

## The Place of R&D and Education Policies in South Korea's Economic Development

Aslı Kavurmacı<sup>1</sup>

### Abstract

Undoubtedly, one of the influential factors in the economic development of a country is its educated and skilled human resources. A meaningful relationship between education and level of development has required countries to determine a national science and technology policy. In this context, it would not be wrong to argue that increased intellectual capital, high numbers of published scientific articles, number of patents set in universities and research centers, and expenditures of R&D affect the level of a country's development in terms of intellectual context. Aiming to create a qualified workforce with the guidance of technology and education, Korea puts this goal into practice by following the innovations in all education levels from primary education to university level and by giving priority to these innovations in most cases. Briefly, the aim of this study is to emphasize that education and R&D policies have been an important driving force behind Korea's development.

### Keywords

South Korea • Educational policies • R&D policies • Economic developments

### Güney Kore'nin Ekonomik Gelişiminde Ar-Ge ve Eğitim Politikalarının Yeri

#### Öz

Hiç kuşkusuz ki ülkelerin ekonomik açıdan kalkınmalarının en önemli etkenlerinden biri eğitim ve sahip oldukları nitelikli insan kaynağıdır. Eğitim düzeyi ile kalkınma arasındaki anlamlı ilişki, ülkelerin ulusal bir bilim ve teknoloji politikası belirlemesini zorunlu kılmıştır. Bu bağlamda entelektüel sermayenin artırılması, daha fazla bilimsel makalenin yayınlanması, üniversite ve araştırma merkezlerinde ortaya koyulan patent sayısının yükselmesi, araştırma ve geliştirme harcamalarının artırılması ülkelerin insan sermayesi bağlamında gelişmişlik düzeylerinin bir göstergesi olduğunu savunmak yanlış olmayacaktır. Teknoloji ve eğitimin rehberliği ile nitelikli bir işgücü yaratmayı hedefleyen Kore, ilköğretimden üniversiteye kadar tüm eğitim düzeylerindeki yenilikleri takip ederek ve çoğu durumda bu yeniliklere öncelik vererek uygulamaya koymaktadır. Bu çalışmanın amacı özetle, eğitimin ve Ar-Ge politikalarının, Kore'nin gelişiminin ardındaki önemli bir itici güç olduğunu vurgulamaktır.

#### Anahtar Kelimeler

Güney Kore • Eğitim politikaları • AR-GE politikaları • Ekonomik gelişme

1 **Correspondence to:** Aslı Kavurmacı (PhD [C]) in Istanbul University, Faculty of Industrial Relation and Labor Economics and Lecturer at Bandırma Onyedi Eylül University, Bandırma, Balıkesir 10200 Turkey. Email: [akavurmaci@bandirma.edu.tr](mailto:akavurmaci@bandirma.edu.tr)

**To cite this article:** Kavurmacı, A. (2018). The place of R&D and education policies in South Korea's economic development. *Sosyal Siyaset Konferansları Dergisi*, 74, 51–64. <https://dx.doi.org/10.26650/jspc.2018.74.0003>

After the Japanese colonial period and separation from North Korea, a tough journey began for South Korea. All productive land and natural resources in the peninsula were left in the north part. In addition, the lack of skilled and productive labor required for the development of South Korea became another major obstacle. To overcome these difficulties, South Korea (hereafter referred to as Korea) put education policies in place as a high priority as well as including economic goals in their plans during the development stages. The primary education level in Korea, which was 45% in the 1950s, reached nearly 100% in the 1960s. Moreover, literacy rates increased from 3% to 80% between 1953 and 1961. The contribution of the state was also important in this period. Therefore, the ratio of government expenses on education reached 15-20% of the public expenditures. The primary school education became compulsory and financing of this education was subsidized by the state. Under these circumstances, between 1962 and 1966 the primary education enrollment rate increased threefold (Gönel, 2000, p. 138).

Many institutions were also formed by the government to support these educational plans and policies during the development period. Before Korea Institute of Science, Technology, and Information (KISTI) which was established in 2011, there were many different institutions that directed research facilities in Korea. First, Korea Science Technologic Information Center (KORSTIC) was founded in 1962. Then, two important centers (KORSTIC and International Economic Research Institute) merged and continued their facilities under the name of Korea Institute of Economy and Technology in 1982. But in the 1990s, competitiveness become an important issue for Korea which needed to be improved globally as quickly as possible. Therefore, in order to be a part of the global competitiveness, the Korea Institute of Science, Technology, and Information (KINITI) was established in 1991. From the 1990s to the 2010s, both KINITI and KORDIC (Korea Research and Development Information Center) become main centers to conduct and improve Korea's research and development resources in both the academic and sectoral respect. Latterly, in 2011, these two centers become one as the Korea Institute of Science, Technology, and Information (KISTI) to sustain Korea's R&D potential more broadly (White Paper, 2014, p.84).

### **Korea's National Development Through Educational Development**

Education has always been underlined as an important factor by Korea since the Chosun dynasty, and over the years of their development phase, the education system increased rapidly and become one of the greatest assets just like other industrialized countries (Gupta et al., 2013, p. 33). Today, Korea is one of the most well-known countries for successful application of their advanced information and communication technologies (ICT) to education. In this respect, they even offer consultation to other countries and the private sector has been an important support to the government in this

regard (Levent & Gökkaya, 2014, p. 276). Government initiated programs, integration of universities and private sector show a significant increase in R&D output and both government and private sector turn this accomplishment into an advantage in the competitive environment. In 2016, according to OECD data, gross domestic spending on R&D was 4,2% in Korea which is 2% more than OECD average (OECD, 2018). To promote education, the government has reorganized many institutions and research centers to respond to the fast-changing technological environment such as expanding the use of digital devices and smartphones in a proactive and prompt manner. The government has also recently introduced compulsory software education in primary and middle schools. In addition, the government has been supporting continuous and preemptive structural reforms for universities to be competitive and ready for future society. They have introduced new features for higher education like The Cyber University, The Korean Massive Open Online Course (K-MOOC) which began its service in 2015, and they have also implemented a next-generation education information system. Nearly 300 online lectures are currently available for lifelong learners or low-income students on K-MOOC (National Library of Korea, 2016; NILE, 2015).

In the beginning of the development stage, Korea targeted education as one of the key areas to achieve speedy growth. In keeping with this, as well as expansion of government budget, spending on education increased as well. In 1970, the government had a 446 billion Won budget while the Ministry of Education (MOE) had a 78 billion Won budget for their expenditures. In 1990, the government budget was 22,689 billion Won and the share of MOE was 5,062 billion Won which was nearly 22% of the total budget. Almost 15 years later, the Korean government's budget exceeded 134,370 billion Won and MOE's share increased to 27,982 billion Won respectfully (Lee, 2006, p. 31). Apart from education, there has been significant increase on annual budget of R&D spending. In 2006, the amount of R&D budget spend was 273,457 billion Won and the budget rose to 637,341 billion Won in 2014 which is 24% of the Federal budget (NTIS, 2014). The importance attached to the

Table 1  
*Contribution of Education to Economic Growth*

	1970	1980	1990	2000	2010	2017
Population (Millions)	32	38	43	47	50	51
GNI per capita (US\$)	257	1,686	6,505	11,865	22,170	27,600*
Unemployment rate (%)	4.4	5.2	2.4	4.1	3.4	3.3**
Labor force (Millions)	10	14	19	22	25	27**
Labor force participation rate (%)	57.6	59	60	61	60.8	63.2**

**Source:** Korea Labor Institute, 2017-Population & Employment Data, 2017-Major Economic Indicators Data, [https://www.kli.re.kr/kli\\_eng/selectBbsNttList.do?bbsNo=35&key=381](https://www.kli.re.kr/kli_eng/selectBbsNttList.do?bbsNo=35&key=381), Date Accessed: 28.05.2018.

\* 2016 World Bank Data: <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KR>, Date Accessed: 28.05.2018.

\*\* 2017 Ministry of Employment and Labor (MOEL), Major Statistics of Economically Active Population, <http://www.moel.go.kr/english/pas/pasMajor.jsp>, Date Accessed: 28.05.2018.

educated human capital and R&D outputs also reflect the development level of the country. As a result, Korea's GNI rates has increased and unemployment rates have decreased over the years.

### **Confucian Ethics and Its Reflections on Education**

Since ancient times, social rules in Korea have been shaped by Confucian traditions, and these rules have also become an important part of social life in modern South Korea (Sleziak, 2013, p. 27). Confucian ethics underline moral and social values and call for a unique sense of identity in the holistic network of the proper roles in many different aspects such as the self, family, society, and government. Therefore, this value system is still considered to be a national inheritance and part of social identity in Korea. By way of explanation, interpersonal relationships and values are expressed in Confucian-related terms. For elementary, middle and high school students, textbooks on ethics and society include basic Confucian norms which means that the responsibility for the ethical education of children is shared by both family and society (Chung, 2015, p. 79–80). In Korea, which has a Confucian moral understanding, education is perceived as an important means to reach a high spiritual level and gain respect in society. During the Chosun dynasty, the knowledge of Confucian books was an important selective factor in examinations for entrance to Sungkyunkwan, an academy that raised high-level bureaucrats in the past. The lower-level schools that used to provide a preparatory education for Sungkyunkwan were also run by the Confucianist elites and their students came from the aristocratic class. The curriculum of these schools consisted of Confucian teachings, calligraphy, literature and Chinese characters (Atay, 2013, p. 135–136). As stated by Kim and Bae, “For Koreans, education has been considered important and quickest way to increase social rank and to achieve *jasusungga* (making one's own fortune)”. From the Chosun dynasty onwards, the appointment of persons from prestigious universities to high-ranking places has made society aware of the need for good education for the future of their children. This is why Koreans are investing in the future of their children and making high expenditure for their education (Kim & Bae, 2004, p. 46). Today, Sungkyunkwan University which is over 600 years old, is still an important higher education center that provides world-class education in Korea. The university has the highest employment rate among other Korean universities which was 68.3% in 2015. In addition to Sungkyunkwan, Korea has many universities offering high quality education in disciplines such as engineering, humanities and social sciences. Some are focusing on research and training at high level while others are working in partnership with universities abroad. For example, graduates from Seoul National University serve as public servants in key positions within the government. Also Sungkyunkwan University strengthens its industry-university links with KAIST's National Center for Nanotechnology, the unique center for nanotechnology, in order

to guide research over this area and its potential applications. The Times Higher Education listed the above mentioned Korean universities' features accordingly (Times Higher Education, 2018).

Table 2  
*World University Rankings – The Highest Three of Korea in 2018*

Rank	Name	Overall	Teaching	Research	Citations	Industry Income	International Outlook
74	Seoul National University	64,9	69,3	71,2	60,6	79,8	34,1
95	KAIST	60,9	56,3	59,2	70,4	100	35,6
111	Sungkyunkwan University	59,3	54,1	55,1	69,5	93,7	44,7

**Source:** Times Higher Education, World University Rankings, [https://www.timeshighereducation.com/world-university-rankings/2018/world-ranking#!/page/0/length/25/locations/KR/sort\\_by/rank/sort\\_order/asc/cols/stats](https://www.timeshighereducation.com/world-university-rankings/2018/world-ranking#!/page/0/length/25/locations/KR/sort_by/rank/sort_order/asc/cols/stats), Date Accessed: 09.04.2018

### **Educational Developments After Japanese Occupation**

After the Korean War and the achievement of national independence, land reforms were carried out and these reforms lead to the abolishment of the aristocratic class. As a result, everyone was able to achieve an equal social status and had the chance of getting a job through education. The training of human resources in Korea after the war had a strategic importance for the reconstruction of the country (Atay, 2013, p. 136). The Korean Government presented and applied various five-year development plans during the 1960s and 1970s. These development plans transformed the economy and the country showed rapid expansion from the late 1960s. But with development, the need for skilled human resources increased. Hence, from the late 1960s to 1970s, high-level vocational and technical education was emphasized and strengthened accordingly. The government made necessary changes to school curriculums and they became more discipline-oriented, stressing science and technology education to be taught at schools (Kim, 2002, p. 30–31). The Korean Government changed its industrial development strategies in the 1970s and emphasized the requirement for technicians and engineers to be qualified with these strategies. In order to meet these needs, the number of technical high schools doubled and the number of students increased considerably. In addition, the technical high school improved in quality and access quotas were extended especially for subjects related to machinery, electronics and chemistry (Kim, 2008, p. 338–339). From the mid-1970s to 1980s, the government stressed the importance of education for the nation's development and introduced a series of education reforms in 1980 including issues associated with competition for college entrance. In addition, they brought new rules in to prevent private tutoring, which creates heavy financial burdens on Korean families. Schools also adopted new curriculums that focused on the combination of many different subjects for the students' education (Kim, 2002, p. 30–31). As highlighted by Kim, "Over the years, human power development policy has also shifted from replacing

many industrial workers towards high-level scientists and engineers, according to changes in industrialization policies in Korea. Since the 1980s, high-level scientists and engineers have been particularly trained and employed in high-tech areas such as computers, semiconductors and bioengineering” (Kim, 2008, p. 340).

### **South Korea’s Education System**

Amsden underlined that, the important role that the well-educated workforce plays in the industrialization process in Korea has proved that a high level of education is one of the main determinants of industrialization. (Amsden, 1989, p. 238). According to Koh and his fellow researchers (Koh et al., 2010, p. 236), “since the expansion of education taking place in sequence, starting from primary education to tertiary education, it’s clearly matched to the stages of Korea’s development. The primary education system provided suitable workers for the industries in the 1960s and then, the development of the secondary education system contributed to the growth of capital-intensive industries in the 1970s and 1980s, while the expanded education policies provided skilled labor for the knowledge-based economy in the 1990s. This is being followed now the discussion about expanding and improving Ph.D. programs in Korea”.

Compulsory primary education in Korea was first initiated in 1950. After that, middle school education was made compulsory in 1985, starting from the islands and isolated areas and then moving to farming and fishing villages, small and medium cities, big cities and then finally, Seoul. Moreover, both primary and middle school education have been compulsory all across the country since 2004 (MOE, 2017). Today, the school system in Korea begins with six years of primary/elementary school. Then students attend middle school for three years. Three years of general or vocational high school education is followed by a two-year degree or university education which also consist of 4 years of education. As a mandatory education, from primary school to middle school, every child must attend their classes. In addition to these, there are higher education institutions offering undergraduate education in four different categories (Kim, 2002, p. 29): (i) colleges and universities, (ii) colleges of education / teacher’s colleges (iii) open universities, (iv) theological colleges, seminaries, and others.

The latest revision in Korea is starting in 2018 and software education will become a compulsory subject in primary and middle schools. To prepare for that, in-service teachers are being trained, old computers are being replaced with new ones and computer classrooms are being set up. In addition, designated software education research institutes and leading schools are sharing and spreading their best practices of software education. In the meantime, Korea adopted the FSS (Free Semester System) in all middle schools in 2016. During FSS, students do not have any kind of exam. All they need to do is to focus on developing their talents, try to find out different interests and think about their career options while experiencing

various activities (MOE, 2017). To support these activities, the government has also summited a variety of additional educational online material available to all students in different Internet portals free of charge (OECD, 2016).

In addition to these revisions, the government has searched for ways to meet not only education with traditional methods but also for different needs. Since 1996, the National Open University of Korea and the system of Self-Study Bachelor's degrees has been introduced to help nontraditional students to obtain degrees. In addition, the government introduced another system called the Academic Credit Bank System (ACBS), for the students who had received academic credits from different institutions. These students had academic credits from more than one institution but did not have enough credit to receive a degree from any of these institutions. With the help of ACBS, credits will be collected into a pool and packaged into a degree, or a plan of study that provides a degree for students (Usher, 2014, p. 8). The National Institute for Lifelong Education reported that the number of ACBS Institutes eligible to operate accredited subjects was 533 in 2015. Since 1998, the number of degree earners through ACBS has been 554,051 and the number of enrolled learners was 1,180,395 (NILE, 2015). Furthermore, more than 100 million works have been made available for free with the Digital Library Portal, which was launched and sponsored by the Korean National Library in 2009 to support the education of students and people from different age groups (White Paper, 2014, p. 85).

### **R&D Policies and Practices in Education**

From the 1960s to 1980s, Korea shifted its investment strategy from industrial policy to technology policy, and also caused a large increase in private sector R & D spending. The share of the private sector in total R&D spending increased from 32% in 1971 to 80% in 1987. As high technology investments have begun in Korean firms, South Korean engineers working in American companies have been targeted and scouted by Korean companies. Engineers who agree to return have played a key role in the learning process and have positively influenced the research efficiency of Korean firms. South Korea's investments in technology reached 10 billion dollars in the 2000s compared with 480 million dollars in 1980. In the same period, the technological investments per domestic product increased from 0.84% to 2.68%. The number of experts interested in science and technology increased from 18,500 in 1980 to 160,000 in 2000. In 1999, The National Science and Technology Council (NSTC) was established by the government to strengthen national science and technology policy coordination. Moreover, the government increased science budget investments from 19% to 25% from 2002 to 2006 and promoted 400,000 specialists in six national strategic areas in 2005. These fields are information technology, biotechnology, nanotechnology, space science, environmental and cultural technology. Government and employers also



encouraged women workers to take various steps to improve their skills in technology-related areas. Some measures were taken in this respect such as the recruitment of more female students in the fields of science and technology (Oğuztürk, 2011, p. 51–52). In addition to increasing the quotas of the programs in the selected areas in universities, various financial and tax promotions have been introduced by the government such as technology funding system, tax reductions in R&D expenditures, the creation of HR development programs, and exemption from military service for research staff working at research centers (Atay, 2012, p. 177; Kim, 2008, p. 338–339).

### **The Government's Role in R&D Policies**

Since the beginning of the industrialization stage, the Korean government acted as a leader for promoting the development of the education system in addition to the industry. Besides the skilled workforce for the industry, a need for qualified scientists and engineers was emphasized. (Kwon, 2010, p. 66). As stated by Gupta and his fellow researchers “South Korea, which has insufficient natural resources for economic growth, has closed this gap with giving emphasis on human resources and has made great investments in education, science, technology and knowledge” (Gupta et al., 2013, p. 1). This awareness has put Korea's universities in an important position and since then Korean universities have been given an important role for creating a well-educated source for economic growth. Since the 1990s, a series of policies for increasing universities' research and development activities and for giving additional support to R&D Programs was introduced by the government. Today, Korea's universities are recognized as some of the important actors who contributed visibly to the economic development of the country (Kwon, 2010, p. 66). In the line with that, the Ministry of Education, Science, and Technology (MEST) and the Ministry of Knowledge Economy (MKE) are responsible for promoting and supervising innovation policies in South Korea. MEST is the core center that is mainly responsible for setting policies for science and technology development and R&D investment. In addition to that, MEST also supports both government and private universities and research institutes (Gupta et al., 2013, p. 16).

Recently, The Government has put into practice some of their education policies. One of the initiative programs among others is the Employment First-University Later Program. Through this program, the government intends promoting lifelong learning and vocational training and resolving the mismatch between the supply of students and labor market demands for particular skill sets. Offering financial support to students in vocational schools is the other main aspect of this program. In 2013, National Competency Standards (NCS) has also been implemented in this respect. The main aims of NCS are to determine the competencies needed by the sector and to gain them through education. To achieve that, schools and colleges have introduced a



new curriculum based on NCS and have aimed to reduce conflicts between technical education and also create a fruitful cooperation for both sides. However, an obstacle for Korean students and their families is high education tuition fees. To overcome this obstacle, the Korean government introduced an income-linked Half-Tuition Policy in 2012. With this policy, fees are intended to be reduced by 50% and provide a full scholarship for students who cannot afford tuition fees. Lastly, a new university assessment system which is another upcoming implementation for universities has been introduced. This system involves the rearrangement of enrolment capacity for higher education institutions. To avoid demographic decline and ensure the quality of the higher education system, three assessments will take place once every three years. If the universities show good performance in the assessments, they will be given higher numbers for student enrolment (KCUE, 2015; OECD, 2016).

Korea's human resources development strategy's first step was to spread education nationwide and then increase the quality of education. To achieve these goals, the government has made a great improvement in taking innovative steps not only for compulsory education and higher education but also vocational education. The Excellent Research Center Program (ERC), Regional Research Center Program (RRC), Industry-University-G.R.I. Consortium Program and The Technopark Program are some of these practices that were initiated by the government and carried out by universities and the private sector to give the country a competitive advantage in both education and industry worldwide.

Table 3  
*Government Initiated R&D Support Programs in Universities*

Name of the Program	Content
Excellent Research Center Program (ERC)	Twenty researchers from selected research-intensive universities were banded together in a team to conduct national R&D program set by the government for nine years. Funds for projects and research team were supplied by the government and every three years, authorities requested satisfactory research outcomes. With the help of this program, the teaching-oriented traditional universities found themselves in a competitive innovation environment during the 1990s.
Regional Research Center Program (RRC)	After the positive effects of ERC program, RRC program started in regional level in 1995 to expand the research capacity of local universities and support rural economy.
The Technopark Program	With the help of The Technopark Program, 37 technoparks were established within the framework of university-industry cooperation in order to support innovative works, to increase productivity and the competitiveness of international competitions since 1997.
Industry-University-G.R.I. Consortium Program	This program was created to support S&M businesses in order to develop and purchase new products. Actors of the program can get financial support. Condition of the program is at least seven or more SMEs and university affiliated research institute should be gathered and perform research on a new product or model at least every one or two years.

**Source:** Erhan Atay, *The Journal of Knowledge Economy & Knowledge Management*, 2012, 7/2, p. 178; APEC [http://www.apec-smeic.org/newsletter/newsletter\\_read.jsp?SEQ=301](http://www.apec-smeic.org/newsletter/newsletter_read.jsp?SEQ=301), Date Accessed: 10.04.2018; Korea Technopark Associations, <http://www.technopark.kr/>, Date Accessed: 10.04.2018.

### The Role of Universities in R&D Policies

In recent years, Korean universities have shown rapid increases in both patent applications and R&D spending. From 1970 to 2008, university R&D expenditures increased by an annual average of 15.3%. With the steady increase in R&D expenditure, there has also been an increase in the university's research output. 1,613 SCI-level journals were published and twenty-seven patent applications were presented by Korean universities in 1990 (Suh, 2010, p. 116). From the 1990s through to the present, the Korean government has supported a number of educational reform packages, particularly in high-tech areas, and has pushed Korean universities to show significant increases in the number of intellectual outcomes such as articles and research (Keçeli, 2013, p. 242). As indicated in the below table, Korea published more than 35,000 articles in 2006. Meantime, research outputs have continuously increased in the following years mainly in engineering, computer science and chemistry, and as a result numbers nearly doubled in 2016 (unesco.org; knoema.com).

Table 4  
*Number of Scientific and Technical Journal Articles Published Between 2006-2016*

Year	Value	Change %
2006	36,747	16.12
2007	41,522	12.99
2008	44,301	6.69
2009	46,021	3.88
2010	50,935	10.68
2011	54,717	7.42
2012	57,374	4.86
2013	59,206	3.19
2014	62,691	5.89
2015	64,523	2.92
2016	63,063	-2.26

**Source:** World Data Atlas, Scientific and Technical Journal Articles of South Korea, <https://knoema.com/atlas/RepublicofKorea/topics/ResearchandDevelopment/RandDExpenditure/Scientific-and-technical-journal-articles>, Date Accessed: 14.04.2018

As stated by Kwon, since the early 1990s research activities have begun to be regarded as important elements of the working life of academicians. Some interviews with academics in Korea underlined the fact that academicians who did not conduct research were found to be inadequate by the academic society. As a result, Korean universities have shown a significant growth in terms of teaching, research activities and industrial collaboration to contribute to their economy. The rate of higher education enrollment rose from 5.4% in 1970 to 65.6% in 2005. In addition, the government's financial budget for research activities has increased significantly since the 1990s. Therefore, significant achievements have been made in patent and technology licensing activities as a result of these contributions since the 2000s (Kwon, 2010, p. 97).

### **Private Sector's Role in R&D Policies**

Until 1980, the country allowed the free movement of goods by lifting restrictions on technology transfer from abroad, and it was decided to change its role in planning and implementing technological innovations. To this end, Korea, which entered the private-sector and university cooperation, also guaranteed the tax and financial incentives provided for these organizations. The government, which considers that technological studies should be carried out with a centralized system, has performed continuous and planned studies with the representatives of other ministries, industry representatives and research institutions lead by the Ministry of Science and Technology (Çalışır & Gülmez, 2010, p. 33). Meanwhile, cooperation with the private sector was handled by business conglomerates called chaebol (e.g., Samsung, Hyundai and LG). In the early years of development, chaebols had first adopted western business practices. Then they changed their production to science-based innovation. As the process of industrialization, South Korea's investment strategies have shifted to services and R&D of technology (Gupta et al., 2013, p. 1). Besides assisting, providing tax incentives and extra funding for technology development to the research centers, the government has made it possible for their research to focus and develop in particular technologic areas. Since 1997, to create a synergy between the private sector and university's research institutions, a large number of technoparks were established ([technopark.go.kr](http://technopark.go.kr)). During this time, stronger partnerships and link between universities and industry have been created including promotion of innovation and education of engineers. Government initiated policies enabled the private sector to focus on fundamental technologies and future growth drivers. In the meantime, they had access to human resource and equipment in universities for their research programs in order to increase their contribution to national economic development. With their large financial background and skilled human resource provided by universities, the private sector made a positive impact both nationally and internationally (MSIP, 2015; Tafesse, 2014, p. 54). For example, South Korean conglomerates Samsung Electronics have shown high numbers in terms of patent applications, ranking second in the global competition (Canon Inc. of Japan was top of the list) in 2016 (WIPO Rankings, 2016). According to WIPO; China, US, Japan, Korea and the UN are the leading countries whose applications amounted to 84% of the world total in 2016. In addition to this, by comparison to China and Japan, Korea's ratio of resident applications to GDP has been more than those countries since 2004 (WIPO, 2016, p. 29, 35). Indeed, achieving high numbers in patent and technology licensing activities, Korean private sector will be able to create a number of new jobs as a result of implementing those patents and projects throughout the country.

### **Conclusion**

One of the most contributing factors to the high growth performance of Korea is the country's intensive investment in human capital. During the last decade, the government,

private sector and the universities have committed to the increase in the intellectual and skilled workforce and today, South Korea has particularly shown a rapid increase in the country's educational level and academic performance. It is important note that, the economic success of South Korea over the last fifty years, followed by the whole world, has been the result of a series of planned and disciplined practices.

At the center of today's production structure is the quality of the workforce rather than its numerical size, and even its combination with capital accumulation and technological development. Recognizing in the early years that the workforce must be competitive in terms of educational level, experience and knowledge for economic growth, Korea has invested in its workforce and has entered high-income countries with industrial policies targeting on technological learning and development. Korea has made enormous efforts to improve its education system to better meet the demands of the evolving society. Korea has invested in human capital in parallel with economic investments over the years, and accordingly human capital accumulation has supported the economy in this respect.

Korea's success in education attracts world-wide attention from both developing and developed countries. Today, as an industrialized country, South Korea has survived difficult periods in its history, such as the Japanese Colonialism and the Korean War. At this point, Korea's efforts and emphasis on education and R&D to produce its own technology without natural resources and infrastructure in the development process have set a good example for many countries.

Today, both in the academic and technologic revolution phase, the government's emphasis on technology has increased the importance of the research outputs of universities and researchers. Thus, the government maintains incentives, establishes new laws, supports more institutions and increases R&D investments especially in essential subjects such as education, science and technology. Today, Korea has been transformed into a good educator that the world closely monitors and draws lessons from with its implemented national education and technology policies.

## References

- Amsden, A. H. (1989). *Asia's next giant South Korea and late industrialization*. Oxford: Oxford University Press.
- Asia-Pacific Economic Cooperation. (2007). Korea: SME technology innovation development program. Retrieved April 10, 2018 from [http://www.apec-smeic.org/newsletter/newsletter\\_read.jsp?SEQ=301](http://www.apec-smeic.org/newsletter/newsletter_read.jsp?SEQ=301)
- Atay, E. (2012). Innovation actors in South Korea: An analysis of university, industry and government research centers. *The Journal of Knowledge Economy & Knowledge Management*, 7(2), 175–191.
- Atay, E. (2013). Kore ve Türkiye'de yönetim. In E. Atay & G. Karsan (Eds.), *Türkiye ve Güney Kore'de entelektüel sermaye gelişimi* (pp. 127–159). İstanbul: Avrasya Enstitüsü Yayınları.

- Çalışır, M., & Gümez, A. (2010). Teknoloji politikaları çerçevesinde ekonomik gelişim: Türkiye–Güney Kore karşılaştırması. *Akademik İncelemeler Dergisi*, 5(1), 23–55.
- Chung, E. Y. J. (2015). *Korean Confucianism: Tradition and modernity*. Korea: The Academy of Korean Studies Press.
- Gönel, F. D. (2000). *Kore kalkınma deneyimi içerisinde insan gücü sermayesinin rolü ve önemi*. Retrieved January 18, 2017 from [http://www.arastirmax.com/tr/system/files/dergiler/140013/makaleler/40/1/arastrmx\\_140013\\_40\\_pp\\_136-143.pdf](http://www.arastirmax.com/tr/system/files/dergiler/140013/makaleler/40/1/arastrmx_140013_40_pp_136-143.pdf)
- Gupta, N., Healey, D. W., Stein, A. M., & Shipp, S. S. (2013) *Innovation policies of South Korea*. Virginia: Institute for Defense.
- Keçeli, Y. (2013). Kore ve Türkiye’de yönetim. In E. Atay & G. Karsan (Eds.), *Kore ve Türkiye’deki üniversite sistemlerinin kıyaslanması ve Yeongushil kavramı üzerine* (pp. 241–249). İstanbul: Avrasya Enstitüsü Yayınları.
- Kim, C. K. (2008). *Korea's development policy experience and implications for developing countries*. Korea: KIEP Pub.
- Kim, D. O., & Bae, J. S. (2004). *Employment relations and HRM in South Korea*. UK: Ashgate Pub. Ltd.
- Kim, G. J. (2002). Education policies and reform in South Korea, The World Bank. *Africa Region Human Development Working Paper Series*, 29–40.
- Knoema. (2016). *World data atlas*. Retrieved April 14, 2018 from <https://knoema.com/atlas/RepublicofKorea/topics/ResearchandDevelopment/RandD-Expenditure/Scientific-and-technical-journal-articles>
- Koh Y. S., & Il, S. K. (Eds.). (2010). *The Korean economy: Six decades of growth and development*. Korea: Korea Development Institute.
- Korea Labor Institute. (2017). *Population and employment data* (Major Economic Indicators Data). Retrieved May 27, 2018 from [https://www.kli.re.kr/kli\\_eng/selectBbsNttList.do?bbsNo=35&key=381](https://www.kli.re.kr/kli_eng/selectBbsNttList.do?bbsNo=35&key=381)
- Korea Technopark Associations. (2018). Retrieved April 10, 2018 from <http://www.technopark.kr/>
- Korean Council for University Education. (2015). *Bringing change and innovation to universities 2015-2016*. Seoul: Korean Council for University Education. Retrieved April 13, 2018 from [http://english.kcue.or.kr/img/pdf\\_150518.pdf](http://english.kcue.or.kr/img/pdf_150518.pdf)
- Kwon, K. S. (2010). *Universities' academic research and knowledge-transfer activities in a catch-up country: The case of Korea* (Doctoral dissertation). University of Sussex, UK.
- Lee, C. J. (2006). *The development of education in Korea: Past achievement and current challenges*. Paper presented at the World Bank East Asia Study Tour for Senior African Education Policy Makers Conference. Retrieved from [http://siteresources.worldbank.org/EDUCATION/Resources/278200-1121703274255/1439264-1153425508901/Development\\_Education\\_Korea.ppt](http://siteresources.worldbank.org/EDUCATION/Resources/278200-1121703274255/1439264-1153425508901/Development_Education_Korea.ppt)
- Levent, F., & Gökkaya, Z. (2014). Education policies underlying South Korea's economic success. *Journal Plus Education*, 10(1), 275–291.
- Ministry of Education. (2017). *Education in Korea*. Retrieved March 22, 2018 from <http://english.moe.go.kr/boardCnts/view.do?boardID=282&boardSeq=72461&lev=0&searchType=null&statusYN=W&page=1&s=english&m=0303&opType=N>
- Ministry of Employment and Labor. (2017). *Major statistics*. Retrieved May 26, 2018 from <http://www.moel.go.kr/english/pas/pasMajor.jsp>
- Ministry of Science and ICT. (2015). *The 5th science and technology foresight*. Retrieved March 24, 2018 from <http://msip.go.kr/SYNAP/skin/doc.html?fn=77108b814b7aca9aeaea00d09d9f9a8c&rs=/SYNAP/sn3hcv/result/201805/>

- National Library of Korea. (2017). *Annual Report of 2016* (Conference of Directors of National Libraries in Asia and Oceania Annual meeting of 2017). Retrieved March 28, 2018 from [http://www.ndl.go.jp/en/cdnla0/meetings/pdf/AR2017\\_Korea.pdf](http://www.ndl.go.jp/en/cdnla0/meetings/pdf/AR2017_Korea.pdf)
- NTIS. (2014). *Statistics of R&D expenditure*. Retrieved May 26, 2018 from <http://www.ntis.go.kr/en/GpExpenditureTotal.do>
- Oğuztürk, B. S. (2011). Güney Kore'nin kalkınmasına inovasyonun rolü. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*, 3(5), 48–53.
- Organization for Economic Cooperation and Development. (2016). *Education at a glance 2016: OECD indicators*. Paris: Author. <http://dx.doi.org/10.1787/eag2016-en>
- Sleziak, T. (2013). The role of Confucianism in contemporary South Korean society. *Rocznik Orientalistyczny/Yearbook of Oriental Studies*, 66(1), 27–46.
- Suh, J. H. (2010). Empirical analysis of university patenting in Korea. *KDI Journal of Economic Policy*. [http://www.kdi.re.kr/kdi\\_eng/publication/other\\_article\\_policy.jsp?pub\\_no=11724&art\\_no=1977&mcd=002008](http://www.kdi.re.kr/kdi_eng/publication/other_article_policy.jsp?pub_no=11724&art_no=1977&mcd=002008)
- Tafesse, T. (2014). Public private partnership in development: Lessons in devising legal and institutional framework from South Korea. *Public Policy and Administration Research*, 3(4), 50–57.
- The National Institute for Lifelong Education. (2015). *The national institute for lifelong education in Korea (NILE) information booklets*. Retrieved March 22, 2018 from [http://203.235.44.44:7010/eng/\\_upload/7422720160118150034.pdf](http://203.235.44.44:7010/eng/_upload/7422720160118150034.pdf)
- Times Higher Education. (2018). *World university ranking*. Retrieved April 9, 2018 from <https://www.timeshighereducation.com/world-university-rankings/sungkyunkwan-university-skku>
- UNESCO. (2014). *From the UNESCO Science Report*. Retrieved April 13, 2018 from <https://en.unesco.org/node/252282>
- Usher, A. (2014). *The Korean academic credit bank: A model for credit transfer in North America?* Toronto: Higher Education Strategy Associates.
- White Paper. (2014). *2014 white paper on ICT in education Korea*. Korea Education and Research Information Service (KERIS). Retrieved December 8, 2015 from [http://english.keris.or.kr/whitepaper/WhitePaper\\_eng\\_2014.pdf](http://english.keris.or.kr/whitepaper/WhitePaper_eng_2014.pdf)
- World Bank. (2016). *GNI per capita, Atlas method (current US\$)*. Retrieved May 28, 2018 from <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KR>
- World Intellectual Property Organizations. (2017). *World intellectual property indicators 2017*. Retrieved April 10, 2018 from [http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_941\\_2017.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2017.pdf)