth, generating decent jobs and fair chances of social mobility. Then people will join the virtuous cycle of human capital investment and economic growth.

The key policy channel to coordinate education and the economy is vocational and technical education and training (TVET), which plays a critical role in supplying industry with mid-level skilled workers. As in Korea in the past, many people in developing countries may prefer general education for advancing to colleges and white collar jobs, looking down on vocational training and manual works. However, industrial competitiveness, a key driver of sustained growth, is based upon skilled workers and their updated vocational and technical skills. TVET, combined with proper reward systems for technicians can essentially change

the mindset of many people to favour blue collar jobs, which is fundamental to transform developing economies to sustaining industrialised ones.

The establishment of a skill qualification framework supported by government and the global and local business communities can help boost the supply of technicians. Setting up exemplary vocational high schools teaching students with excellent facilities and guaranteeing their employment in decent jobs could help inspire young generations. However, the success of a vocational training system closely depends on meeting industry's demand—a task to be jointly tackled by the private sector and government.

Thus, tripartite partnership and close coordination among industry, education and government is key for effective skill development. Since it would be too difficult to build effective partnership in whole sectors of industry, the government can strategically select certain sectors to mobilise resources and young talents to make a few successful cases as good examples. Multinational or global companies can be great partners to sponsor such programs that aim to change formal schooling and vocational education. The candidate schools should be one of regular schools under the supervision of educational administration, not training centres or institutions under labor authorities, which have a minimal impact on formal schooling. Given limited financial resources and policy capacities in developing countries, the strategy of introducing reforms on a pilot basis for targeted fields or institutions could be more effective than widespread adoption at once.

Another important criterion in deciding the priority of investment among various different educational sectors is the “quantity or quality” issue. This is a quite complicated puzzle. Especially in the early developmental stage, the investment in primary, secondary, vocational, and tertiary education must be distributed in a strategic manner to make the system more inclusive and effective. For example, the government may emphasise the expansion of primary schooling, forsaking the quality of it for some time, as Korea did. A high ratio of students to teachers and that of students per classroom in the early developmental stage contributed to make primary education accessible for more children and gave them a chance to pursue secondary education. On the other hand, the number and the quality of teachers were under tight control to keep the profession attractive for talented people. Their heavy work of covering overpopulated classrooms was rewarded with a stable status as civil servants with guaranteed life-long tenure and steady income.

A nuanced approach is needed for investment in higher education and its reform. Higher education in developing countries is responsible for narrowing the knowledge gap with developed countries by preparing national leaders in every sector of society and by learning and transferring advanced technology from global society. Universities and colleges should be networking hubs for domestic talent offering advanced knowledge and technology. They are epicentres of modernisation in the sense that they lay the groundwork for democracy

and install scientific culture into the social interaction. However, unfocused expansion of colleges for private interests could lead to ineffective investment in higher education that may hinder modernisation and even worsen brain-drain by producing over-educated graduates with limited productive skills aligned with actual needs, who therefore remain unemployed. At the initial stage, technical or vocational training schools and institutions at secondary levels are likely to be more in demand, and should therefore remain in focus for efficient human capital investment.

In the development stage quality control and selective investment would be critical to lay the groundworks of an effective higher education system. The policy framework should aim to encourage focused functional differentiation among different institutions and to contain the urge for rapid quantitative expansion in public or private institutions. Educational authorities can usefully set minimum quality standards requiring qualification of faculties, specification of facilities and educational assets, limiting the operations to effective institutions. At the same time, there should be robust policy leadership linking the curricula of higher educational institutions with regional and industrial demands. This will promote differentiation and specialisation of each institution at regional and national level. In addition, it is imperative to design and activate effective human resource management as early as possible. Since some brain drain in developing countries is unavoidable, a proactive circular system sending talent abroad for education and providing strong incentives for their return would be a winning strategy in the long run. For example, some African countries have operated the brain circulation initiative of PASET (See Box 1 for more information).

Last not but least, policies are means to solve social problems, not ends themselves. Therefore, the problems and solutions should be understood in their specific contexts, and require continuous monitoring and fine-tuning. This in turn demands well functioning official institutions and capable civil servants. Sovereign government is the only authority to implement policies and needs to attend to it throughout the whole policy process: setting development priorities, sequencing reforms, packaging policies, devising strategies for implementation, and coordinating and fixing issues that arise. Factors such as cultural diversity, various socio-economic structures, and varied political demands shape the unique circumstances of policy reform for each nation. While lessons from the experience of other countries are available, every country needs their own creative and cooperative solutions. The problem-solving process involves some trials, errors and failures, but this is inescapable feature of learning by doing in development.

BOX 1: Partnership for Skills in Applied Sciences, Engineering and Technology (PASET)

The Partnership for skills in Applied Sciences, Engineering and Technology (PASET) initiative was launched in 2013 to address the rapidly growing youth population and their employment by African governments and the private sector, with facilitation by the World Bank. This partnership recognized the critical need to strengthen applied science, engineering and technology capabilities for the socio-economic development of sub-Saharan Africa (SSA), from the upper-secondary technical and vocational level to the postgraduate level, and in scientific research. PASET is a unique Africa-led initiative, which focuses on building skills for key economic sectors that will support Africa's socio-economic transformation. To accomplish its plans, PASET sets 10-year medium term goals including:

1) Training at least 10,000 new Ph.D. holders in ASET programs; 2) Establishing a SSA region-wide post graduate scholarship program in ASET fields and addressing brain drain at the post graduate level; 3) Doubling the number of students in ASET programs in at least 10 SSA countries; 4) Facilitating the emergence of at least 5 additional universities in SSA with high quality ASET programs, and centers of postgraduate studies & applied research in ASET disciplines; 5) Facilitating the emergence of at least 5 regional Technical, Vocational Education and Training (TVET) centers of excellence for training faculty of TVET institutions; 6) Developing a regional quality assurance mechanism for ASET programs; and 7) Establishing high quality data systems and benchmarking of ASET programs and institutions in at least 10 SSA countries.

In order to attain these objectives, PASET has launched a number of regional initiatives, which bring together financing, partnerships, technical assistance and knowledge sharing: (i) Regional Scholarship and Innovation Fund (RSIF) for training Ph.D students and undertaking research and innovation in ASET disciplines in SSA universities; (ii) Partnerships with foreign universities for SSA universities that become host universities for RSIF scholars to improve the quality of their postgraduate programs; (iii) Regional Benchmarking Initiative to improve the quality of universities with technical assistance from Shanghai Jiao Tong University; (iv) Establishment of Regional Technical and Vocational Education and Training (TVET) Centers of Excellence; and (v) Technical support to countries to develop their Country ASET Action Plans.

Partner countries including Brazil, China, and India have participated in some capacity in PASET activities, and the Korean government has cooperated with PASET members by means of a Knowledge Sharing Program (KSP), which aims to enhance policy capacity through mutual learning activities.

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