

Pioneer Open Summer Study

Pandemic Epidemiology: Societal Impacts and Strategic Response

“To what extent has South Korea’s cultural prioritisation of educational success contributed to the relative success of its COVID-19 outbreak response?”

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Country: South Korea

I . Introduction

COVID-19, the novel form of coronavirus, has changed life as we know it for decades to come. Isolation, social distancing, and more drastic sanitation efforts are now all part of the new reality we have found ourselves in. COVID-19 has abruptly opened our eyes to the horror and uncertainty of a global pandemic: a battle in which the frontlines cannot be seen and thousands of soldiers travel, invisibly, through the air, waiting to ambush, and where a single compassionate embrace could prove fatal. As the world scrambles to defend against this ever-changing, deadly opponent, some countries manage to control the spread of the virus more effectively than others.

South Korea is one such country, standing out as a country that has managed to achieve notable success in containing the outbreak all whilst maintaining a stable economy. The first case of coronavirus was confirmed on January 20, 2020 (Park et al.), reaching its peak number on March 3, when they had a total of 851 new cases reported in those 24 hours (Worldometer), but then returning to a fairly stable low point from early April to early July, whereby the highest number of new cases in a day was recorded on May 28th, when 79 new cases were recorded (Worldometer). As of August 29, 2020, South Korea maintained a cases per million rate of 378 - this figure stands in stark contrast to that of most other countries: for example, the US (17877), Uzbekistan (1224), Australia (998), Germany (2876), Brazil (17900) (Our World in Data) One question at the forefront of our minds, and many public health experts' minds was, "how were they able to achieve such a seemingly impossible task?"

This paper will argue that South Korea's historical values of knowledge, a culture that places, and policies encouraging education attainment have been the main, long-term drivers and factors in its outbreak management success. Through South Korea's example, this paper will demonstrate the far-fetching, seemingly invisible at first glance, implications and benefits of a country placing a high emphasis on achieving a highly educated population: both through policy decisions and cultural valuation.

II. Cultural and National Background of South Korea

The Republic of South Korea is a nation in East Asia that has historically been influenced by the Confucianism belief system.

Confucianism, also known as Ruism, is an ancient belief system propagated by Confucius in China in 551–479 BCE (Yao). Regarded as a way of life, a philosophy, that any individual, regardless of their religion, can adhere to, it has permeated the ideals and structure of government, society, family, and education in East Asia (Weiming). Confucius considered benevolence, righteousness, ritual propriety, integrity, and wisdom as the 5 constant virtues, and these values are visibly reflected in the origins of the nation. Therefore, although its cornerstones lay in the ethics and morals of daily life, Confucianism's strong emphasis of scholarship, perseverance, and hard work (Rishi) helped create societies where dominion is based on education attainment, which, in itself, was considered to be morally transformative (Sorensen)

Today, this zeal for education is embedded in South Korean culture and society, having been only intensified throughout the years. This high cultural regard of education has permeated South Korean society to such an extent that the phenomenon has been termed *education fever*. (Rishi)

From a young age, South Korean students are under immense pressure to succeed academically: high academic achievement is the gateway to admission into the nation's top-tier universities, which ultimately in South Korean society is seen as the guarantee to a high-paying, stable career in one of the *chaebols*, societal reverence, and good marriage prospects. This focus on social mobility dominates the lives of parents and children, which is reflected in the numerous societal structures established to achieve this goal, and the proportion of financial investments made by parents specifically into a child's academic achievement, often at the cost of basic life needs. *Hagwons*, or *cram schools*, for example, are for-profit private institutions that provide supplemental education (The Free Encyclopedia). There are almost 100 000 hagwons in South Korea (Borgen), and approximately 9 800 000 children under the age of 18 (Index), creating an estimated ratio of a hagwon for every 98 children. Almost every South Korean child attends a hagwon in pursuit of supplementary education.

The whole-society permeating focus on education attainment has led to South Korea leading international high school education rankings: "South Korea is one of the top-performing OECD countries in reading literacy, mathematics and sciences with the average student scoring 519, compared with the OECD average of 492, placing it ninth in the world and has one of the world's most highly educated labor forces among OECD countries" (Education GPS)

III. Background of South Korean education system

Korea’s education-centered approach to development has cultural roots. The South Korean education system was founded on the national concept of Hongik Ingan, which can be translated as the humanitarian ideal. This concept stems directly from the myth of Dangun, the legendary founder of the Gojoseon Dynasty and progenitor of the Korean race (“*The Practice of Hongik Ingan*”).

Under the Basic Education Law, which was passed in 1949, the Korean education system involves six years of primary school, three years of lower secondary school, and three years of upper secondary school (NCEE). Through this system, widespread illiteracy was soon eradicated, and by the mid-1960s, primary school completion rate had soared to 90%. (NCEE) Progress was swift and steady. In 2020, the South Korean education system was ranked as the third best in the world (Humphries). The secondary school completion rate is 100%, and in recent years South Korean students have consistently achieved among the highest results on global standardized tests. (OECD. “*PISA 2018 Results*”) Furthermore, as demonstrated in **Figure 3-1**, Korea has the highest rate of tertiary education in the OECD, with nearly 70% of 25-34-year-olds holding college degrees. That in a few generations Korea has “managed to go from massive illiteracy to topping the global charts in both quantity of education and quality of education” is widely regarded as an impressive accomplishment (NCEE).

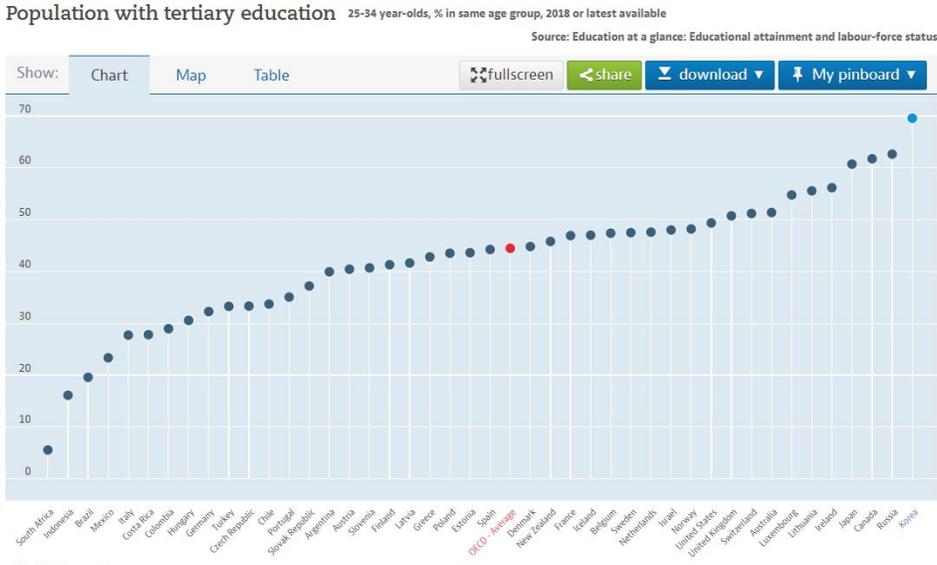


Figure 3-1. Population with tertiary education (OECD. “Education Attainment”)

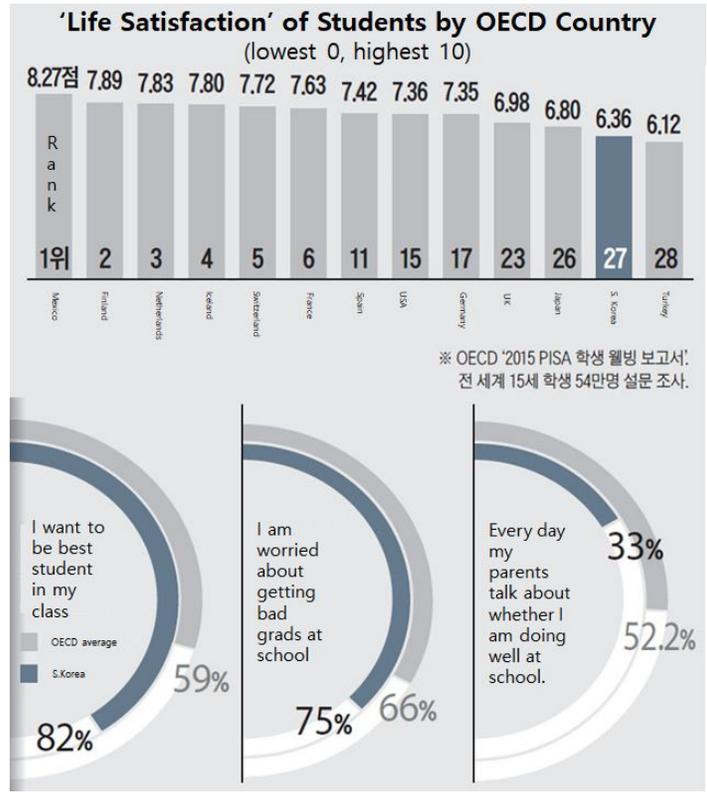


Figure 3-2. 'Life Satisfaction' of Students by OECD Country (Kim, Yeonju)

Despite the impressive results it has generated, the Korean education system also has some downsides. In particular the system has been criticized for being dominated by tests and exams. In Korea, “virtually every form of opportunity, from marriage prospects to job prospects, depends on which upper secondary school and college students attend.” (NCEE) As a result, students and their parents feel a pressure to achieve that has been described as “unparalleled in the world” (NCEE). As **Figure 3-2** indicates, three quarters of South Korean 15-year-olds expressed anxiety about getting bad grades at school, well above the OECD average. Similarly, more than half reported that their parents talk about their performance at school on a daily basis.

IV. COVID-19 Infections and Fatality Rates

South Korea is one of the countries that has successfully managed a pandemic outbreak without any quarantine closures. It demonstrated high accomplishment in the three stages of their COVID-19 response strategy: detection, containment, and treatment. This was due to a high preparedness and a stable education policy. The country has built hundreds of clinics to increase the number of testing. In order to contain the stable flattened number in outbreaks, many officers were responsible for tracing contacts of ones who were infected. Their health system had a high demand that resulted in increasing the number of hospital institutions to prevent shortages of PPE (Personal Protective Equipment) and increase the capacity.

At the moment there are 16,670 coronavirus cases along with 309 deaths (report from August 21, 2020 11:23 GMT). The first case was confirmed on January 20th; however, no massive outbreak was caused until a woman, know as “patient-31”, attended a church service while being infected on February 18th. The number of cases peaked on March 3rd, by that point 100,000 people in the country were tested. Nonetheless, the rapid and extensive testing which was undertaken (300,000 tested by the end of March) limited the spread of the outbreak and flattened the curve, as shown in **Figure 4-1** and **Figure 4-2**.

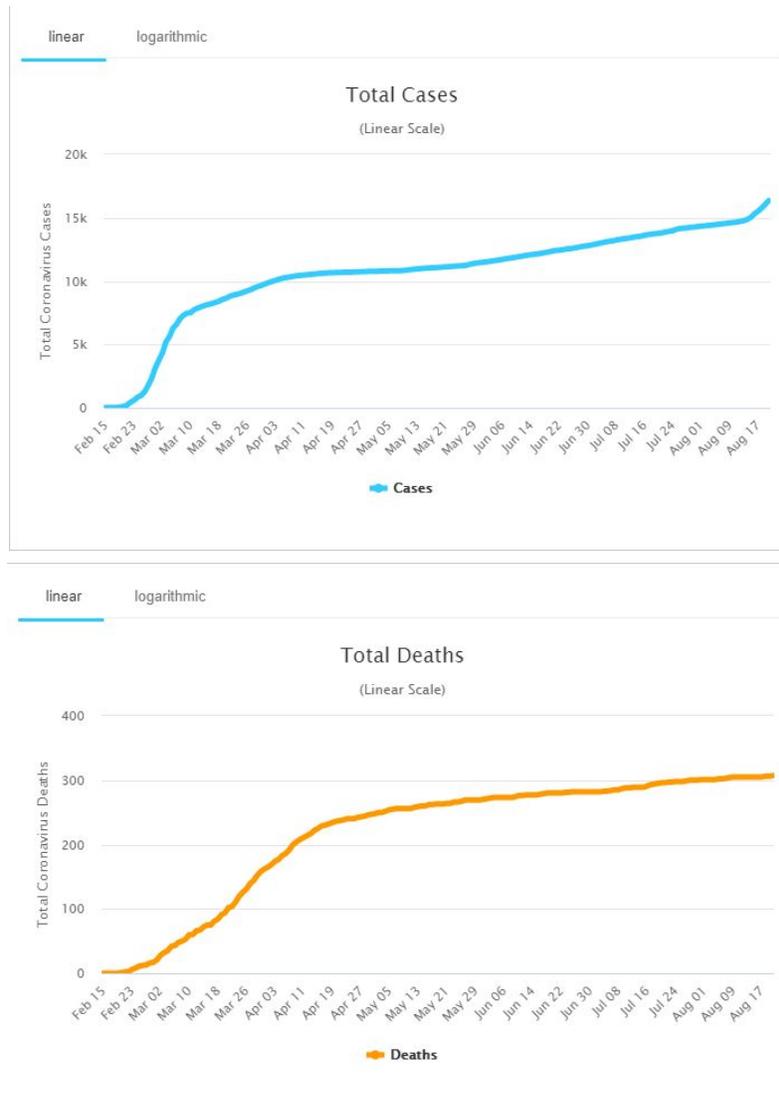


Figure 4-1 and **Figure 4-2** (Statista 2020): This figure shows the total cases and the total deaths in South Korea

Figure 4-1 is the graph on the left side that presents the total cases, while **Figure 4-2** is the one on the right that shows the number of deaths. We see that both graphs are relatively similar and both starting from around April 15 are gradually flattening. There is a very low constant number that is allowing the growth.

Case fatality rate (CFR), sometimes called case fatality ratio, is a measure of the severity of a disease and is defined as the proportion of the number of deaths by the number of patients diagnosed with the disease. In the current situation, the rates can be used to assess the government's response and the health care response to the epidemic outbreak. CFR of COVID-19 widely varies among different countries around the world, and thus can be used as an indicator of a country's efficacy of outbreak response.

Despite being one of the countries with the largest number of COVID-19 cases in the early phases of the pandemic and becoming the most infected country after China in early March, South Korea's curve and CFR rate is strikingly different from the CFR of most countries - all amidst the fact that the South Korean government was one of the very few that did not impose strict lockdown measures. The current CFR in Korea is 1.7% (300 deaths out of 17,000 confirmed cases), as of August 21, 2020, while the CFRs are 13.7% in Italy, 5.7% in Iran, 7.4% in Spain, and 5.5% in China (Kim, Dong-Hyun).

There are many reasons for South Korea's success in containing the spread of the virus; however, the measures taken by the government would have little effect without the public's willingful cooperation and voluntary compliance. It is very likely that both these factors are the result of the traditionally high value of education success in the country - they will be further discussed in the next sections.

V. Healthcare

V-1. State of Healthcare

South Korea is ranked second in Asia for the best healthcare system, with a health care index of 82.26 in mid-2020 (Numbeo, 2020). The high-quality, accessible healthcare in the Republic has resulted in economic growth and universal health coverage through national health insurance; whilst the government's priority of investing in the healthcare system after funds became available following the nation's rapid economic development has created the essential foundations for the development of healthcare: a nation's healthcare system is most responsive to direct investments (Ospina, Esteban Ortiz, and Max Roser, 2020). By all parameters, the Korean population is healthier than most other Asian countries (WHO, 2015). By life expectancy, the most commonly used parameter to assess a population's health (Ospina, Esteban Ortiz, and Max Roser, 2020), South Korea ranks second in the world, coming second only to Japan (See **Figure 5-1** and **Figure 5-2**).

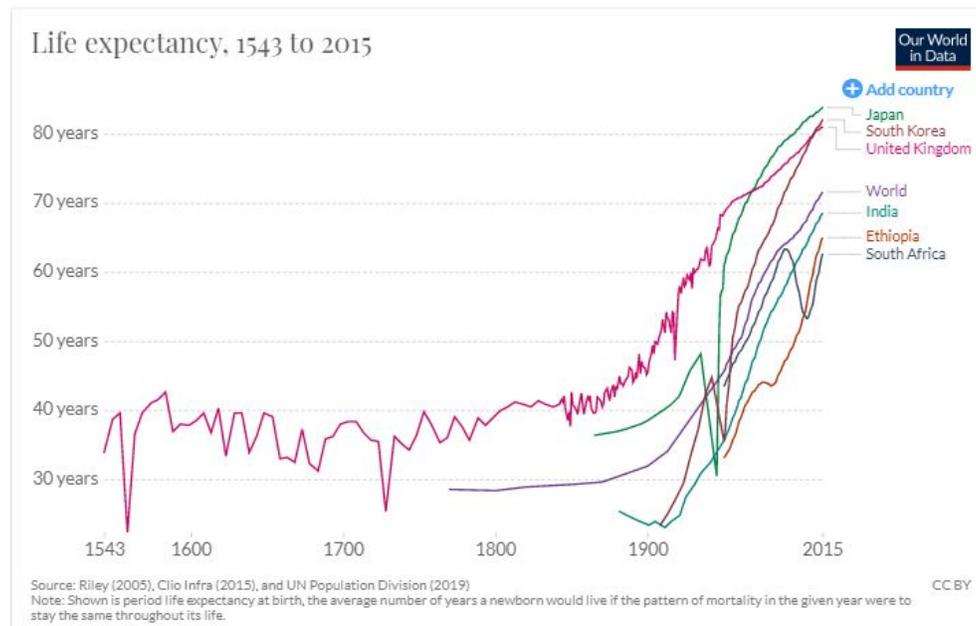


Figure 5-1. Life expectancy, 1543 to 2015 (Ospina, Esteban Ortiz, and Max Roser, 2020)

In 1908, South Korea's life expectancy stood at 23 years of age, substantially lower than the world average; in less than a century, it has quadrupled, reflecting, amongst other societal factors, the rapid establishment of its healthcare system over the years.

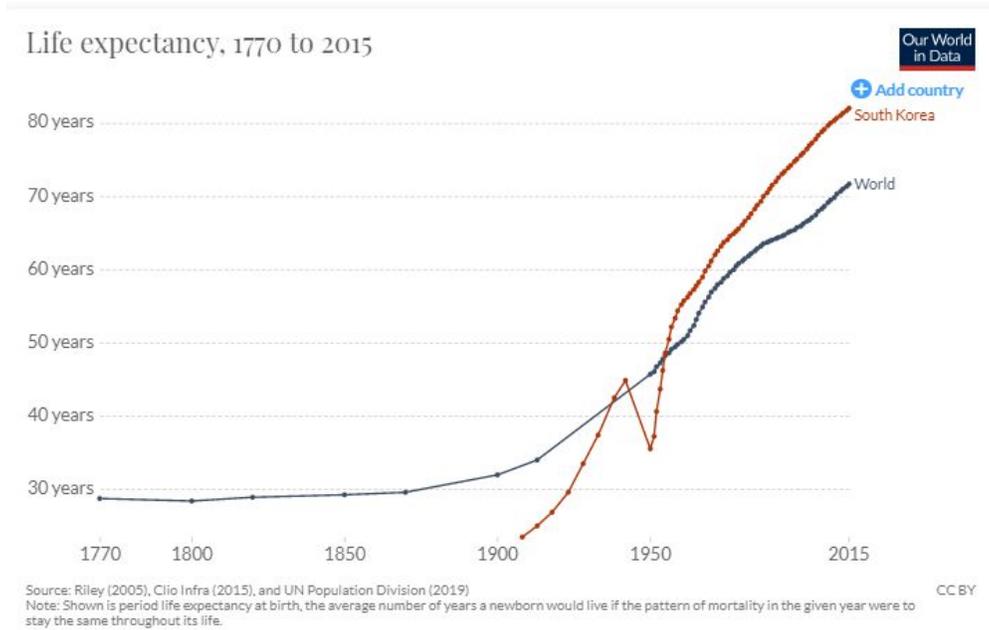


Figure 5-2. Life expectancy, 1770 to 2015, (Ospina, Esteban Ortiz, and Max Roser, 2020)

South Korea’s advanced, accessible healthcare system played a key role in its COVID-19 mitigation efforts. By comparing South Korea’s healthcare system’s role in combating COVID-19 to that of Italy, one of the nations that experienced the highest CFR rates, we find that South Korea made use of its advanced state of technology, widely using it to create efficient, innovative testing centers. Moreover, South Korea’s holistic medical education proved to be advantageous in the extreme situation of a pandemic, compared to Italy’s medical education requiring future physicians to specialize early. (Pan American Health Organization)

Other features of South Korea’s healthcare system that contributed to successful control over the pandemic:

- 1) Korea has a competitive medical qualification system: It is well-known that Korea has one of the world's best and most competitive education systems where the country's students consistently score in the top 3 for international math, science and medical competency exams. Most students who have performed well and are in the top 10 rank make the decision to go to the medical field where more rivalry takes place. Due to Korean medical education program there has been a drastic increase by providing excellent professors and study methods. From 2000 to 2017, there has been a general increase in the number of doctors every year which helped the COVID - 19 situation get in hand as more doctors were able to treat a greater number of patients.
- 2) Korean medical service industry is over-supplied, keeping costs under track: While the competition is high, the Korean program of medical education qualifies a relatively significant number of doctors in relation to population size. In 2017, there were approximately 2.34 doctors for every 1,000 Koreans. It was a small improvement

compared with the previous year and since 2000 its ratio has gradually risen as shown in **Figure 5-3**. The large supply of doctors suggests the population's health care needs are well-met.

- 3) Korea's use of technology in the medical field: Korea is known to be a global leader in electronics, robotics and other high-tech industries which benefits the healthcare system by using the technology to treat patients and make the process easier and more comfortable. Korean hospitals and clinics are commonly filled with the new technologies and medical equipment. Throughout this country, even dental clinics use modern 3D modeling and simulation technology to create dental implants wirelessly. South Korea used technology effectively to help control the measures in COVID - 19 by creating applications that gathered relevant data and allowed officers to cope with high volume of investigations.
- 4) The pharmaceutical industry in Korea: Korea has developed the drug industry to accommodate for generic medications. Similar to what is prescribed in the clinics of the US, local drugs prescribed in Korea are generally inexpensive and accessible to patients (Medisetter, 2017).

Number of doctors in South Korea from 2000 to 2017
(per 1,000 inhabitants)

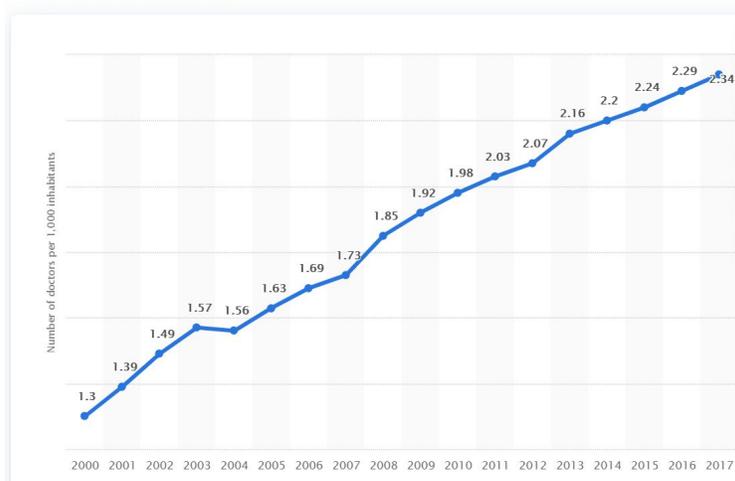


Figure 5-3: This graph shows the increases in number of doctors in South Korea over time from 2000 to 2017 (So, 2020)

V-2. How Did It Happen?

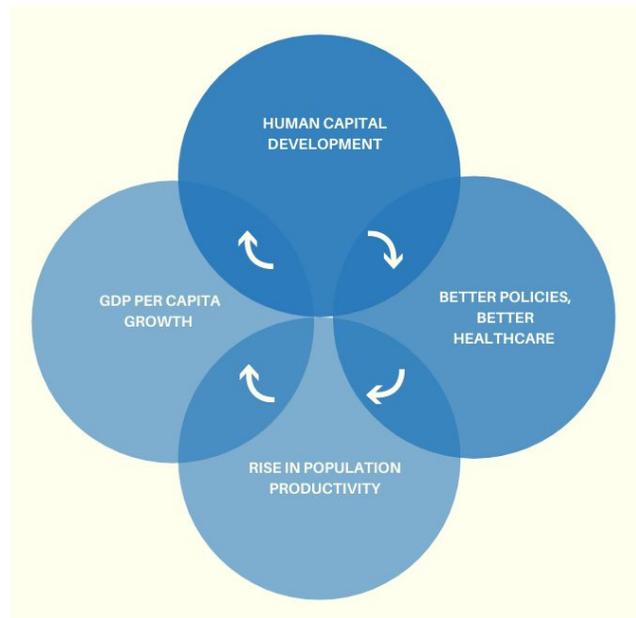


Figure 5-4 South Korea’s example proves that the level of a nation’s human capital development is directly linked to the advancement of its economy and healthcare system

An overlap is observed in the graphs of South Korea’s life expectancy (See **Figure 5-1**), the number of health professionals in the country (See **Figure 5-3**), and South Korea’s gross domestic product (GDP) per capita over the years (See **Figure 7-1**). This reflects the strong, intrinsic ties between a population’s education attainment levels, economic growth, and the health of the population. Individuals with higher education attainment levels are able contribute to the functioning of society, and, in return, are paid; the individual is thus able to attain a higher, healthier standard of living. Education leads to better policy decision-making that ultimately leads to a further rise in living – including health and education – standards in the society, creating all means for a more productive population that is able to propel its development even further.

VI. Mitigation Efforts

VI-1. Use of Technology

South Korea's efforts to control and reduce the potential devastation caused by COVID-19, is one of their greatest success stories. Unlike other countries, who were still grappling with the shock of such a deadly and fast-spreading virus, South Korea was much more aware of the effects of a pandemic as well as how to fight one, seeing as they had to fight an outbreak of MERS, Middle East Respiratory Syndrome, only a few years prior, in 2015 (Oh). Vital to the forefront of their battle against COVID however, remained South Korea's investment and priority in education.

Like many other nations, South Korea experimented with a number of different strategies to try to contain the spread of the virus. One innovative method was to turn to technology, specifically, the introduction of apps to collect and distribute information. South Korea is one of the most technologically advanced nations in the world, largely as a result of the high emphasis on Research and Development in the country, of which they spend 4.5% of their GDP on (Dayton). The booming research and development industry has allowed for South Korea to make a number of innovative technological advancements, including ones which have allowed for greater levels of success in dealing with coronavirus.

In an increasingly digital world, where many individuals have access to smartphones or other electronic devices, the idea to implement apps was met with general success. In a survey done in 2019, 88.8% of S. Korea's total population had access to a smartphone, so this does seem to be a smart approach (Statista). Upon arrival to the country, foreigners were told to download an app from the Korean Ministry of Health and Welfare as well as the Ministry of Interior and Safety. These apps collected information about the individual's health, which they had to report on every day, and possible symptoms of COVID such as a fever, headache, or loss of taste and smell (UN News). Another example of a helpful app that has been developed is called Corona 100m. This app has proved extremely valuable to the country and its citizens. The use of Corona 100m lies in its name. The app informs users if they come within a 100 meter radius of a person who has developed COVID-19 (Shendruk). This way, users are able to avoid these potential hotspots and maintain distancing, ensuring their own wellbeing and aiding the nation's overall reduction in cases. Educating the public and making this information accessible to all helps greatly in combating the virus as the public understands the dangers and can take the necessary precautions.

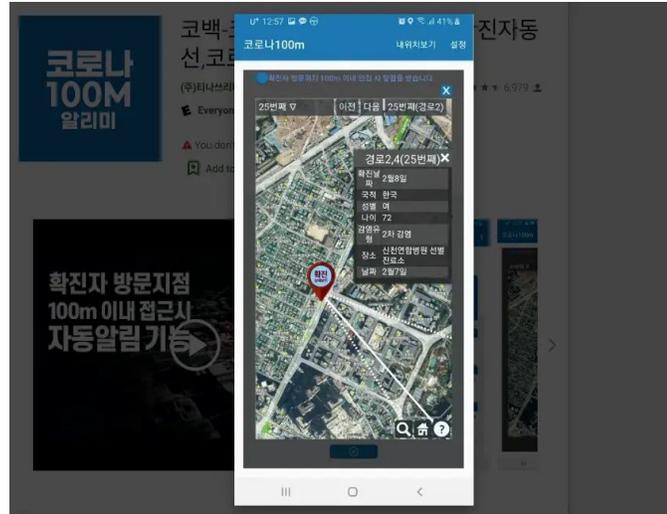


Figure 6-1 Corona 100m: (Meisenzahl)

South Korea has also taken their efforts in contact tracing and media a step further than other countries. During the 2015 outbreak of MERS, legislation changed to give the government authority to “collect mobile phone, credit card, and other data from those who test positive to reconstruct their whereabouts,” and that information “is shared on social media apps that allow others to determine whether they may have crossed paths with an infected person” (Normile)

Both the contact tracing and mobile application efforts have been bolstered by “smart city tech” (Holmes): coupled with artificial intelligence technologies, it allows an official, in 10 minutes, to identify the route of a patient over the day. (BI)

VI-2. Testing

One of the most notable reasons for South Korea’s success is thanks to their rapid, numerous and widespread distribution of testing kits. According to Dennis Normile, as of March 17th, South Korea has tested more than 270,000, which amounts to more than 5200 tests per million inhabitants. In comparison, the United States has tested around 74 tests per 1 million inhabitants according to the U.S. Centers for Disease Control and Prevention (Normille). The fast and effective testing with which South Korea has used is extremely useful as it allows them to more accurately pinpoint where the virus is and who it has infected, which then allows them to take measures to contain it more efficiently. If one thinks of the battle against coronavirus as a game of battleship, South Korea has managed to place more pins on their board, thus allowing them to have a greater idea of where they need to focus on. The USA, in comparison, has a smaller number of pins on their board, allowing the virus to continue to spread and attack invisibly.

South Korea’s COVID-19 response strategy sits atop three pillars: fast and free testing, expansive tracing technology, and mandatory isolation of all cases, including the asymptomatic (Source) Two of the pillars are the results of South Korea’s cultural and policy emphasis on

science and technology education. South Korea invests heavily in research and development, public research institutes, and its universities (Science), and today, the nation has been ranked as *the most innovative* for 6 years in a row by Bloomberg (Science). The prioritization of research and development (R&D) had invariably led to South Korea's innovative approach to COVID-19 mitigation, as well as the technological know-how to successfully realize it. The success of the nation's technological approach to mitigation is directly linked to South Korea's competitiveness in STEM education: it consistently scores top 10 spots in PISA Math and Science rankings (Sleicher)

VII. Response to Economic Challenges

South Korea is a highly developed country, ranked the third highest in Asia after Singapore and Japan. It has the world's 12th-largest economy by nominal GDP. Its citizens enjoy one of the world's fastest Internet connection speeds and the most dense high-speed railway network. It was named the second-best country in the world to raise kids in the 2020 UN Child Flourishing Index, with the best chance at survival, thriving and well-being due to good healthcare, education, and nutrition. The country is the world's 5th largest exporter and 8th largest importer. From 2014 to 2019, South Korea was named the world's most innovative country by the Bloomberg Innovation Index.

The innovative and developed economy of the nation played a key role in its COVID-19 response. It funded the highly-technological mitigation efforts, the R&D for the rapid development of testing kits, the building of hundreds of high-capacity screening clinics, testing centers, the skilled workforce of epidemiological intelligence officers for thorough contact tracing, the recruitment of thousands of additional healthcare workers to meet the surging demand, the building of temporary hospitals, and its expansive economic stimulus measures that alleviated the impacts of the pandemic on the economy.

Yet this strong, resilient economy - that proved to be crucial to South Korea's COVID-19 response - as little as 30 years ago, was not an attribute of the nation. At the end of the Korean War, in 1953, South Korea was one of the poorest countries in the world. By examining the factors that lead to its rapid economic growth, often named *the Miracle on the Han river*, the authors find that the policy of education prioritization was the overarching driver of this growth.

The support for education - particularly engineering and science education - provided the human capital and intellectual potential needed to foster economic growth based on technological innovation in a resource-poor country.

The way that the South Korean government has kept the people informed about COVID-19 can be viewed as an extension of its education system. Rather than dismissing the risks or provoking unnecessary hysteria, the government has been relatively open about the scope of the pandemic in Korea, the location and amount of new cases, and methods to reduce the risk of infection. Through this open information-based approach, the government has created conditions that have allowed the domestic tourism industry to thrive, despite the pandemic.

South Korea, being one of the most economically successful Asian countries, utilized its past experience and knowledge of how to make the economy boost and keep the unemployment rates low, which helps to have this year's economic situation under control. It uses the unemployment benefits to have the population stimulated to keep spending on goods and services. It was mentioned before in the paper that due to Korea's progressive education system the country could devise innovative technology, and that the most Korean exports are Korean technological devices: this boost in economics helped the government to gather enough budget for unemployment benefits to run the economics in the country during the COVID-19.

VII-1. The Role Of Unconventional Education

Tourism industry, all over the world, has suffered the most when COVID-19 broke out. This has not bypassed South Korea. According to the Korea Tourism Organization, the total number of tourists was cut by nearly 70 percent through May. Foreigners accounted for 63.3% of hotel guests in 2018, but now account for only 10 percent, according to the Korea Hotel Association.

Tim Mendelssohn stated that “education doesn’t just happen in the classroom” (Mendelssohn). Currently, the term ‘lifelong learning’ has emerged. Advocating the uncontact tourism sites and posting banners on public places, such as police stations, supermarkets, and tourist sites, directly connects to the public lifelong education: enlightenment of the general population of the awareness. Many people tend to acknowledge Korean education system as primary and secondary school education. However, this statement is ignorant of what South Korea defines under learning. According to Article 3, Clause 5 of the Korean Constitution, “the Nation should promote lifelong education and learning”, which means that in Korean education, lifelong education for the general population is included (“대한민국헌법”).¹ This means that it is valid to deal about enlightenment education policy towards the general population by utilising methods such as – booths, campaigns, banners.

From August 13th to 16th, 2020, Korean International Tourism Show was held in Ilsan KINTEX for the purpose of boosting domestic tourism which will eventually lead to the development of the local economy (KOREA International TOURISM SHOW). During this Korean International Tourism Show 2020, citizens could obtain the indirect education of the importance of uncontact traveling. The Incheon Tourism Organization Domestic Tourism Team staff member stated that they “prepared the booth mainly to advocate the uncontact tourist site” (Incheon Tourism Organization Domestic Tourism Team Staff Member).² By advocating the uncontact tourist sites, it will both help the economic sector of local tourism as well as containing COVID-19 infection. This is undeniable that by educating uncontact tourism sites to the general population will increase the money flow in our society which will automatically lead to the increased spending of consumers. As consumers’ consumption is the significant factor that determines the GDP as an expenditure method, which is also known as aggregate demand that is calculated by consumption, investment, government spending, and net export. The decreased tourists led to decreased consumption in the nearby region’s market. In order to deal with this issue, the government has injected money into the society in the form of an emergency disaster relief fund. Due to this government intervention, there was a spark effect on Korean local economy as the consumption rate on corner stores has “increased 39% for 6 weeks based on last year’s data” (Lee).³ While Korean government is implementing expansionary policy and domestic uncontact tourism encourages education, Korean government is enlightening the population by initiating campaign activity and posting banners in public places.

¹ Translated from “국가는 평생교육을 진흥하여야 한다”

² Translated from “언택트 관광지 홍보를 주된 목적으로 부스를 준비했어요”.

³ Translated from “6주 가맹점 평균 매출은 전년 동기 대비 39% 늘어난 것으로 조사됐다”

VII-2. Resilience of International Trade

International trade is defined as the exchange of goods and services between countries. First of all, trade between countries leads to a greater competitiveness since the domestic firms compete with the foreign ones to be able to sell more products in the country, and this is considered to be an effective way for the businesses to learn new ways to produce innovative products, and offer them at cheaper prices to their customers. Secondly, some countries might lack specific resources, and the trade between them and the other countries help them gain those lacking resources to be able to produce their own goods, which positively impacts the economic growth of the first countries. Also, this would mean that if there are more resources available due to international trade, consumers have a wider range of products and goods to choose from, which expands their consumption behaviour, making them more willing to consume more beneficial products, which then also helps to boost the economic growth. Moreover, during the trade between countries, they are able to get the foreign exchange currencies, which they then can use to buy essential goods from other countries. For example, when Ghana sells gold and cocoa to the Netherlands, it will be paid in euro, which it can then use to buy needed goods from abroad, such as industrial machinery or petroleum. This is important for countries who do not have a convertible currency - one which can be freely exchanged for other currencies on the world market. These are not the only gains from international trade, but they already depict the importance of a country to be able to trade with other countries.

International trade has always been and continues to be one of essential assets of the Korean economy. The COVID-19 outbreak had a significant impact on the South Korean economy and its international trade in particular. The authors have concluded that a stable economy built on international trade (as it is one of the biggest constituent parts of Korean economics) let South Korea react, respond and tackle the pandemic very quickly. A closer analysis of the nation's history of becoming an economic powerhouse warrants the crucial role education played in the process.

One of the biggest events that transformed South Korea from a developing, poor country with an unstable economy into a developed country which is included in top-20 countries with the highest GDP as of 2019 and in "Four Asian Tigers" is called "the miracle on the Han river". This name is similar to the original phrase "Miracle on the Rhine", coming from West Germany to refer to the German economic rebirth after World War 2. In 1961 Chang Myon in his New Year's address suggested the analogy and encouraged South Korean citizens to "bear difficulties in the hope of achieving a similar economic upturn". The growth and stabilization of South Korean economy was triggered by the following aspect:

Hard work of the labor force.

South Korea was never a resource-rich country and before the economic upheaval Korean economics was primarily relying on agricultural and light industries, and consuming goods for people living in the country. However, the situation has significantly changed as prime-minister Chang Myon has been

overthrown and the third president of Korea Park Chung-hee came to the power. He announced the beginning of the very first “Five-Years Plans of South Korea” (1962-1966). The plan was aimed to evolve the nation's economy by expanding agriculture and energy industries such as coal and electricity; developing basic industries such as chemical fertilizer, cement, oil refinery, iron , and steel; expanding overhead social capital including roads, railways, and ports; making full use of idle resources including increased employment. The plan succeeded and provided several thousands unemployed people with workspace, but people had to work 14 or 15 hours a day, without having a rest.

GDP was rising up to 10% yearly in the period of 1970-2010 (**Figure 7-1**).

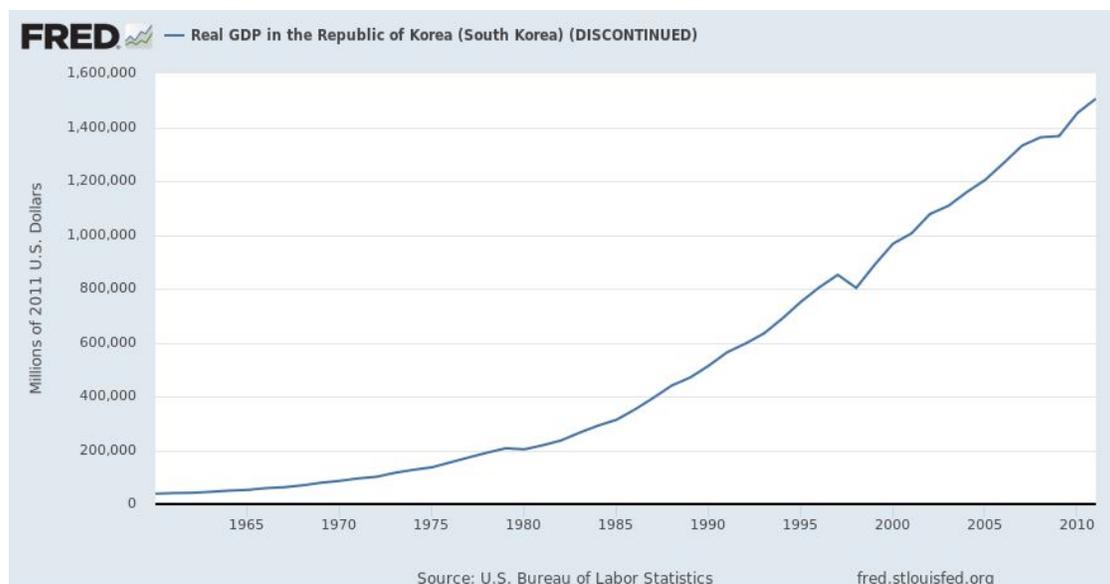


Figure 7-1. GDP Growth rate from 1960 to 2010 (FRED)

The analysis of Korea’s transformation from a resource-poor, developing country into one of the most advanced economies of today reveals the underlying catalyst of change: South Korea’s culture and policies of accumulating and using knowledge. This innovation-focused economy has arguably created the foundation for the nation’s extraordinarily successful COVID-19 response.

Although the outbreak of COVID-19 mostly had a negative impact on Korean economics, the government still managed to benefit from it as well. South Korea was one of the first countries to start producing test kits. First sets of test kits were developed in under a month. Not only South Korea managed to practically stop the pandemic and contract the number of COVID-19 cases, but the Korean government also benefited from exporting test kits abroad (Kim, Jaewon): once the novel coronavirus started spreading globally at an extremely high rate,

korean test kits consumption demand has rapidly increased and sufficiently profited South Korean economics, as shown in **Figure 7-2**.

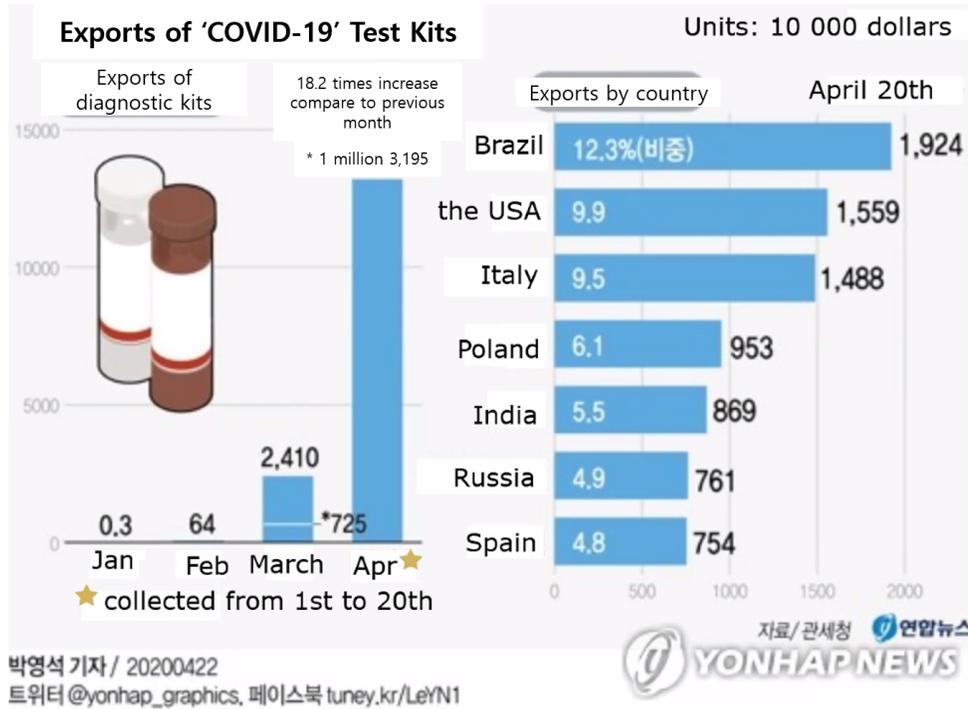


Figure 7-2. Exports of 'COVID-19' Test Kits (Park)⁴

VII-3. Reliance of the Market Sector

Unemployment is defined as the number of unemployed people - all people above a particular age (i.e. not children) - who are not working and actively looking for a job. There are specific costs to unemployment, which increase in their severity the longer the unemployment lasts. First of all, there is loss in productivity, where the low economic productivity leads to the fall in aggregate demand, that then results in low GDP. Low GDP then results in a bigger increase of unemployment. The level of incomes, profits and revenues falls as well because of the problems in the economy, and this results in a decrease in demand for products. As the profits of producers then suffer too, the businesses have lower budgets for research and development. More unemployed people means lower tax revenues for the government, and as the government's budget also falls into a partial deficit, it tries to spend less on education, health care, infrastructure, security, etc., which negatively impacts the society. To help the situation and boost the economy, the government might try to give unemployment benefits, but this means that the government cuts short on its expenditure on society, which again, negatively impacts the

⁴ This is the figure, translated from Korean to English, that was included inside Yonhap News, Korean News site, this shows the exports of diagnostic kits.

[Disclaimer]: TaeHwan, Madina, and Sabrina have objectively translated texts in the source to the best of their abilities. The text in the bibliography with Korean title, '코로나19' 진단키트 수출 현황, was originally in Korean.

latter. Also, unemployment negatively affects workers' skills, leading to their partial loss due to the lack of active practice. Thereafter, it is vital to keep the unemployment rates low.

Unemployment is one of the key negative outcomes of the current pandemic: many, due to quarantine and self-isolation, have started working from home, and some lost their jobs since many businesses have closed down. With second quarter GDP shrinking 3.3 percent from the previous quarter, the South Korean economy entered a technical recession (a "technical recession" is when there are 2 negative quarters of GDP) for the first time since 2003. The second quarter decline follows a 1.3 percent decline in GDP in the first quarter (Stangarone). However, the economy promptly rebounded.

To simulate the economy and retain consumer demand, the Korean government provided unemployment benefits. June saw the government provide a record of \$917 million in unemployment benefits.

The education system of South Korea made it possible for the country to economically flourish, which then the government could use for giving the unemployment benefits. It was mentioned before in the paper that due to Korea's progressive education system the country could have educated citizens who can devise technology that was innovative for other countries, and that the most Korean exports are Korean technology: this boost in economics helped the government to gather enough budget for unemployment benefits to run the economics in the country during the COVID-19.

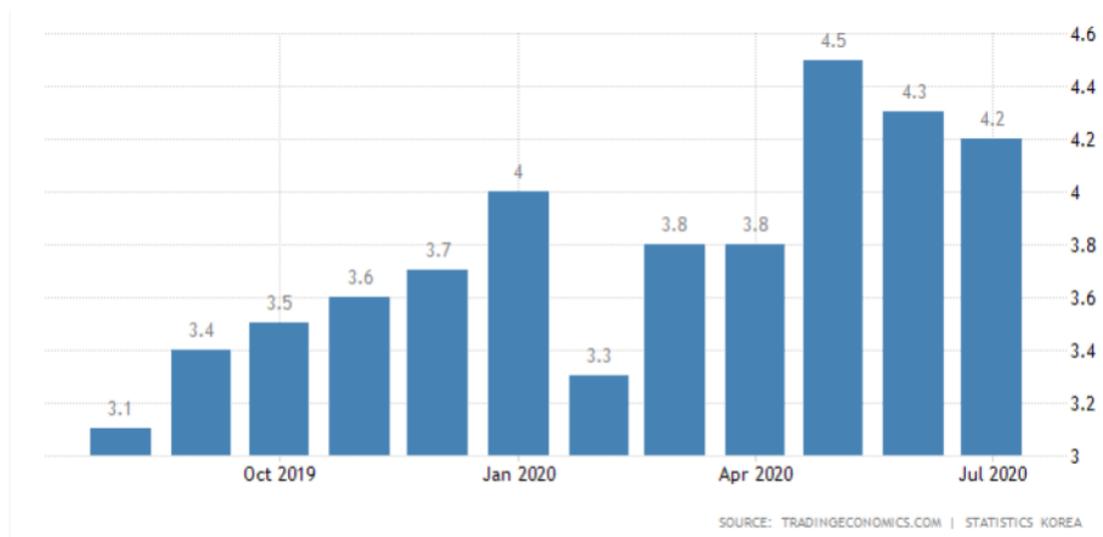


Figure 7-3. Unemployment Rates in South Korea in 2019-2020
(<https://tradingeconomics.com/south-korea/unemployment-rate>)

As it can be seen from the graph, the biggest unemployment rates were in May 2020, accounting for 4.5%, but then the country could bring that number down by 0.3% in three months, making it 4.2% in July (see **Figure 7-3**). This data is based on official statistics by Statistics Korea (KOSTAT), which means that this source could be based on the analysis of the unemployment part.

Moreover, as the government brings in unemployment benefits, it enables its citizens to spend the money on their needs and to allow for the economy to keep expanding and operating, which then also triggers the other economic activities to be activated and keep running. This methodology then helps not only the consumers in the households, but also businesses (see **Figure 7-4**).

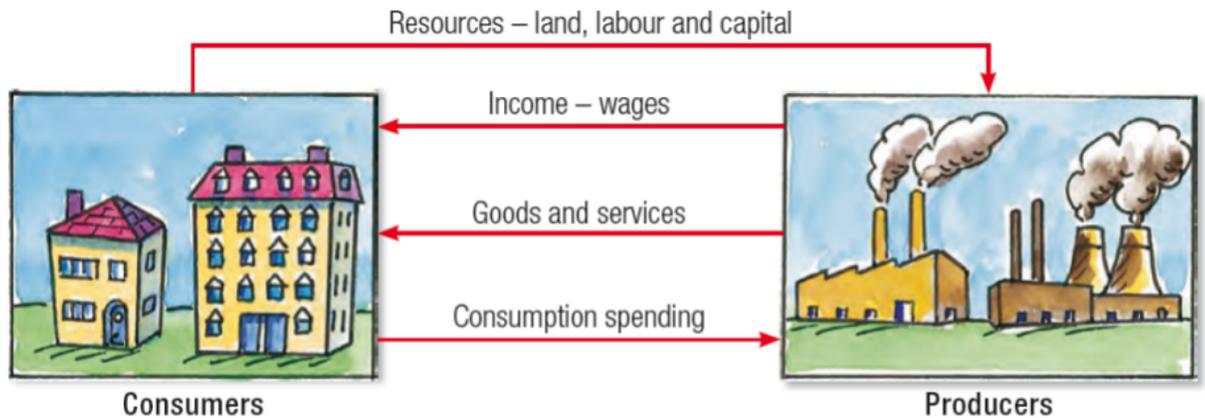


Figure 7-4. The Economy Business Cycle

(<https://sites.google.com/a/stmonicas.qld.edu.au/year9business/economic-models>)

Readers can see that consumption spending triggers the business action, which then stimulates the goods and services to be produced at higher rates, thereby stimulating the economic cycle.

In the analysis of the impacts of COVID-19 on three aspects of the South Korean economy, a common pattern emerges: in all cases, the larger factor contributing to a successful approach was, in one way or another, consolidated by South Korea's focus on innovation and education attainment, as well as the strong economy built on the grounds of the Miracle on the Han River - a miracle that, in itself, was founded on the same values of education, innovation, and hard work, ultimately creating an economy where human capital is the most valued resource and innovation flourishes.

VIII. Treatment and Vaccine Development

VIII-1. Research and Development

Globally, vaccine development is at the forefront of scientific research, as experts have unanimously come to a consensus that only a vaccine can stop the spread of COVID-19, allowing the resuming of pre-pandemic life without any threat of recurring waves of outbreak.

Essential factors that play a key role in the successful development of a vaccine are:

- 1) Existing knowledge on the pathogen;
- 2) Scientific/technical infrastructure for carrying out research and testing;

In regards to these factors, South Korea gained traction due to its high focus, and prioritization, of all R&D activity. In 1999, the country's investment in research and development R&D totalled 2.07% of its GDP, just below the average for nations in the Organisation for Economic Co-operation and Development (OECD). In the latest figures, the country has stretched out and is the clear leader at the top. The 4.29% (63.7 trillion won, or US\$60.5 billion) that South Korea invested in R&D in 2014 outstrips runner-up Israel (at 4.11%), as well as regional competitor Japan and the United States. Thereafter, South Korea has been ranked as the most innovative country by Bloomberg Magazine for six consecutive years, only to be beaten by Germany in 2020 (Jamrisko)

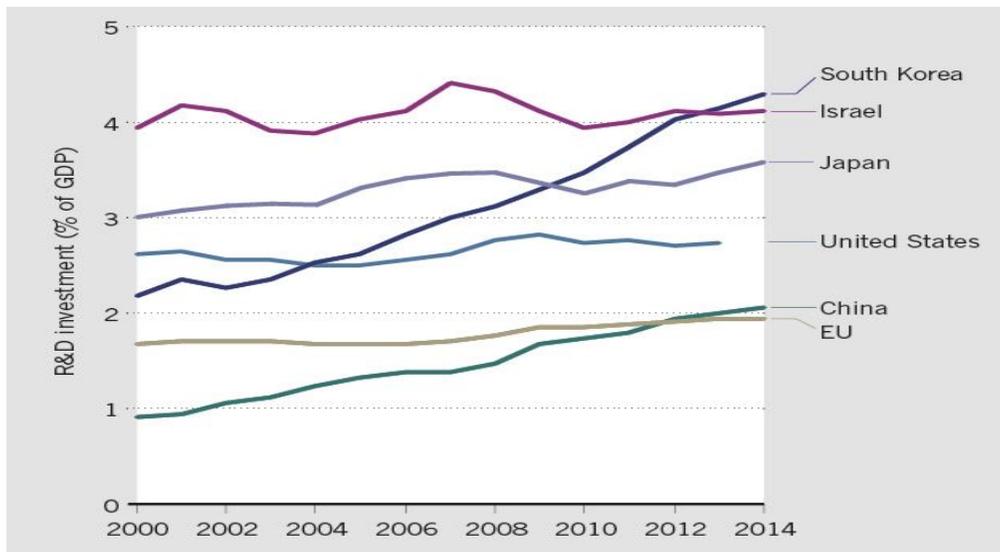


Figure 8-1: This graph shows South Korea's spending on R&D, which has risen to more than 4% of its gross domestic product (GDP)

(<https://www.nature.com/news/why-south-korea-is-the-world-s-biggest-investor-in-research-1.19997>)

"We don't have any other natural resources — we only have our brains to turn to," Chang Suk-Gwon, a business management professor at Seoul's Hanyang University, told Bloomberg.” (Jamrisko)

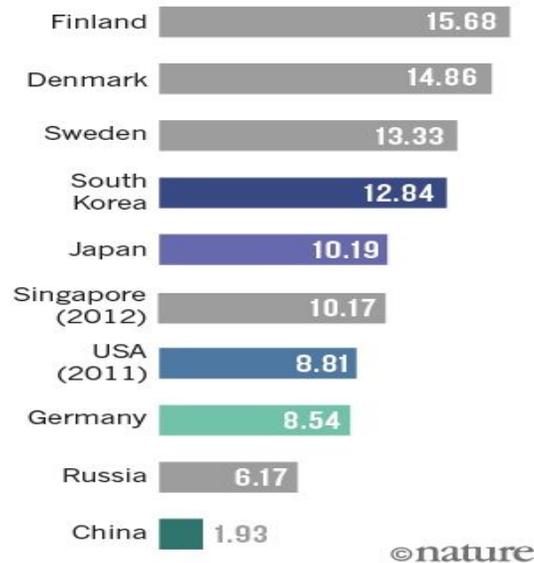


Figure 8-2. This graph shows the result of research carried out in 2013, which indicates that South Korea has one of the world’s highest proportions of researchers. (<https://www.nature.com/news/why-south-korea-is-the-world-s-biggest-investor-in-research-1.19997>)

Today, South Korea, along with Singapore, are advanced innovative world leaders in state of the art technologies of medical science, computer technology, biotechnology, space technology, military technology, stealth technology, robotics, and information technology manufacturing (Robertson). It is evident that the government’s prioritization of, and willingness to spend significant resources on building research infrastructure has greatly contributed to the rapid development of a large number of testing kits that were not only used in Korea, but also exported to other nations, making South Korea’s efforts of COVID-19 mitigation global.

VIII-2. Vaccine Development

The efficient and widespread contact-tracing, as well as the unlimited free testing available, made it possible to track the mutation of the pathogen, greatly enabling Korean researchers to quickly build up their knowledge of the pathogen and thus speed up their research efforts of developing a vaccine.

According to the Korea Pharmaceutical and Bio-pharma Manufacturers Association (KPBMA), 15 South Korean firms have begun working on a COVID-19 vaccine or a potential treatment. Among the 15, five with capabilities of flu vaccine development, while other 10 are trying to find new drug candidates to treat COVID-19 or verifying existing drugs’ efficacy on

COVID-19. As of August 22, 2020, two private companies and The National Institute have progressed into phase 1 and 2 trials with the vaccines Genexine, Medytox/Vaxine, and CEPI, respectively.

KPBMA Chairman Won Hee-mok also declared that Korea is seeking special measures to develop vaccines and treatment quickly, to protect pharmaceutical sovereignty. He highly assures that Korea will overcome this crisis only with the pharmaceutical industry's R&D capabilities and public-private collaboration supported by the government.

In the absence of a vaccine amidst a health crisis, South Korea, like most nations, focused on determining existing treatments that would also work against the coronavirus disease. According to trials conducted by national healthcare organizations, one in three South Korean COVID-19 patients' conditions improved with the help of remdesivir, which proved to be considerably more effective than any other treatment. However, data from clinical trials is still inconclusive regarding the efficacy and safety of remdesvir as a COVID-19 treatment.

IX. Conclusion

By analyzing South Korea's COVID-19 response from a broad range of perspectives: economics, national mitigation efforts, the healthcare system, and treatment development, the authors, in all instances, have outlined South Korea's high human capital development as a decisive factor in the successful outcomes in all mentioned spheres. South Korea has managed to extraordinarily transform itself from a resource-poor, agrarian nation less than a century ago, to one of today's most advanced economies, largely due to its policies that encouraged education attainment, the effectiveness of which were greatly enabled by the existing local historical cultural values of wisdom, life-long learning, and perseverance.

Our research has important implications for all nations, both developed and developing. Countries should realize that prioritizing education policy has long-lasting consequences that are not, at first, easily apparent. The value of human capital is only increasing at an exponential rate in today's rapidly developing technological world, where the risks of paradigm-shifting events occurring is increasing expeditiously amid climate change and growing anthropogenic impact on the Earth's biosphere. For a developing country, a focus on growing human capital is most likely a decision with the most returns in the long-term; and when policy decisions are made with consideration for individual nations' varying geographic endowments - the most efficient. In all cases, it is evident that a nation which fails to educate its population will struggle greatly in the upcoming years.

X. Bibliography

"Coronavirus: South Korea." Worldometer, www.worldometers.info/coronavirus/country/south-korea/. Accessed 29 Aug. 2020.

Dayton, Leigh. "How South Korea Made Itself a Global Innovation Leader." *Nature*, Nature Research, 27 May 2020, www.nature.com/articles/d41586-020-01466-7.

"EFM News." *Tbs*, 2020, tbs.seoul.kr/eFm/newsView.do?typ_800=N.

"First person: South Korea's COVID-19 success story." UN News, United Nations, 1 May 2020, news.un.org/en/story/2020/05/1063112.

FRED. *Real GDP In Republic Of Korea (South Korea) (DISCONTINUED)*. 2020, <https://fred.stlouisfed.org/series/KORRGDPR>. Accessed 24 Aug 2020.

"Hagwon." Wikipedia, The Free Encyclopedia, en.wikipedia.org/wiki/Hagwon. Accessed 29 Aug. 2020.

"Hagwons in South Korea." The Borgen Project, borgenproject.org/hagwons-south-korea/. Accessed 29 Aug. 2020.

Herald, The Korea. "New Virus Cases Hit 5-Month High of 279." *The Korea Herald*, 16 Aug. 2020, www.koreaherald.com/view.php?ud=20200816000040.

Holmes, Aaron. "South Korea is relying on technology to contain COVID-19, including measures that would break privacy laws in the US — and so far, it's working." *Business Insider*, May 2020, www.businessinsider.com/coronavirus-south-korea-tech-contact-tracing-testing-fight-covid-19-2020-5.

Humphries, Lewis R. "The Best Educational Systems In The World". *Investopedia*, 2 April 2020, <https://www.investopedia.com/articles/professionaleducation/12/top-educational-systems.asp#:~:text=In%202020%2C%20the%20top%20three,%2C%20Denmark%2C%20and%20South%20Korea>. Accessed 24 Aug 2020.

- Incheon Tourism Organization Domestic Tourism Team Staff Member. "What Was Your Main Objective To Deliver Towards Citizens Who Came To The Fair". Ilsan KINTEX Exhibition Center 1, Hall 3, 2020.
- Jamrisko, Michelle, and Wei Lu. "Germany Breaks Korea's Six-Year Streak as Most Innovative Nation." Bloomberg, 18 Jan. 2020, www.bloomberg.com/news/articles/2020-01-18/germany-breaks-korea-s-six-year-streak-as-most-innovative-nation.
- Jastrow, Mark. "Why South Korea Is the World's Biggest Investor in Research." Nature, Macmillian Publishers, 16 June 2016, www.nature.com/news/why-south-korea-is-the-world-s-biggest-investor-in-research-1.19997.
- Kim, Dong-Hyun, et al. Journal of Korean Medicine , 2020, pp. 1–3, *Understanding and Interpretation of Case Fatality Rate of Coronavirus Disease 2019*, <https://www.jkms.org/Synapse/Data/PDFData/0063JKMS/jkms-35-e137.pdf>.
- Kim, Jaewon. "South Korea Drugmakers Seek To Scale Next Coronavirus Mountain". *Nikkei Asian Review*, 2020, <https://asia.nikkei.com/Business/Pharmaceuticals/South-Korea-drugmakers-seek-to-scale-next-coronavirus-mountain>. Accessed 24 Aug 2020.
- Kim, Sungmin. "수젠텍, 코로나19 '항체 진단키트' "정확도 94.4%"" ["Sugemtec, COVID-19 'antibody diagnosis Test Kit' "Accuracy of 94.4%"]. *바이옵스펙테이터 [Biospectator]*, 31 March 2020, http://www.biospectator.com/view/news_view.php?varAtcId=9938. Accessed 24 Aug 2020.
- KOREA International TOURISM SHOW. "목적 | 대한민국 방방곡곡 여행박람회" ["Purpose | Korean Tourism Show"]. *Korea International Tourism Show*, edited by KOREA International TOURISM SHOW, www.ktourismshow.com/sp.php?p=13. Accessed 21 Aug. 2020.
- "Korea Student Performance." Education GPS, OECD, gpseducation.oecd.org/CountryProfile?primaryCountry=KOR&treshold=10&topic=PI. Accessed 29 Aug. 2020.
- Lee, Woosung. "경기도 재난기본소득·정부 재난지원금 효과...가맹점 매출 '쑥'" ["Effect of Gyeonggi-do Disaster Basic Income·Government Emergency Disaster Relief Fund ... merchant sales increase"]. *연합뉴스 [Yonhap News Agency]*, 2020, <https://www.yna.co.kr/view/AKR20200610171200061>. Accessed 23 Aug 2020.

Medisetter. "7 Reasons Why Medical Treatment In South Korea Is World Class." *Medisetter*, 18 Mar. 2017, medisetter.com/blog/en/medical-treatment-south-korea-world-class/.

Accessed 29 Aug. 2020.

Meisenzahl, Mary. "Take a look at these Korean apps helping people avoid areas infected by the coronavirus." *Business Insider*, 2 Mar. 2020, www.businessinsider.com/coronavirus-south-korea-photos-apps-location-outbreak-where-2020-3.

Mendelssohn, Tim. "Education Doesn'T Only Happen In The Classroom". *Conscious Magazine*, <https://consciousmagazine.co/education-doesnt-only-happen-in-the-classroom/#:~:text=Y&text=It%20education%20doesn%27t%20just%20happen%20in%20the%20classroom.&text=It%20happens%20by%20doing%20things,real%20world%20learning%20through%20actions>. Accessed 19 Aug 2020.

NCEE. "South Korea Overview". *National Center On Education And The Economy*, <https://ncee.org/what-we-do/center-on-international-education-benchmarking/top-performing-countries/south-korea-overview/>. Accessed 24 Aug 2020.

Normile, Dennis. "Coronavirus cases have dropped sharply in South Korea. What's the secret to its success?" *Science, American Association for the Advancement of Science.*, 17 Mar. 2020, www.sciencemag.org/news/2020/03/coronavirus-cases-have-dropped-sharply-south-korea-whats-secret-its-success.

Numbeo. "Health Care Index by Country 2020 Mid-Year." *Numbeo*, 2020, www.numbeo.com/health-care/rankings_by_country.jsp. Accessed 29 Aug. 2020.

OECD. "Education Attainment - Population With Tertiary Education - OECD Data". *OECD Data*, 2020, <https://data.oecd.org/eduatt/population-with-tertiary-education.htm>. Accessed 24 Aug 2020.

Oh, Myoung-don. "Middle East respiratory syndrome: what we learned from the 2015 outbreak in the Republic of Korea." *US National Library of Medicine, National Institutes of Health*, www.ncbi.nlm.nih.gov/pmc/articles/

- Robertson, Iain. "South Korea Invests in Biotech." *Innovators*, OnePoint5Media, 7 Feb. 2017, www.innovatorsmag.com/south-korea-invests-in-biotech/.
- Scleicher, Andreas. PISA 2018: Insights and Interpretations. OECD, www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf. Accessed 29 Aug. 2020.
- So, Won. "South Korea: COVID-19 Death Rate by Age Group." *Statista*, 24 Aug. 2020, www.statista.com/statistics/1105088/south-korea-coronavirus-mortality-rate-by-age/. Accessed 25 Aug 2020
- So, Won. "Number of doctors in South Korea from 2000 to 2017." *Statista*, 9 June 2020, www.statista.com/statistics/647235/doctor-density-south-korea/. Accessed 29 Aug. 2020.
- Sorensen, Clark. "Success and Education in South Korea." *Comparative Education Review*, vol. 38, no. 1, Feb. 1994, pp. 10+. JSTOR, www.jstor.org/stable/1189287?read-now=1&seq=1. Accessed 29 Aug. 2020.
- "South Korea." *Worldometer*, www.worldometers.info/coronavirus/country/south-korea/. Accessed 25 Aug 2020.
- South Koreans Are Using Smartphone Apps to Avoid the Novel Coronavirus. 29 Feb. 2020, qz.com/1810651/south-koreans-are-using-smartphone-apps-to-avoid-coronavirus/.
- "South Korea R&I In A Nutshell." Science and Technology Office Seoul, www.stofficeseoul.ch/research-innovation/in-south-korea/south-korea-ri-in-a-nutshell-2/. Accessed 29 Aug. 2020.
- The Practice of Hongik Ingan: Lives of Queen Seondeok, Shin Saimdang and Yi Yulgok*. Seoul, Diamond Sutra Recitation Group, 2011.
- "Total Confirmed COVID-19 Cases per Million People." Our World in Data, Global Change Data Lab, ourworldindata.org/grapher/total-confirmed-cases-of-covid-19-per-million-people. Accessed 29 Aug. 2020.

"대한민국헌법 | 국가법령정보센터" ["Constitution of South Korea | National Law Information Center"]. *Law.Go.Kr*, 1987, <http://www.law.go.kr/lsInfoP.do?lsiSeq=61603#0000>. Accessed 22 Aug 2020.

"Total Confirmed COVID-19 Cases per Million People." Our World in Data, Global Change Data Lab, ourworldindata.org/grapher/total-confirmed-cases-of-covid-19-per-million-people. Accessed 29 Aug. 2020.

Weiming, Tu. "Confucianism." *Encyclopædia Britannica*, www.britannica.com/topic/Confucianism. Accessed 29 Aug. 2020.

WHO. "Republic of Korea health system review." *World Health Organization*, 2015, www.searo.who.int/entity/asia_pacific_observatory/publications/hits/hit_korea/en/. Accessed 29 Aug. 2020.

Yao, Xinzhong. *An Introduction to Confucianism*. 2000. Google Books, books.google.co.uz/books?id=tAE2OJ9bPG0C&redir_esc=y.