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in the EU and the Republic of Korea

Similarities, differences, and areas for cooperation

A report by Renew Europe MEP Susana Solís
in collaboration with
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Renew Europe

One of my priorities this term as a member of Renew Europe in the European Parliament, is to promote research and innovation as key drivers of European prosperity. We must not forget that approximately two thirds of the EU's economic growth derives from R & D. This importance only grows in the current post-pandemic context, as we need it to achieve a rapid and sustainable recovery.

In the EU we have set ourselves ambitious targets, and the challenges that lie ahead are important: The green and digital twin transitions are inalienable goals that will transform our production system and our economy in the coming years. But to achieve this transformation, it will be essential to continue betting on innovation and technology.

Due to the fact that Europe competes at an international level , it is important to look around us, and analyze what other countries have done well in R&D. In this sense, it is crucial to look at the best in class, and the Republic of Korea is one of the best examples we have at global level: In the last few years, the country has quickly climbed the international rankings as one of the world’s most innovative economies and, in 2020, it broke into the top ten in the Global Innovation Index for the first time.

The Republic of Korea is also one of the EU's 10 strategic partners and we share many of our core values such as human rights, climate protection and democracy. Currently, the EU is Korea's third-largest trading partner and the largest foreign investor for Korea, while Korea is the EU's 9th largest trading partner.

2020 saw the 10th anniversary of the Korea-EU strategic partnership, proving that the relationship between both the EU and Korea continues to be strong. It is clearly one of the strongest partners with the political and economic clout to make a difference at global and regional level, to contribute to the resolution of international crises and to jointly address the key challenges of the 21st century.

Cooperation with Korea is a priority for the EU and there is strong potential of collaboration for mutual benefit in a wide range of areas, ranging from 5G, Internet of Things, nanoelectronics and AI to antimicrobial resistance, automated driving systems and disaster resilience and security.

It is because of these reasons that as member of Renew Europe, I have decided to co-author the study:Technological innovation in the EU and the Republic of Korea: Similarities, differences, and areas for cooperation with the aim to illustrate what we have in common, lessons to be learnt, the power and importance of technological innovation and the possibilities for future cooperation.

Executive Summary

The Republic of Korea (ROK) quickly climbed the international rankings as one of the world's most innovative economies. In 2020, the ROK broke into the top ten in the Global Innovation Index for the first time. In the latest World Economic Forum Global Competitiveness rankings, it ranks fourth in the world for both research and development (R&D) and commercialization. Similarly, in Startup Genome's 2020 report, there is an entire section dedicated to "The Meteoric Rise of Seoul's Startup Ecosystem", as the city burst into the world's top 20 startup ecosystems[1]. The report gushes that "Seoul should serve as an example to other cities looking to grow their ecosystems with a robust, data-driven programme of investment and support for local startups".[2]

Given the exponential rise of the Korean innovation system on the world stage, into one of the world's leading innovators and startup ecosystems, in this report we compare the ROK's innovation system with the EU. We detail the role of government policy and changes to the institutional setting in the ROK since the East Asian Financial Crisis in 1998 through to 2020 in order to unpack the drivers of its meteoric rise. Crucially, we offer a synthesis of the EU innovation system over a similar period (2000-2020). By distilling the thrusts of the two innovation systems over these share time periods, we are able to identify the similarities and differences between the ROK and EU systems. We also zoom into the Spanish context, to offer further depth in the coverage of the European innovation setting. Collectively, this comparative approach helps us to identify potential lessons that can be drawn from the ROK approach, and outline arenas for potential bilateral cooperation between the EU and ROK.

The lessons we draw from the ROK's open innovation system approach, in which collaboration between large firms and startups is at the core. To begin with, we observe that funding, of both R&D and startup ecosystem development, has been crucial to the boost in innovation capacity and activity levels. Korea's large firms are major R&D spenders, and there is notable public-private R&D collaboration. The state has fuelled the startup ecosystem, in particular, with the launch of startup-friendly stock markets and public investment in venture capital. The ROK government has purposively worked to ensure that the regulatory framework supports both the development of intellectual property and also the exit strategies available to high-growth startups. The marked rise in innovation capacity, and startup activity in particular, has been enabled by government investment in human resource training. There is a steady pipeline of STEM graduates, who enable the large firm (*chaebol*) capacity, and also, constitute a strong talent pool of startup founders.

Through the analysis, we propose a series of recommendations for EU instruments and programmes for fostering the European innovation system. This includes: (1) that Horizon Europe remains the cornerstone of innovation funding; (2) the European Innovation Council (EIC) sees a scale up of its funding and mentorship activities, (3) efforts to further increase linkages between innovation and jobs, (4) further boosting of the Commission's work to foster female entrepreneurship, and (5) greater emphasis on integrating large firms into the open innovation system.

[1] Startup Genome. (2020) *Global Startup Ecosystem Report 2020.* Available at: https://startupgenome.com/report/gser2020.
[2] Ibid, p. 59.

We also outline seven areas for further consideration of “blue sky thinking” in terms of innovation system support. The blue-sky thinking canvasses institutions, research and development provision and startup ecosystem, particularly with respect to learning from the ROK and bolstering collaboration between the innovation systems. In terms of institutional blue-sky thinking, we recommend the consideration of (1) a startup-friendly stock exchange and (2) the creation of an EU agency responsible for coordinating startup policies across issues, as the ROK’s Ministry of SMEs and Startups does. In terms of conducting R&D, we recommend the (3) establishing of a bilateral R&D fund, modelled after the ROK’s fund with Israel, which would boost collaborative R&D across the EU and ROK.

To scale up collaboration across the startup ecosystems in the EU and ROK, we recommend the (4) creation of a version of the K-Startup Grand Challenge, that would bring ROK entrepreneurs to the EU, (5) the establishing of a bilateral fund of venture capital fund, to support the further integration of venture capital markets and startup ecosystems across the EU and ROK, (6) launch an EU version of the K-Global Silicon Valley programme, which connects the vibrant European startup ecosystems with the ROK, and (7) establish an EU-ROK Startup Centre in Seoul, as a physical and institutional hub for the connection of the ecosystems.

1. Introduction

The EU sees technological innovation as a cornerstone of its future growth strategy, the European Green Deal, and a Europe fit for the digital age. Horizon 2020 and the incoming €95.5 billion Horizon Europe programme place academia and industry at the heart of European innovation activities. Further broadening the conceptualization of how innovation is produced, the European Innovation Council (EIC) adds innovators, startups, small firms, and researchers to the core of Europe's innovation strategy. Hence, the EU is developing a comprehensive, “open” innovation ecosystem bringing together the public and private sectors, and big and small firms. This is to be welcome, for the European innovation scoreboard 2020 shows that the region’s innovation performance gap has increased vis-a-vis some third countries.

One of these countries is the Republic of Korea (ROK). Dating back to the aftermath of the 1997-98 Asian Financial Crisis, the ROK has adopted the innovation model that the EU is now prioritizing. Indeed, successive ROK governments have launched a wide range of policies and provided substantial funding to establish an innovation system in which research institutes, universities, startups, and big conglomerates work together. This report offers insight into the ROK’s approach to developing its national innovation system, particularly with respect to fostering the open innovation system and boosting startup activity. It then compares the EU approach in order to distil similarities and differences, and identify areas for further collaboration between the EU and ROK. In turn, this will support the next stages of development of Europe's technological innovation system. This report will answer the following questions:

- What are the similarities between the innovation systems of the ROK and the EU?
- What are their differences?

- How can the EU boost technological innovation cooperation with the ROK?

To analyse public support for the two innovation systems, innovation policy will be distinguished in terms of eight policy types that would guide the analysis in this section: (1) Funding, (2) Taxation, (3) Regulation, (4) Clusters, Networks, Institutes, (5) Attracting Talent and Investment, (6) Stock Market Access, (7) Technology Infrastructure and Government Procurement, and (8) Education and Training.[3] Table 1, below, summarizes the innovation policy types:

Table 1: Startup-centric innovation policies

Innovation Policy Type	Specific Policy Tools
1. Funding	• R&D expenditure • Direct startup (equity and debt) investment • Investment in VC funds
2. Taxation	• Incentives for R&D spending • Tax rates by firm age and size • Incentives for investors, particularly VCs and business angels
3. Regulation	• Intellectual Property (IP) rights • Bankruptcy laws • Labour market regulations (including pension fund regulation) • Investor regulations and legal structures
4. Clusters, Networks, Institutes	• Science parks • Innovation centres • Accelerators and incubators • Special economic zones (SEZs)
5. Attracting Talent and Investment	• Programs to entice (foreign) entrepreneurs to startup locally • Incentives to encourage FDI, either for startups or large firms
6. Stock Market Access	• Establishing stock markets catering to startups • Rules around stock market listing and foreign exchange dual listing
7. Technology Infrastructure and Government Procurement	• Infrastructure projects (e.g. 5G) • Open data • Use of government coffers to serve as customers
8. Education and Training	• STEM education • Entrepreneurship skills training

[3] For an overview of the policy menu, see: Pacheco Pardo, Ramon, and Robyn Klingler-Vidra. 2019. "The Entrepreneurial Developmental State: What Is the Perceived Impact of South Korea's Creative Economy Action Plan on Entrepreneurial Activity?" *Asian Studies Review* 43(2): 313–331; Klingler-Vidra, Robyn. 2014. "The Public Venture Policy Menu: Policies Public Authorities Can Take." *Venture Findings* 1(1): 36–42.

Continuity and change in the provision of policies across these eight types will be examined in terms of which companies are target beneficiaries (e.g. large firms or startups) and accompanying institutional aspects, such as the provision of support for equity and credit instruments to enable the innovation ecosystem.

Section 2 will analyse the evolution of the ROK's innovation ecosystem in the period of 1998-2020; that is, from the early aftermath of the East Asian Financial Crisis (EAFC) to last year. The section will pay particular attention to the continuities across administrations, showing how successive ROK governments have built on their predecessors' policies to build a sophisticated innovation ecosystem.

2. The evolution of the ROK's technological innovation ecosystem

The 1997 East Asian Financial Crisis shook the foundations of the ROK's existing economic model, which had emphasized the role of large firms (the *chaebol)* in driving economic growth, job creation and innovation. From the onset of the crisis, there was a general feeling that close ties between the government and the *chaebol*, from the 1960s onwards, had fuelled a lack of transparency and accountability that was at least partly to blame for the EAFC.[4] It was in this context that startup-centric innovation policies advanced, as detailed in Table 2 below.

Table 2: ROK startup-centric innovation policies (1998-2007)

Year	Initiative	Innovation Policy Type	Implementing Organization
1998	Fostering Venture Businesses (벤처기업육성)	Clusters, Networks, Institutes	Central government
	Special Law to Promote Venture Firms	Regulation	Central government
	Act on the Special Cases Concerning Support for Technoparks	Regulation	Regional governments
	Venture Business Startup Program "Restart Fund"	Funding	Small and Medium Business Corporation
1999	Science and Technology Vision 2025	Clusters, Networks, Institutes	Central government
1999	National Science and Technology Council (NSTC)	Clusters, Networks, Institutes	Central government
2001	Act on the Promotion of Technology Innovation of Small and Medium Enterprises	Regulation	SMBA

[4] Hundt, David. 2005. "A Legitimate Paradox: Neo-liberal Reform and the Return of the State in Korea." *The Journal of Development Studies* 21(2): 242–260. Chang, Sea-Jin. 2003. *Financial Crisis and Transformation of Korean Business Groups: The Rise and Fall of Chaebols*. Cambridge: Cambridge University Press.

2002	Korea BioValley (San Diego)	Funding	Federation of Korean Industries
2003	Innovate Korea (혁신)	Clusters, Networks, Institutes	Central government
2004	Office of Science, Technology and Innovation (OSTI)	Clusters, Networks, Institutes	MOST
2005	Act on the Promotion of Collaborative Cooperation between Large Enterprises and Small-Medium Enterprises	Regulation	SMBA
	Korea Venture Investment Corporation (KVIC)	Funding	KVIC

Sources: Collected by the authors and their research assistants from official government websites and publications.

Coming to power in the midst of the EAFC, and voted in by an ROK population critical of the *chaebol* and looking for change, gave the Kim government even more reason to diversify the sources of economic growth.[5] The Kim government thus launched an array of plans, regulatory changes, and other initiatives designed to make startups central to innovation and economic growth in the ROK. Roh Moo-hyun, his liberal successor, would follow suit (see table 2). ROK policymakers believed that startups would be willing to take the necessary risks to help diversify the ROK economy. Furthermore, they thought that startups were unhindered by the bureaucratic impediments making radical innovation more difficult for the *chaebol*.[6] But the embrace of startups was not a complete rejection of *chaebol* support, the Roh government started a process of promoting cooperation between the *chaebol* and startups that continues to this day.[7]

a. Finance

With respect to the financing of startup-centric innovation, in this era the ROK state sought to further develop domestic capital markets. In particular, VC markets received specific support. The government launched its own VC funds and created a program to provide matching funds for investors in VC funds. VC markets were a central component of the government's policy to support high-tech startups that could become competitive at the international level.[8] Traditionally, these companies had found difficulties in obtaining financing, in spite of government efforts during the ROK's developmental stage to direct funding towards SMEs in general and innovative startups in particular. The EAFC made the banking sector more cautious with its lending, increasingly distributed through mortgages

[5] Kim, Dae-jung. 2019. *Conscience in Action: The Autobiography of Kim Dae-jung*, translated by Seung-hee Jeon, London: Palgrave Macmillan.

[6] Authors' interview with Office of the President of the Republic of Korea government official, 20 June 2017, Seoul.

[7] Klingler-Vidra, Robyn, and Ramon Pacheco Pardo. 2019. "Beyond the Chaebol? The Social Purpose of Entrepreneurship Promotion in South Korea." *Asian Studies Review* 43(4): 637–656.

[8] Klingler-Vidra, Robyn, and Ramon Pacheco Pardo. 2020. "Legitimate Social Purpose and South Korea's Support for Entrepreneurial Finance Since the Asian Financial Crisis," *New Political Economy*, 25(3): 337–353.

and credit to well-known companies – especially *chaebol*.[9] Thus, the government decided to directly fund VC markets.

In this respect, particularly significant was the launch of the Korea Venture Investment Corporation (KVIC) by the Roh government in 2005. KVIC supports the VC market through the 30-year Korea FoF, an investment vehicle in private VC funds.[10] The FoF provided much-needed legitimacy to government investing, since the government was not directly picking winning firms (or sectors). Instead, it was investing in private VC firms which then made their own investment decisions.[11] This way, the government increased equity capital to startups through VC firms. By September 2019, the FoF had grown to KRW4.1 billion.[12] Furthermore, out of eight ROK unicorns as of mid-2019, seven had received funding from the FoF in their early stages.[13]

In addition, the government increased funding for R&D and export promotion. To start with, the government boosted funding for the ROK to become competitive in radical innovation. KAIST, especially, was the main beneficiary along with national universities – particularly the ROK's top-ranked Seoul National University. Pohang University of Science and Technology (POSTECH), established by POSCO in 1986, also benefited from government efforts to promote the ROK's competitiveness at the cutting edge.[14] Overall government spending in R&D as a percentage of GDP increased following the EAFC, remaining above 2.5 percent from 2004 onwards and making the ROK one of the top two OECD countries according to these measures.[15] This was one of the highest figures in the world along with Israel's.

Aware of the difficulties experienced by ROK startups to internationalize, the government also started to provide funding for commercializing products internationally. On the commercialization side, the Ministry of Information and Communication (MIC) established iParks in eight locations across the world – including Silicon Valley and other innovation centres across the world. These were business incubators to promote the ROK's IT exports, with firms receiving free space, mentoring, and support in establishing partnerships with local commercial channels.[16] On the research side, the Kim government launched Korea BioValley in San Diego, California, in 2002. The focus was on biotech innovation, with the government building the infrastructure and providing below market rate, or free, leases to companies in this sector.[17]

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[9] Thurbon, Elizabeth. 2016. *Developmental Mindset: The Revival of Financial Activism in Korea*. Ithaca, NY: Cornell University Press.
[10] Klingler-Vidra and Pacheco Pardo, 2020.
[11] Thurbon, 2016.
[12] KVIC. 2020. *Fund of Funds*.
[13] MSS. 2019. *"Fund of Funds (FOF)," a Firm Assistant Leading the Innovative Growth of Startups and Ventures*, 27 May 2019.
[14] Kim, Sungwoong. 2010. "From Brain Drain to Brain Competition: Changing Opportunities and the Career Patterns of US-Trained Korean Academics," in Charles T. Clotfelter (ed.), *American Universities in a Global Market*, Chicago: The University of Chicago Press, 335–369.
[15] OECD. 2021. *Gross Domestic Spending on R&D*.
[16] Thurbon, Elizabeth, and Linda Weiss. 2006. "Investing in Openness: The Evolution of FDI Strategy in South Korea and Taiwan." *New Political Economy* 11(1): 1–22
[17] Niiler, Eric. 2002. "US Wary of South Korean Plans for Californian Biocenter." *Nature Biotechnology* 20(4): 321.

b. Employment

The EAFC resulted in a spike in unemployment in the ROK, and the *chaebol* could not absorb the growing workforce. In this context, support for startups became a job creation tool. Indeed, from the onset KVIC was tasked with supporting job creation. In this respect, its support for the VC market entailed providing funding to the largest number of firms possible through direct support to the VC market.[18] But it also entailed fostering private investment by promoting participation by institutional investors and pension funds, while working to boost the number of angel investors.[19] This means that KVIC was implicitly tasked with developing a strong private market to support startups and, ultimately, job creation.

The decrease in the *chaebol* employment opportunities, the increase in governmental support for startups, and the availability of non-permanent job contracts supported an increase in the number of high-tech startups. The share of jobs in SMEs – including startups – jumped from 80 percent in the aftermath of the EAFC to over 86 percent in 2002. It has remained above this figure ever since.[20] In the specific case of high-tech startups, younger South Koreans who in the past might have joined one of the *chaebol* or remained there throughout their career decided to launch their own firm instead.[21] A case in point is Lee Hae-jin, who left his job at Samsung in 1999 to launch Naver – the ROK's leading internet portal search engine. This sort of career move became more common throughout the 2000s.

c. Innovation

The EAFC and Kim's election also served the ROK state to decisively move from catch-up to frontier innovation. As the ROK sought to find new sources of growth in the aftermath of the crisis, frontier innovation became one of the areas prioritized by the government.[22] SMEs are considered to be better at radical – as opposed to incremental – innovation. Nimbler, in need of new products, and unhindered by internal bureaucratic hurdles, SMEs were considered to have a competitive advantage over their larger peers when it came to the R&D of new technologies.[23] The Kim government believed this, and prioritized support for SMEs and startups that could spur innovation. Support for *chaebol*-led innovation did not disappear, but it was considered to be separate from SME innovation.

The Roh government also sought to foster radical innovation, but with a crucial change: the ROK state established a policy of developing an entrepreneurial ecosystem with the *chaebol* embedded.[24] This policy survives until today. Roh's "Innovate Korea" policy and the NIS concepts were designed to promote the creation of an entrepreneurial ecosystem – with the

[18] Klingler-Vidra and Pacheco Pardo, 2020.
[19] KVIC. 2020. *History*.
[20] MSS. 2020. *Status of Korean SMEs*.
[21] Authors' interview with entrepreneurship foundation manager, 30 August 2016, Seoul; authors' interview with Seoul Business Agency manager, 23 August 2017, Seoul.
[22] Choung, Jae-Yong, Hye-Ran Hwang, and Wichin Song. 2014. "Transitions of Innovation Activities in Latecomer Countries: An Explanatory Case Study of South Korea." *World Development* 54: 156–167.
[23] Authors' interview with Seoul CCEI manager, 20 June 2017, Seoul.
[24] Klingler-Vidra and Pacheco Pardo, 2019.

government at the centre.[25] The Roh government launched the Office of Science, Technology and Innovation (OSTI) in 2004, part of the MOST established in 1969. OSTI was created to facilitate inter-ministerial coordination on the areas of its remit and, crucially, to promote indigenous innovation. The National Science and Technology Council (NSTC), launched in 1999, had previously had this function, but it was considered inefficient insofar that it did not sit under any ministry. The Minister of Science and Technology, meanwhile was also named deputy prime minister, which underscored the importance that the Roh government gave to innovation.[26]

As part of its Participatory Government, the Roh government also pushed for an innovation system in which the private sector and civil society were fully embedded in the planning, coordination, and assessment of innovation policy. Experts, private sector workers, and NGOs were involved in the R&D budget allocation, coordination, and assessment process. For the first time, the ROK conducted "Technology Assessment" projects on nano-bio-info and radio-frequency identification technologies.[27] The goal was to harness the expertise of groups with different knowledge and skills, which could boost frontier innovation. Concurrently, the ROK did not have to worry about the potential uses and effects of its innovation during the catch-up phase. But this was not the case at the frontier state, thus the need to assess the impact of new technologies.

Furthermore, the Roh government was the first to decisively push for spatially balanced national development as part of the just-mentioned Participatory Government. This included the promotion of regional innovation clusters across the country. His government established 13 innovation clusters specializing in different areas (e.g. electronics and IT in Gumi, automobiles in Ulsan, or photonics in Gwangju). The government also supported local clusters and promoted the development of clusters anchored around the *chaebol* (e.g. POSCO's materials cluster in Pohang or Samsung's IT cluster in Suwon).[28] The thinking was that different regions, or cities, could specialize in different areas of innovation. This policy would be resumed by the Park Geun-hye government and then continued by the Moon Jae-in government.

The ROK state felt that the education system might be inadequate to develop the necessary human resources to promote radical innovation. In 1999, the Ministry of Education and Human Resources Development launched Brain Korea 21 (BK21). This was a US$21 billion, seven-year education project aimed at supporting and developing graduate schools that could produce creative knowledge. All areas of knowledge creation received support, but the emphasis was on natural and applied sciences. Most of the funding went to students and

[25] Seong, Jieun, and Wichin Song. 2008. "Innovation Policy and Administration System in the Era of Post Catch-up: The Case of the Roh Moo-hyun Administration's Innovation Policy." *Asian Journal of Technology Innovation* 16(2): 25–46.
[26] Schuller, Margot, Marcus Conle, and David Shim. 2012. "Korean Innovation Governance under Lee Myung-Bak – A Critical Analysis of Governmental Actor's New Division of Labor," in Jorg Mahlich, and Werner Pascha (eds.) *Korean Science and Technology in an International Perspective*. Heidelberg: Springer: 109–128.
[27] Seong and Song, 2008, pp. 38-9.
[28] Park, Chisung, Jooha Lee, and Changho Chung. 2015. "Is 'Legitimized' Policy Always Successful? Policy Legitimacy and Cultural Policy in Korea." *Policy Sciences* 48: 319–338.

infrastructure, to ensure that it reached its intended beneficiaries.[29] BK21 was subsequently renewed by the Roh government and survived until 2012. Roh also launched the New University for Regional Innovation (NURI) program in 2004 to support graduate education in universities outside of the Seoul metropolitan area. Up to 500 research centres and groups benefited from BK21.[30]

d. **Firm size**

The EAFC served as a catalyst for the government to double down on its backing for innovative SMEs. The Kim government came to power in the middle of the dot-com bubble. The ROK had not been immune: Daum, today the country's second-largest search engine, had been launched in May 1997; Naver, the ROK's first portal with its own search engine and today the country's leading internet firm, followed in June 1999. In other words, by the time the Kim government started to support startups in earnest and published Vision 2025 in September 1999 (see table 2), there were already examples of startups innovating in sectors in which the *chaebol* were unable to compete. This further reinforced the government's support for startups.

When the Roh government came into power in 2003, the dot-com bubble had burst. This had laid bare the limits of an SME-led radical innovation model. The Roh government thus shifted its focus towards the development of entrepreneurial ecosystems embedded into the *chaebol* fabric.[31] The government also passed the Act on Special Cases Concerning the Regulation of the Special Economic Zones for Specialized Regional Development in 2004, the Act on the Development of Traditional Markets and Shopping Districts in 2005, and the Act of the Facilitation of Entrepreneurial Activities of Persons with Disabilities that same year, to support entrepreneurship across different parts of the country and among countries excluded in the past (see table 2). This showed strong support for SMEs while trying to meet the goal of inclusiveness that was part of the Participatory Government.

At the same time, the Roh government started to design policy to support the *chaebol* indirectly. The 2005 Act on the Promotion of Collaborative Cooperation between Large Enterprises and Small-Medium Enterprises symbolized this new approach (see table 2). The Roh government sought to facilitate the integration of startups in the *chaebol* production and sales channels, which also worked to inject the *chaebol* with renewed innovation capacity. This could be done by incorporating startups as suppliers or through acquisition, which provided the *chaebol* with the startup's talent and technology.

Relative pause in the advance of Startup Korea: aftermath of the GFC and the Lee Myung-bak government (2008-2012)

[29] Moon, Mugyeong, and Ki-Seok Kim. 2001. "A Case of Korean Higher Education Reform: The Brain Korea 21 Project." *Asia Pacific Education Review* 2(2): 96–105.
[30] Kim, Sungwoong. 2010. "From Brain Drain to Brain Competition: Changing Opportunities and the Career Patterns of US-Trained Korean Academics," in Charles T. Clotfelter (ed.), *American Universities in a Global Market*, Chicago: The University of Chicago Press, 335–369.
[31] Klingler-Vidra and Pacheco Pardo, 2019.

The ROK was the only developed country, along with Australia, not to suffer a recession during the GFC. The ROK had learnt the lesson from the EAFC, and it implemented the second largest stimulus package in the world as a percentage of GDP after China's.[32] In this context, Lee Myung-bak became the first conservative president in 10 years when he took office in 2008. Lee introduced changes to the entrepreneurship-supporting policies pursued by his two liberal predecessors. The Lee government continued to support innovative SMEs and startups. But his government did not introduce any overarching plan or policy conductive towards further developing the country's entrepreneurial ecosystem, in the way that Roh had. Instead, he introduced changes to existing entrepreneurship-supporting polices. These were related to an increase in funding and the facilitation of market access (see table 3).

Table 3: ROK startup-centric innovation policies (2008-2012)

Year	Initiative	Innovation Policy Type	Implementing Organization
2008	577 Initiative	Clusters, Networks, Institutes	Central government
	Ministry of Education, Science and Technology (MEST)	Education and Training	Central government
	Institute for Korea Entrepreneurship Development (IKED), Korea Institute of Startup & Entrepreneurship Development (KISED) from 2011	Clusters, Networks, Institutes	IKED/KISED
2009	Act on the Facilitation of Purchase of Small and Medium Enterprise-Manufactured Products and Support for Development of Their Markets	Infrastructure and Government Procurement	Central, regional, and local governments
2011	Act on the Fostering of Self-Employed Creative Enterprises	Regulation	SMBA
	Angel Investment Matching Fund	Funding	KVIC
2012	Korea Technology Finance Corporation Act amendment	Funding	Korea Technology Finance Corporation (KOTEC)

Sources: Collected by the authors and their research assistants from official government websites and publications.

At a more general level, the overarching strategy underpinning Lee's economic policy was the "Green Growth Strategy". By its own nature, the strategy necessitated innovation.[33] Therefore, the Lee government sought to promote a more innovative ROK economy by increasing support to basic research and the commercialization of innovation, which, it thought, were weak spots. Thus, it disbanded MOST and OSTI. Some of MOST's functions

[32] OECD. 2010. *OECD Factbook 2010*, Paris, OECD.

[33] Han, Heejin. 2015. "Korea's Pursuit of Low-Carbon Green Growth: A Middle-Power State's Dream of Becoming a Green Pioneer." *The Pacific Review* 28(5): 731–754.

were transferred to the Ministry of Education, Science and Technology (MEST); namely, education and basic research. Most notably, however, Lee established a Ministry of Knowledge Economy (MKE) with innovation policy and applied research as part of its remit. Meanwhile, NSTC was upgraded following the dissolution of OSTI. However, its policy planning and coordination functions were split between MEST, now home to NSTC, and MKE.[34]

a. Finance

Lee continued the policy initiated by Kim and Roh whereby a growing share of government lending went to SMEs. Building on the Green Growth Strategy, the government allocated KRW13.9 billion (approximately €10.3 million) to support SMEs working on green industries.[35] Meanwhile, KVIC continued to increase lending to private VC firms through its FoF.[36] Similarly, government-guaranteed loans for SMEs continued to increase throughout Lee's time in office.[37] Furthermore, KVIC launched an Angel Investment Matching Fund in 2011, whereby it would match the funds provided by angel investors to startups upon their request.[38]

In addition, in 2012 the National Assembly passed an amendment to the Korea Technology Finance Corporation Act. The amendment allowed the Korea Technology Finance Corporation (KOTEC) – founded in 1989 as the Korea Technology Credit Guarantee Fund – to provide equity investment to early-stage venture businesses (see table 3). The implication was that the state could essentially become a co-owner of early-stage startups. This was a significant policy change insofar hitherto the government had provided funding or credit guarantees to startups or to firms financing them, such as VC firms. But the government could now have a direct stake in the business it was supporting.

b. Employment

Job creation was a top priority of the Lee government, particularly as the GFC threatened to result in huge layoffs as had been the case during the EAFC. To begin with, KVIC and the Korea Finance Corporation launched a KRW120 billion Job Creation Fund in 2010, with a second KRW107 billion fund the next year. The specific goal of these funds was to invest in VC firms supporting SMEs "with high job-creation potential". The ROK state was therefore providing direct support to startups holding the promise to create jobs, including in so-called Next Generation Growth Engine industries.[39] By making explicit the goal of job creation, the government was also sending the message that funding would be forthcoming to firms helping to reduce youth unemployment.

In addition, and directly related to job creation for younger South Koreans, the Young Entrepreneurs Startup Academy was set up in 2011.[40] This agency was launched not only to

[34] Schuller *et al,* 2012
[35] Klingler-Vidra and Pacheco Pardo, 2020.
[36] KVIC. 2020. *Fund of Funds*.
[37] Pacheco Pardo and Klingler-Vidra, 2019.
[38] KVIC. 2020. *Angel Investment Matching Fund*.
[39] KVIC. 2020. *Job Creation Fund*.
[40] KOSME. 2017. *학교소개 (School Introduction)*.

provide funds to would-be young entrepreneurs – meaning those under 39 years old – but also to offer office space, training, and mentoring. The non-financial aspects of the project were crucial. Some of the largest barriers to prospective entrepreneurs are a lack of managerial, legal, and other skills necessary for people who essentially become CEOs and, oftentimes, CFOs once they launch their business.[41] The Young Entrepreneurs Startup Academy was designed to address this issue.

Finally, in 2011 the Act on the Fostering of Self-Employed Creative Enterprises was passed. Self-employed individuals or business entities comprising fewer than five non-regular workers were allowed to continue to operate self-employed firms for three years after they had expanded beyond five workers. This gave them tax and other advantages, thus reducing labour costs. Furthermore, these firms received support from the government including, potentially, funding (see table 3). The act addressed the concern that the creative industries, a potential source of new jobs, were hindered by employment costs higher than they could absorb.

c. Innovation

Dating back to the 1980s and, especially, 1990s the ROK feared that it would be sandwiched between "high-tech" Japan and "low-cost" China, leading to both a lack of competitiveness and the hollowing out of its industry. This was the economic iteration of the centuries-old "shrimp among whales" syndrome, whereby South Koreans feel that their wellbeing is not in their hands, but instead depends on the actions of bigger countries in the region. In the aftermath of the GFC, and with China both attracting an ever-growing number of manufacturing jobs and moving up the value-added chain, this fear intensified. The feeling was that the ROK was in dire need of fostering radical innovation.

From the Lee government's perspective, radical innovation necessitated boosting the ROK's basic research capabilities. MEST was entrusted with this task. Links between government R&D institutes (GRIs) and universities on the one hand and the *chaebol* on the other had traditionally been weak. From the 1980s onwards, it was clear that the *chaebol* were leading the ROK's innovation through their own R&D units rather than in cooperation with public bodies.[42] By bringing together education and S&T under the same ministry, the government was seeking to strengthen the links among the country's school education policy, basic research conducted by universities, and competitiveness in new technologies. This included an education policy fostering basic skill and creativity. This was coupled with a S&T policy based upon greater funding for "high risk, high return" areas such as biotechnology, nanotechnology, and brain research – with funding increasing to KRW16.6 trillion (approximately €12.4 billion) by 2012 under the 577 Initiative. The Lee government also introduced policies to attract foreign experts to the country's universities and GRIs.[43]

[41] Schoof, Ulrich. 2006. "Stimulating Youth Entrepreneurship: Barriers and Incentives to Enterprise Startups by Young People." *SEED Working Paper* 76.
[42] Mok, Ka Ho. 2013. "Promotion of Innovation and Knowledge Transfer: South Korean Experiences," in Ka Ho Mok (ed.) *The Quest for Entrepreneurial Universities in East Asia*. Basingstoke: Palgrave Macmillan: 47–58.
[43] MEST. 2008. *Becoming an S&T Power Nation through the 577 Initiative. Science and Technology Basic Plan of the Lee Myung-bak Administration*, Seoul, MEST.

The Lee government also identified commercialization of innovative products, services, and ideas as a weak spot in the ROK's innovation system. Thus, the MKE was tasked with providing funding in areas that could be commercialized. In 2009, the government unveiled a KRW1 trillion (approximately €742 million) program to fund research in up to ten materials in which the ROK could get a 30 percent share of the world market. Following from the government's Green Growth Strategy, energy- and environment-related green technology also received a funding boost.[44] The IT sector was also prioritized, especially computers, telecommunication equipment, and electronic components.[45] GRIs working in the areas prioritized by the government benefited from these higher levels of investment.

Commercialization of innovation by SMEs also received government support. The government passed the Act on the Facilitation of Purchase of Small and Medium Enterprise-Manufactured Products and Support for Development of Their Markets in 2009. The act asked governments at all levels to use the public procurement system to boost demand for SME goods and services by prioritizing their acquisition. In addition, the act compelled the government to support the development of domestic and international distribution channels (see table 3). Essentially, the act was designed to facilitate sales by SMEs, since their products are often less competitive than the *chaebol* products price- and technology-wise.

d. Firm size

The Lee government continued to support SMEs through funding and legal changes to facilitate their operation and market entry. Partly, this was the result of the changing nature of the ROK's labour market. The percentage of South Koreans employed in SMEs continued to grow and self-employment was also becoming more common,[46] hence the need to support them. For example, Lee announced in his New Year speech of 2012 a KRW500 billion fund for self-employed entrepreneurs to grow their startups.[47] Partly, support for SMEs reflected that direct help to the *chaebol* continued to be unacceptable. And partly, governmental support for SMEs was a means to strengthen the government's market-friendly agenda.

The *chaebol* developed their own programs to nurture innovation by non-employees. For example, SK Telecom, the largest mobile service carrier, launched programs to train IT experts and mobile app developers.[48] And Samsung launched an in-house idea and startup incubator C-Lab (Creative Lab) in 2012.[49] But these were not government-led or supported programs. Rather, it was the *chaebol* seeking to promote innovation to increase their product range and talent pool.

Expansion of Startup Korea: the Park Geun-hye and Moon Jae-in governments (2013-2020)

[44] Scarlatoiu, Greg. 2012. "Low Carbon, Green Growth Korea," in Jorg Mahlich and Werner Pascha (eds.) *Korean Science and Technology in an International Perspective*, Heidelberg: Springer: 239–258.
[45] MEST, 2008.
[46] MSS, 2020.
[47] Lee, ibid.
[48] SK Telecom. 2011. *Partner for New Possibilities. 2011 SK Telecom Sustainability Report*, Seoul, SK Telecom.
[49] Samsung. 2018. "Three New Projects Spin Off from Samsung Electronics' C-Lab." *Samsung Newsroom*. June 6.

The Park Geun-hye and Moon Jae-in governments put innovation and startups at the centre of their economic policies, seeking to develop an open innovation system that would bring together the public sector (especially universities), the *chaebol*, and startups. Following from the relative hiatus in the aftermath of the GFC and during the Lee government, Park made the "creative economy" one of the centrepieces of her inaugural address in February 2013,[50] after mentioning the topic during her campaign. Her government unveiled a Creative Economy Action Plan shortly after, in June.[51] Continuing along the same lines, Moon put the Fourth Industrial Revolution at the centre of his economic policy in one of his first major economic speeches in June 2018;[52] this was barely a month after his inauguration, and followed repeated discussion of the issue during his campaign. In October, the Moon government launched a Presidential Committee on the Fourth Industrial Revolution tasked with making the ROK a world leader in areas such as ICT and AI.[53] This signalled that the ROK state thought that innovation and startups were not optional. Rather, they were major elements of the present and future of the country's economy as both Park and Moon sought to develop a sustainable ROK entrepreneurial ecosystem. Table 4 summarizes the wide range of policies, funding programmes, and regulatory changes to make startups and entrepreneurship a key element of the economic growth and job creation strategy of the state.

Table 4: ROK startup-centric innovation policies (2013-2020)

Year	Initiative	Innovation Policy Type	Implementing Organization
2013	Creative Economy Action Plan	Clusters, Networks, Institutes	Central government
	Ministry of Science, ICT and Future Planning	Regulation	Ministry of Science, ICT and Future Planning
	Fund of Funds for Industrial Technology Commercialization	Funding	KVIC
	Foreign VC Investment Fund	Funding	KVIC
	KONEX	Stock Market Access	KONEX
2014	Creative Economy Innovation Centers (CCEIs)	Clusters, Networks, Institutes	Regional and local governments
	Act on Support for the Protection of Technologies of Small and Medium Enterprises	Regulation	Central government
2015	Special Act on Support for Small Urban Manufacturers	Regulation	Central government
	Angel Fund of Funds	Funding	KVIC

[50] Park Geun-hye, *Opening a New Era of Hope*, 25 February 2013.
[51] Government of the Republic of Korea, *The Park Geun-hye Administration's Creative Economy Blueprint, "Creative Economy Action Plan and Measures to Establish a Creative Economic Ecosystem"*, 5 June 2013.
[52] Moon Jae-in, *Congratulatory Remarks by President Moon Jae-in at the 2nd Annual Meeting of the Board of Governors of the Asian Infrastructure Investment Bank*, 16 June 2017.
[53] Sohn, JiAe. 2017. "President Emphasizes 'People-centered Fourth Industrial Revolution'". *Government of the Republic of Korea*. October 12.

	Youth Development Fund	Funding	MOSF
	KEPCO Fund of Funds	Funding	KVIC and KEPCO
2016	K-Startup Grand Challenge	Attracting Talent and Investment –	National IT Industry Promotion Agency, and MSS from 2017
2017	Ministry of SMEs and Startups (MSS)	Regulation	Central government
2018	Scale-Up Co-Investment Fund	Funding	KVIC
	KEBHana-KVIC Unicorns Fund of Funds	Funding	KVIC and KEBHana
2019	Strategy to Promote Second Venture Boom	Funding	Central government
	SME Policy Deliberation Committee	Regulation	MSS
	Masterplan for Promoting Women's Entrepreneurship Activities	Funding	MSS
2020	Seoul City Scale Up Fund	Funding	Seoul City government
	Digital Startup Commercialization Fund	Funding	Ministry of Economy and Finance
	K-Unicorn Project	Funding	MSS

Sources: Collected by the authors and their research assistants from official government websites and publications.

Arguably, this culminated in the creation of the Ministry of Science, ICT and Future Planning in 2013 – rebranded the Ministry of Science and ICT in 2017 – and the MSS in 2017. The former was a "super-ministry" with control of all government R&D funding, and the latter – the first ministry in the world with "startup" in its name – controlled all aspects of startup policy in the ROK.

The Park and Moon governments sought to develop a startup ecosystem through which to develop and promote a risk-taking culture and entrepreneurship as a valid career choice, including for fresh university graduates. Traditionally, launching or joining a startup was considered more of a fall-back option than a first career choice. Park and Moon sought to change this perception through media appearances, visits to startups, and, more generally, the development of a startup-centric innovation ecosystem offering funding, mentoring, internationalization, and other opportunities in a structured rather than piecemeal way. More generally, their two governments sought to raise the profile of startups more generally. The clearest example was the launch of the MSS in 2017 – a world first.

Like their predecessors, the Park and Moon governments refrained from providing direct support to the *chaebol*. However, both made a concerted effort to connect the *chaebol* and startups. The logic was that the former could provide mentoring, funding, or even an exit strategy to the latter. Thus, the Park government launched 19 CCEIs across the country to

support startups, with one of the *chaebol* serving as a corporate partner in each of them.[54] Furthermore, the government involved the *chaebol* in the design of startup policy and the entrepreneurial ecosystem to facilitate the successful integration of startups into the ROK's economy.[55] The K-Startup Grand Challenge, designed to bring foreign entrepreneurs to the country, also involved a partnership between government and the *chaebol*.[56] And when Moon came to power, he included "to promote mutually beneficial cooperation between the SMEs and large-sized enterprises for their Mutual Prosperity (sic)" as number 27 out of 100 tasks in his Five-Year Plan.[57] The government was thus openly indicating that it wanted SMEs, including startups, to work together with the *chaebol*.

Meanwhile, the Park and Moon governments also sought to spearhead the launch of innovative startups in different parts of the country. Most notably, the 19 CCEIs were located across the country's different provinces and main cities. Each had a specific sectoral focus related to the province or city and the partner *chaebol*; for example, automobiles in Gwangju Province (Hyundai), games and fintech in Gyeonggi Province (KT), or aviation and logistics in the city of Incheon (Hanjin).[58] Also, following the launch of the MSS there was an emphasis on the provision of funding and other types of support across the country.[59]

a. Finance

Funding for startups substantially increased under the Park and Moon governments. KVIC continued to be the main source. It took a more sophisticated approach, with the launch of three new funds to provide more targeted support. In addition, a KRW25 billion FOF for Industrial Technology Commercialization Fund was created in 2013 to promote the commercialization of technologies by startups with little experience in this area. This was followed shortly after by a Foreign VC Investment Fund. Also launched in 2013, this KRW135.4 billion fund focused on supporting the entry of startups in foreign markets. A second such fund worth KRW170.7 billion was launched in 2016.[60] Furthermore, a KRW41.6 billion Angel Fund of Funds was created in 2015 to invest in private investment associations making investments in early-stage startups.[61]

Seeking to tap into private funding, KVIC also launched two joint funds under the Park and Moon governments, respectively. The KEPCO FOF was launched in 2015. With a fund size of KRW52.5 billion by the end of 2018, its focus was to support the power and energy sectors as well as ICT startups in both Gwangju and South Jeolla Province. Meanwhile, the KRW110 billion KEBHana-KVIC Unicorns Fund of Funds was formed in 2018 to foster a startup-led innovation ecosystem and, relatedly, to nurture unicorns through indirect investments.[62]

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[54] CCEI. 2019. *입주공간 (Tenant Space)*.
[55] Ibid.
[56] K-Startup. 2018. *Organizer & Sponsor*.
[57] Government of the Republic of Korea, *100 Policy Tasks. Five-Year Plan of the Moon Jae-in Administration*, 16 July 2017, p. 21.
[58] CCEI, 2019.
[59] MSS. 2018. *Actively Foster Local SMEs in Non-metropolitan Areas*, 11 June 2018.
[60] KVIC. 2020. *Foreign VC Invest Fund*.
[61] KVIC. 2020. *Angel Fund of Funds*.
[62] KVIC. 2019. *KVIC MarketWatch. International Edition*, vol 1., Seoul, KVIC.

The government heavily – and successfully – promoted the ROK as a destination for foreign VC firms. Firms entering the market included 500 Startups (that launched 500 Kimchi), Altos Ventures (Altos Korea Opportunity Fund), Draper Athena (Draper Athena Fund), or Big Basin Capital (Big Basin Fund). As a manager at Seoul's Google Campus put it, foreign firms were attracted to the country thanks to the Park government's efforts to develop an entrepreneurial ecosystem.[63] This included foreign VC funds.

In addition, the Park government set up the Growth Ladder Fund and KONEX in 2013. Managed by K-Growth from 2016, the fund was divided into separate funds specializing on the seed, growth, and later stages of a startup's life cycle. In 2018, the Moon government expanded K-Growth's remit to include areas such as KOSDAQ scaling up, corporate restructuring, or social impact. As of November 2019, K-Growth had invested US$4.9 billion.[64] As for KONEX, it was a stock exchange for startups and SMEs prior to listing on KOSDAQ. In other words, it was a vehicle to provide an exit strategy to startups not yet ready to be accepted for listing on KOSDAQ but ready to go public and seek equity financing.[65] By the end of 2018, 44 companies had graduated from KONEX to KOSDAQ.[66]

The Park and Moon governments also used funding to target specific groups that they wanted to promote as entrepreneurs. The Park government announced a Youth Development Fund to support innovative youth activities in 2015.[67] It also launched the K-Startup Grand Challenge in 2016 to attract foreign entrepreneurs and startups to the ROK by offering them funding, office space, and an accelerator program: 5,725 teams applied in 2016-18, with 85 of them receiving the full support offered by the program.[68] In the case of the Moon government, the MSS announced a US$465 million package as part of the 2019 Masterplan for Promoting Women's Entrepreneurship Activities, along with a US$7.85 billion public procurement program to purchase products from women-led SMEs. The objective was to promote women-led startups through the provision of special guarantees, R&D support, and purchases.[69]

More generally, funding flowed to unprecedented levels. In 2018, governmental funding for startups reached KRW3.4 trillion (approximately €2.5 billion). This was the first time that it had topped KRW3 trillion, a powerful signal of the scale of the government's commitment to provide funding to develop an entrepreneurial ecosystem. It also spearheaded private investment, to the extent that in 2018 two-thirds of venture investment was private sector money.[70] As a result, the ROK had 11 unicorns as of the start of 2021. This was sixth highest

[63] Authors' interview with Google Campus manager, 23 August 2017, Seoul.
[64] K-Growth. 2020. *Key Figures of K-Growth*.
[65] KONEX. 2020. 코넥스시장 소개 (Introduction to KONEX Market).
[66] Yonhap. 2018. "S. Korea's 3rd Bourse Marks Solid Growth in 2018." *Yonhap News Agency*. December 30.
[67] Pacheco Pardo and Klingler-Vidra, 2019.
[68] K-Startup. 2018. *Introduction*.
[69] MSS. 2019. *To Expand Support for More StartUps and Solid Enterprises Led by Women*, 9 July 2019.
[70] Salmon, Andrew. 2019. "As Unicorns Spawn, South Korea's Anti-entrepreneurial Practices Evaporate." *Asia Times*. June 8.

in the world, the second highest in East Asia after China, and above Japan's four unicorns.[71] The ROK was punching above its economic weight.

To further foster the financing of the country's startup ecosystem, Moon announced a so-called Second Venture Boom in March 2019 – after the first of the late 1990s and early 2000s. In his speech, he pledged KRW10.25 billion in VC by 2022. The focus was to help startups to scale up, to avoid them going bust due to a lack of funding at an early stage. Importantly, this included promoting M&A. The logic was that M&As could help startups to grow rapidly, as the example of the U.S. showed.[72]

b. Employment

The Park and Moon governments saw startups as job creation tools. As an interviewee put it: "It's all about job creation. Startups are about jobs, not exits or changing the world like in Silicon Valley".[73] To this end, both governments actively pursued startup job creation programs. They continued Lee's Young Entrepreneurs Startup Academy, rebranded as the Youth Startup Academy to ensure that poor managerial skills did not prevent the continuing operation of successful startups.[74] The Moon government also implemented funding programs to directly address job creation through startups. In 2018, KVIC launched the Scale-Up Co-Investment Fund. The remit of this KRW50.6 billion fund was to co-invest alongside institutional investors in startups and SMEs scaling up that were "designated as a good job creator".[75] The theme of "good jobs" was important for the Moon government, which stressed the need for startups to create high-quality jobs.

In addition, Seoul also launched the 2019 Masterplan for Promoting Women's Entrepreneurship Activities. The masterplan included several funding lines and guarantee programs to support female entrepreneurship.[76] Considering that the female labour force participation rate had historically lagged behind the male rate and stood at 53 percent in 2018,[77] the masterplan was a means to create jobs for an underrepresented segment of the population. Indeed, the country's startup ecosystem has a higher ratio of female employees compared to Silicon Valley and other ecosystems.[78] One of the main reasons is that women feel that startups provide more flexibility and a better work-life balance compared to the *chaebol*.[79] It therefore made sense to boost job creation through support for women entrepreneurs.

c. Innovation

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[71] CB Insights. 2021. The Complete List of Unicorns.
[72] Moon Jae-in, *Remarks by President Moon Jae-in at Public Presentation on Strategy to Promote Second Venture Boom*, 6 March 2019.
[73] Authors' interview with co-working space manager, 20 June 2017, Seoul.
[74] KOSME. 2018. *Human Resource Development*.
[75] KVIC. 2019. *KVIC MarketWatch. International Edition*, vol 1., Seoul, KVIC.
[76] MSS. 2019. *Launch of "SME Policy Deliberation Committee," a Pan-Governmental Body to Manage SME Policies Comprehensively*.
[77] World Bank. 2020. *Labor Force Participation Rate, Female (% of Female Population Ages 15+*.
[78] Korean Startup Ecosystem Forum, 2016.
[79] Authors' interview with entrepreneurship foundation manager, 30 August 2016, Seoul.

The ongoing need to compete at the frontier stage continued to be a driver of Seoul's startup policy for the Park and Moon governments. Park established the Ministry of Science, ICT and Future Planning upon starting her term in office. This so called "super-ministry" had control over all government R&D funding, as well as all S&T policies.[80] It was succeeded by the Ministry of Science and ICT when Moon took office in 2017, which retained broadly the same competencies as his government focused on the Fourth Industrial Revolution.

At the same time, the Park and Moon governments also sought to foster radical innovation. Startups were specifically targeted for this purpose, especially those in the services sector.[81] A key reason behind the focus on startups for radical innovation purposes was the belief that the *chaebol* might find it more difficult to innovate due to their strength in existing sectors. This also explains the focus on services. Since the *chaebol* were stronger in manufacturing, the government could see radical innovation in services as a way to compensate for the *chaebol* weaknesses and also avoid direct startup-large firm competition – in which the former would have little chance of winning.

Continuing from Lee's prioritization of innovative product commercialization, Park and Moon focused on providing support in this area. KVIC's Industrial Technology Commercialization Fund and Foreign VC Investment Fund provided support for startups to sell their innovative products in domestic and international markets, as just explained. Commercialization was also supported through legislation. Approved in 2015, the Special Act on Support for Small Urban Manufacturers was intended to allow startups and other SMEs to get the necessary skills and funding to develop and commercialize their products (see table 4).

One area that both the Park and Moon government fostered was upskilling the workforce to foster innovation. This included a new-found openness to foreign talent, underpinned by the belief that highly-skilled foreigners could be attracted to the ROK. The Park government thus launched the K-Startup Grand Challenge in 2016. This was an accelerator to attract startups from around the world.[82] Under her government, Seoul also launched an "entrepreneur visa" for foreigners willing to launch a startup in the ROK.[83] Focusing on the education system, the Park government continued the BK21 program first established by Kim. Rebranded as BrainKorea21^{Plus}, this education program again provided funding for universities and students with a focus on funding for students and infrastructure.

d. Firm size

The Park and Moon governments sought to develop open innovation systems. To this end, they first focused their funding and regulatory support on SMEs, as the Lee government had done as well. The total number and percentage of South Koreans employed by SMEs continued to grow.[84] Therefore, it made sense for Seoul to focus its efforts on supporting them. Indeed, the scandal involving Park, in which Samsung and other *chaebol* were accused

[80] Larson, James F., and Jaemin Park. 2014. "From Developmental to Network State: Government Restructuring and ICT-led Innovation in Korea." *Telecommunications Policy* 38(4): 344–359.
[81] OECD. 2014. *OECD Reviews of Innovation Policy. Industry and Technology Policies in Korea*, Paris, OECD.
[82] K-Startup. 2018. *K-Startup Grand Challenge Program*.
[83] Pacheco Pardo and Klingler-Vidra, 2019.
[84] MSS, 2019.

of providing donations to a close confidant of the president in exchange for political favours, further eroded the image of large corporations.[85] This made provision of direct state support for the *chaebol* more difficult. In the case of Moon, the first liberal president in almost a decade also thought that support for SMEs, as opposed to the *chaebol*, was also a means to level the playing field between both types of companies.[86] The thinking was that SMEs needed state support in order not to see themselves – and their innovations – taken over by the *chaebol*.

To support startups and their fuelling of system-wide innovation, the Park government launched 19 CCEIs across the country as explained above. The Moon government maintained these. Notwithstanding the above, the two main startup clusters had emerged and continued to evolve organically for the most part; that is, without the need for a CCEI. The first of these clusters was Seoul, or rather different areas in Seoul such as Gangnam, Pangyo, and Mapo. These areas benefited from their attractiveness to high-skilled labour and easy access to capital.[87] The second cluster was Daejeon, where KAIST was located and the MSS was established. This cluster focused on high-tech, capital-intensive sectors such as biotech, robotics, or nanotechnology.[88]

Notwithstanding the above, both Park and Moon pushed for the *chaebol*-SME cooperation as part of the open innovation system approach. Therefore, the MSS set up an SME Policy Deliberation Committee involving government officials, SMEs, startups, and the *chaebol*.[89] *Chaebol* were therefore directly involved in the design of startup-centric innovation policy. Meanwhile, each CCEI had one of the *chaebol* as a partner, as discussed above. In other words, SMEs received direct support from the government but the *chaebol* were closely involved in developing an entrepreneurial ecosystem. Hailing this cooperation, in February 2021 Moon stated the following when visiting a producer of low dead space syringes: "Behind this innovative accomplishment was mutually beneficial cooperation among large companies, SMEs and the Government."[90]

3. Comparative analysis of the EU's and the ROK's technological innovation ecosystems

This section will analyse the EU's technological innovation system using the ROK's as a point of comparison. The period covered will be 2000-2020; that is, the years covered by the Lisbon Strategy (2000-10) and the Europe 2020 Strategy (2010-20) that put innovation at the heart of the EU's economic strategy. The comparison will be developed across the eight policy types used in section 2. Throughout the section, there would be a comparison of the similarities and differences between the EU's and the ROK's strategies.

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[85] Chung, Esther. 2018. "Former President Park Sentenced to 24 Years in Prison." *JoongAng Daily*. April 7.
[86] Moon Jae-in, *Remarks by President Moon Jae-in at Public Presentation on Strategy to Promote Second Venture Boom*, 6 March 2019.
[87] Korean Startup Ecosystem Forum. 2016. *Korean Startup Ecosystem Forum White Paper 2016*, Seoul, Korean Startup Ecosystem Forum.
[88] Yoon, Donghun. 2017. "The Regional-innovation Cluster Policy for R&D Efficiency and the Creative Economy: With Focus on Daedeok Innopolis." *Journal of Science and Technology Policy* 8(2): 206–226.
[89] MSS, 2019.
[90] Government of the Republic of Korea. 2021. *Remarks by President Moon Jae-in during Visit to Producer of Low Dead Space Syringes*. February 18

The previous section revealed that it is the ROK's ambition to develop an open innovation system. Startups, the *chaebol*, and universities are all targeted in different aspects of innovation policy, but not on an individual basis. Policy has (increasingly) encouraged different actors in the ecosystem to work together. This was very clear in the case of startups and the *chaebol*, with the latter being encouraged to mentor and help the former. Meanwhile, universities receive funding to develop new technologies and train the next generation of high-skilled workers that are hoped to launch startups or work for one of the *chaebol*.

In addition, this section offers a comparison in terms of EU and ROK innovation policy on building an innovation ecosystem, clusters, boosting R&D and patent filing, entrepreneurship, and venture capital funding activities.

a. Finance

The EU and the ROK have several similar mechanisms but also important differences in the area of innovation financing. Horizon 2020 is the EU's biggest and best-known research and innovation programme, disbursing almost €80 billion in 2014-20.[91] This programme was a continuation and an upgrading of the seven Research Framework programmes that allocated €118.2 billion in 1984-2013 period.[92] In other words, Horizon 2020 was a substantial upgrade from its predecessors in terms of budget allocation, deploying the equivalent of two-thirds of a 30-year budget in just six years. As part of Horizon 2020, the pilot EIC ran in 2019-20. This provided over €2 billion in funding, covering "pathfinder" projects that strive to fuel technological breakthroughs, as well as "accelerator" funding for startups and SMEs to scale up.[93] Increasing the scale of funding yet again, Horizon 2020 has been replaced by the €100 billion Horizon Europe framework programme that will run from 2021-27.[94] These are substantial amounts, but they still lag slightly behind the ROK innovation budget on an absolute basis and also relative to GDP. The ROK government plans to spend KRW27.2 trillion (approximately €20.2 billion) in 2021 alone.[95] In other words, the more populous and larger economy of the EU plans to spend – in absolute terms - in seven years what the ROK would spend in five were it to maintain its level of spending. Indeed, the ROK's R&D has remained over 4.5 percent of GDP since 2018 – the largest percentage in the OECD bar Israel and substantially above that of both the EU R&D targets and actual spending levels.[96]

In terms of funding priorities, Horizon Europe and the ROK's innovation budget are similar. The first two pillars of Horizon Europe are Excellent Science and Global Challenges & European Industrial Competitiveness. The Excellent Science pillar focuses on frontier research through the European Research Council (ERC), developing human resources, and building upgrading research infrastructure.[97] Likewise, the ROK focuses on frontier research, human

[91] European Commission. 2021f. *Funding Programmes and Open Calls*.
[92] European Commission. 2013. *Development of Community Research – Commitments. 1984-2013 (Current Prices)*.
[93] European Commission. 2021c. *Enhanced European Innovation Council (EIC) Pilot – About*.
[94] European Commission. 2021g. *Horizon Europe*.
[95] Yonhap. 2020. "S. Korea's R&D Budget Spending to Rise 12.3 Pct Next Year." *Yonhap News Agency*. September 4.
[96] OECD. 2021.
[97] European Commission. 2021g.

resource development via BrainKorea21^{Plus}, and university and research centre infrastructure building. As for the Global Challenges & European Industrial Competitiveness Pillar, its remit includes research clusters addressing societal challenges, reinforcing industrial capacity, and the activities of the Joint Research Centre to provide independent scientific advice to the EU. The clusters emphasised by the EU include health; culture, creativity and inclusive society; civil security for society; digital, industry and space; climate, energy and mobility; and food, bioeconomy, natural resources, agriculture and environment. In particular, Horizon Europe emphasises five societal challenges (or "missions"): adaption to climate change including societal transformation; cancer; climate-neutral and smart cities; healthy oceans, seas, coastal and inland waters; and soil health and food.[98] Broadly speaking, these are all areas that the ROK covers in its innovation budget. Indeed, the current government has been focusing on themes including the Fourth Industrial Revolution, green growth (which previous governments also emphasised), and a "just and fair society",[99] which closely match the EU's emphasis on research and innovation being at the service of society.

The third pillar of Horizon Europe is Innovative Europe, and focuses on market-creating innovation.[100] In particular, the EIC (rebranded Enhanced EIC) targets top-class innovators, entrepreneurs, SMEs, and scientists working at the frontier stage and seeking to market their ideas internationally.[101] The ROK has been focusing on these groups since the aftermath of the EAFC, and the current government is no exception. Thus, both Horizon Europe and the ROK's research and innovation budget target groups that have more difficulties accessing funding compared to large firms.

Horizon Europe also focuses on the theme of Widening Participation and Strengthening the European Research Area, which cuts across the three pillars. The goals are to ensure that underrepresented groups join research and innovation activities, as well as to allow for the free flow of researchers, scientific knowledge, and technology across the EU.[102] In terms of widening participation, the ROK targets young people and women specifically (see below). There are no specific programmes, however, to target other specific groups (e.g., first-generation university students or minorities). As for mobility programmes, the nature of the EU as a 27-member state organisation is obviously different from the nature of the ROK. Thus, there is no comparable programme in the latter.

Turning our attention to the (equity) financing of innovative startups, the EU has been strongly promoting pan-European VC since the adoption of the Regulation on European Venture Capital Funds (EUVeCa) in 2013 (Regulation (EU) No345/2013).[103] In terms of direct VC financing, the Commission and the European Central Bank's (ECB) European Investment Fund (EIF) launched VentureEU in 2018. This is a €410 million Funds-of-Funds, which strives to boost and bring together private and public capital for pan-European venture capital funds.[104] Meanwhile, the EIB also has a number of equity-financing facilities and programmes

[98] Ibid.
[99] See Government of the Republic of Korea, *Speeches & Remarks*.
[100] European Commission. 2021g.
[101] European Commission. 2021c.
[102] European Commission. 2021g.
[103] European Commission. 2021e. *European Venture Capital Funds (EuVECA) – Regulation (EU) No 345/2013*.
[104] EVPA. 2019. *VentureEU*. September 6.

to directly finance startups through its EIF's European Fund for Strategic Investment (EFSI) Equity Instrument.[105] They include the European Angels Fund (EAF) for business angels,[106] the Mezzanine Facility for Growth FoF,[107] the Single EU Equity Financial Instrument, which includes seed funding,[108] or the Europe Scale-up Action for Risk Capital (ESCALAR) Programme for scale-ups.[109] In total, the EFSI allocated €10.7 billion, in order to bolster the growth of promising European startups, between 2015-20.[110] This is similar to the ROK's programmes in two ways: 1) a single entity manages the bulk of the funds available for equity investment in startups and through VC funds and 2) there are a wide range of programmes to cater for startups at different stages of their life cycle (i.e., seed, growth, and later stages). While welcome, these programmes fall well short of the scale of the ROK's FoF. Again, it is important to note that the ROK's funding is larger in absolute terms, and much more significant to the local ecosystem relative to its population and GDP.

In addition, the Commission's DG for Internal Market, Industry, Entrepreneurship, and SMEs launched the programme for the Competitiveness of Enterprises and Small and Medium-Sized Enterprises (COSME) in 2014. Operating through the EIF and with a budget of €2.3 billion until 2020, the COSME has two programmes: 1) the Loan Guarantee Facility (LGF) providing guarantees to banks and other financial firms providing loans and leases to SMEs (including startups), and 2) the Equity Facility for Growth (EFG) that invests in risk-capital funds providing VC to European startups. Both of these programmes were scaled up versions of similar programmes running under the Innovation Framework Programme (CIP) that ran from 2007 to 2013.[111] These programmes are similar to the ROK programmes managed by KVIC. They fill an important gap in the market insofar as lenders are less likely to provide credit financing to SMEs and the VC sector is less developed in both Europe and the ROK compared to the United States. The schemes strive to reduce the risk that investors in startups – be it the banking sector providing loans or venture capitalists making equity investments – in an effort to increase startups access to financing.

Focusing on the differences between the EU and the ROK in terms of the financing of innovation, a key difference is that there is no stock market across the EU specifically targeting startups like KONEX does in the ROK. The London Stock Exchange's AIM (formerly the Alternative Investment Market) was a stock exchange friendly to high-growth startups, but Brexit has meant that this venue is no longer within the EU context. This means that the startups of European entrepreneurs have to meet more stringent conditions set by traditional stock markets (Deutsche Börse and Euronext) when going public as an exit strategy. Along similar lines, the EU lacks a mechanism for the Commission or the EIB to provide equity investment to startups, with only national government mechanisms (such as Germany's KfW). The ROK government has had this mechanism since 2012, which has offered a viable local market for growing startups – and their investors – to exit. With a startup-friendly stock

[105] EIF. 2021. *EFSI Equity Instrument*.
[106] EIF. 2021. *European Angels Fund*.
[107] EIF. 2021. *Mezzanine Facility for Growth*.
[108] EIF. 2021. *Single EU Equity Financial Instrument*.
[109] EIF. 2021. *ESCALAR Programme*.
[110] EIF. 2021. *European Fund for Strategic Investments (EFSI): Boosting Jobs and Growth*.
[111] European Commission. 2020a. *EU Support for Business – COSME Infographics*. September 30.

exchange, venture capitalists, angel investors and startup founders gain confidence that they will be able to access public equity markets when they achieve scale.

Another difference between the EU and the ROK relates to the active promotion of access to foreign capital. Dating back to the Park Geun-hye government (2013-2017, ROK government agencies have been promoting their country as a destination for foreign VC firms to complement domestic ones. In contrast, the EU is primarily focusing on fostering a domestic VC ecosystem, rather than linking it with other global VC centres. Furthermore, the EU does not have specific funding programmes to attract talented foreign entrepreneurs equivalent to the K-Startup Grand Challenge. In operation since 2016, the K-Startup Grand Challenge programme helps to mobilize overseas funding by foreign entrepreneurs successfully setting up shop in the ROK and then reaching out to their home country networks. Entrepreneurs from outside the EU were eligible to apply for the EIC pilot programme running in 2019-20.[112] But this was not specifically designed for potential non-EU entrepreneurs, whose needs may differ from their counterparts from inside the bloc. Finally, the EU does not explicitly have sites overseas to promote the internationalization of its innovative firms or to promote the EU as a startup destination. This has been a key component of the ROK's financing strategy dating back to the Kim Dae-jung government (e.g. the iParks and similar programmes that established hubs in Silicon Valley and in Europe). Granted, the EU's domestic market is bigger than the ROK's and arguably the ROK is in greater need of accessing foreign capital. But this seems to be an untapped source of financing and a basis for growing important networks for talent and ideas for the EU.

b. Employment

Innovation helps to create high value-add and high-paying jobs. The EU is not as explicit as successive ROK governments have been in linking the advance to startups to employment policy, in particular in relation to the role that startups can play in increasing high-quality employment (though potentially risky) opportunities. As a result, the EU lacks a specific regulatory or funding framework directly related to providing support to innovative firms and startups with high value-added job creation potential. Instead, the EU seems to align with the Silicon Valley view that innovation is good per se and will lead to job creation even if this is not an explicit goal. In fact, employment in startups has been declining across the EU in the years since the Eurozone Sovereign Debt Crisis, as the overall number of startups decreased, despite the global startup boom in the same period.[113]

Take the case of the regulatory framework. There is no EU equivalent to the ROK's Act on the Fostering of Self-Employed Creative Enterprises. On the contrary, a report commissioned by the Commission estimates that regulatory barriers to innovation has cost the EU between one and two million jobs due to missed investments by first seeking to innovate. The report suggests that the removal of regulatory barriers to innovation could result in the creation of 70,000 to 140,000 jobs in the EU annually by 2030.[114] More broadly, there is no EU-wide

[112] European Commission. 2021c.

[113] Hallak, Issam, and Peter Harasztosi. 2019. *Job Creation in Europe. A Firm-level Analysis*, Luxembourg, Publications of the European Union. EUR 29689 EN.

[114] European Commission. 2017. *Assessing the Impacts of EU Regulatory Barriers on Innovation – Final Report*, Luxembourg, Publications of the European Union.

legislative framework specifically supporting job creation by startups. Having said that, the Innovation Principle established in 2016 whereby policy-makers are encouraged to design legislation that creates the conditions for innovation to flourish is a welcome development that could certainly support job creation.[115] In addition, the EU's flexibility in relaxing state aid rules that would have prevented (temporarily) loss-making startups from receiving financial support during the COVID-19 pandemic suggests that more tailored legislation could be on offer in the future.[116]

The EU's lack of explicit focus on the ways in which startups can support job creation is also reflected in the absence of programmes explicitly targeting young people or women in this area.[117] In contrast, in the ROK the Job Creation Fund launched by KVIC and the Korea Finance Corporation has job creation embedded in it. The Youth Startup Academy set up in 2011 offers funding and training to entrepreneurs under the age of 39 years old. Since 2009, the EU offers an Erasmus for Young Entrepreneurs that provides financial support to (would-be) entrepreneurs to stay with a well-established entrepreneur in another country. This is similar to the ROK academy programme insofar it provides the entrepreneur with mentoring and network-building. Despite its name, however, the programme has no age limit.[118] And the financial assistance offered is very low compared to the ROK programme: between €530 and €1,100 monthly depending on the member state of destination as opposed to up to KRW 1billion (approximately €742,000) in funding on top of office space and training.[119]

With regards to women, the ROK's 2019 Masterplan for Promoting Women's Entrepreneurship Activities is directly linked to creating jobs for entrepreneurial women. There is no equivalent in the EU. Instead, WEgate – a consortium supported by the COSME – and the Enterprise Europe Network (EEN) are, respectively, an information portal and a support group to foster entrepreneurship among women.[120] The EU has also run pilot projects to foster a female business angel community as part of an effort to boost female investors, so that ultimately the financing of startups is more gender balanced.[121] Such efforts to go "upstream" to inclusiveness at the investor level will take time to bear fruit, but do ultimately strive to improve the ecosystem's support for female founders. As of yet, though, the Commission acknowledges that women remain underrepresented amongst entrepreneurs. Thus, it has announced the launch of an initiative under InvestEU to provide funding for

[115] European Commission. 2019d. *The Innovation Principle*. December 13.
[116] Bradshaw, Tim, and Daniel Thomas. 2020. "EU to Relax State Aid Rules that Hindered Support for Start-ups." *Financial Times*. June 15.
[117] There are, though, numerous national programmes, administered by national and sub-national governments in the European Union, that do specifically strive to boost access to innovative entrepreneurial activities for marginalised groups, according to gender, race, ethnicity, age, disability status, and socio-economic disadvantage. See Klingler-Vidra, Robyn. 2019. *Global Review of Diversity and Inclusion in Business Innovation*, London, LSE Consulting. February 8.
[118] Erasmus for Young Entrepreneurs Support Office. 2021. *Erasmus for Young Entrepreneurs*.
[119] Erasmus for Young Entrepreneurs Support Office. 2019. *Monthly Financial Assistance Paid by IOs to NEs*; KOSME. 2018.
[120] WEGate. 2021a. *Who We Are*; WEGate. 2021b. *Enterprise Europe Network – Women Entrepreneurship Sector Group*.
[121] European Commission. 2021p. *Internal Market, Industry, Entrepreneurship and SMEs – Women Entrepreneurs*.

female-led companies and funds.[122] The EU is thus building a structure similar to the one recently established in the ROK.

c. Innovation

The EU's and the ROK's support for innovation have several similar features. One of them is the focus on STEM (science, technology, engineering and mathematics) education. Both the EU and the ROK see this as a crucial aspect of their strategy to boost innovation, for STEM graduates account for roughly one third of startup founders at the global level. Horizon 2020 prioritised boosting interest and support for the study of STEM subjects as a means to build capacities.[123] By increasing the diversity of the talent pool with STEM skills, the pipeline of talent for innovation is greater. This support cuts across different groups: school students, university students, teachers, industry, and civil society organisations. The ERC and Marie Sklodowska-Curie Actions are two key components of the EU's STEM strategy, providing funding for universities and research institutions, research teams, and individual researchers.[124] On top of that, the Commission also supports entrepreneurship education through its European entrepreneurship competence framework (EntreComp). Launched in 2016, EntreComp uses the COSME funding for workshops to support peer-learning and to create communities of practice.[125] In other words, to facilitate would-be entrepreneurs' ability to learn from the successes and mistakes of other entrepreneurs. The ROK has a similar approach, with BK21 and BrainKorea21^{Plus} supporting the development of STEM human resources dating back to 1999, and peer-learning as a way for would-be entrepreneurs to learn the skills that cannot be taught in the classroom. The EU, however, is yet to match the ROK in the percentage of STEM graduates. The figure stands at 34 percent in the ROK, the second highest in the OECD and well above the organisations 27 percent average.[126]

The EU and the ROK also have similarities in their approaches to the development of entrepreneurial innovation clusters and networks. The EU has a long-standing history of supporting the establishment of clusters. The Commission's industrial cluster policy has received a further boost in recent years with the support of the COSME and Horizon2020.[127] The Cluster Excellence Programme has sought to strengthen the professional management of clusters since its launch in 2014.[128] Furthermore, Startup Europe has been providing support for startups to scale up by providing financial support to around 60 clusters since 2011.[129] The EU has also supported internationalisation and peer-learning through the ClusterXchange, Cluster Go International, and International Cluster Matchmaking Events.[130]

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[122] Ibid.
[123] European Commission. 2021j. *Horizon 2020 – Science Education*.
[124] European Commission. 2021i. *Horizon 2020 – Marie Sklodowska-Curie Actions*; *European Research Council*. 2021. *Mission*.
[125] European Commission. 2021m. *Internal Market, Industry, Entrepreneurship and SMEs – Entrepreneurship Education*.
[126] OECD. 2019. *Education at a Glance 2019. Korea*.
[127] European Commission. 2021n. *Internal Market, Industry, Entrepreneurship and SMEs – Industrial Cluster Policy*.
[128] European Cluster Collaboration Platform. 2021b. *European Cluster Partnerships*.
[129] Startup Europe Club. 2021a. *About Us*.
[130] European Cluster Collaboration Platform. 2021a. *ClusterXchange*. European Cluster Collaboration Platform. 2021b.

In addition, Horizon2020 has funded INNOSUP-1, a project to facilitate cross-regional and cross-sectoral innovation among SMEs.[131] And, Startup Europe has developed several projects to support cooperation and scaling up across Europe.[132] In this respect, the EU has a similar approach to the ROK but with two crucial differences. To begin with, the ROK provided more support in terms of the establishment of clusters, with the Roh government establishing 13 innovation clusters and Park's administration opening 19 Centres for the Creative Economy and Innovation (CCEIs) demonstrating the "visible hand" of the state in the setting up of clusters across the ROK. Also, the EU is keener in supporting cooperation among clusters than the ROK is. Having said that, both the EU and the ROK take a similar approach to having spatially balanced clusters across their territories. And both of them embed experts and civil society in discussions about cluster development.

Likewise, both the EU and the ROK emphasise and support the importance of research infrastructure. The Commission devoted almost a third of its 2014-2020 budget – €355.1 billion – to its Cohesion Policy. These funds can be used by member states' central, regional, and local governments to build research institutes, labs, startup clusters, and other physical infrastructure necessary for research innovation.[133] Furthermore, from 2014 to 2020 the EU used €2.4 billion of funding from Horizon 2020 and €6.6 billion from the European Regional and Development Funds to build European Research Infrastructures. This project aims at opening national research infrastructures to top scientists across Europe, pooling research data for easy access and analysis, connecting national scientific communities, avoiding unnecessary duplication, and granting European Research Infrastructure Consortium (ERIC) with a stable and special legal status.[134] And since 2008, the European Institution of Innovation & Technology (EIT) has been a focal point for collaborative innovation and the promotion of entrepreneurship across the EU. Modelled after the MIT, the EIT received approximately €2.4 billion in funding in 2014-20.[135] This will increase to nearly €3 billion in 2021-27.[136] Similarly, successive ROK governments have been building the physical infrastructure for innovation to take place dating back to the 1970s. And since the launch of BK21 and BrainKorea21^{Plus}, physical infrastructure has been supplemented with programmes similar to those of ERIC. Also, KAIST was also the ROK's answer to the MIT when it was launched. Its budget was US$856 million in 2019, with 24 percent endowed by the ROK government.

Support for innovation also involves ensuring that startups can commercialize their products to become profitable. There are over 50 EU programmes providing funding, technical capacity, legal assistance, consultations, market information, training and education, and other forms of support.[137] The ROK government is more aggressive in its support for commercialization compared to the EU though, particularly with regards to their internationalization. The establishment of iParks to promote IT exports shortly after the East

[131] European Commission. 2021l. *Internal Market, Industry, Entrepreneurship and SMEs – Emerging Industries and Value Chains*.
[132] Startup Europe Club. 2021b. *Our Projects*.
[133] European Commission. 2021t. *The EU's Main Investment Policy*.
[134] European Commission. 2019c. *Research Infrastructures Make Science Happen*, Luxembourg, Publications of the European Union.
[135] EIT. 2021a. *What Is the EIT's Budget?*
[136] EIT. 2021b. "EIT Strategy 2021-2027 Agreed." *EIT*. January 29.
[137] https://ec.europa.eu/digital-single-market/en/go-to-market-support

Asian Financial Crisis shows that the ROK government has long been aware of the need to support commercialization. Subsequent programmes under the Lee, Park, and Moon governments have also supported commercialization both in the ROK and overseas. The ROK's greater emphasis on commercialization can also be seen in the area of procurement. The Renewed Agenda for Research and Innovation presented in 2018 encourages public buyers of goods and services to support innovation via procurement.[138] And the Big buyers Initiative and Innobroker – the latter focusing especially on SMEs and startups – should give a further boost to public procurement as a tool support innovation as they move beyond the pilot phase in the coming years.[139] Also in the ROK, the 2009 Act on the Facilitation of Purchase of Small and Medium Enterprise-Manufactured Products and Support for Development of Their Markets actually requires governments at all levels to use procurement as a means to support innovation by SMEs and startups (not only small firms, but their innovative activities and products). And the 2019 Masterplan for Promoting Women's Entrepreneurship Activities allocates funding specifically for procurement from innovative women-led SMEs.

Focusing on the attraction of talent, the EU has several initiatives in this area that also feature in the ROK toolkit to promote innovation. Dating back to 2012, up to 16 member states have set up strategies and admission schemes to attract entrepreneurs from outside of the EU.[140] And focusing on the intra-EU level, the previously-mentioned Erasmus for Young Entrepreneurs programme – launched by the Commission in 2009 – allows for entrepreneurs from one member state to spend time in any other member state in order to obtain entrepreneurial and management experience.[141] In addition, the Eureka-Eurostars programme jointly run by EUREKA and the Commission provides funding for SMEs to collaborate with other SMEs, universities, and research centres to collaborate in R&D projects. The programme involves 36 participating countries – the EU's 27-member states plus nine partners, which include the ROK.[142] In the case of the ROK, the government has also launched an "entrepreneur visa" (similar to that offered by the US and UK). But it also has the K-Startup Grand Challenge in place since 2016, which has helped to promote the ROK as a place for foreigners to launch their startups. The EU has no such programme, and instead focuses primarily on intra-EU movements.

There are two aspects of the ROK's entrepreneurship and startups promotion and support toolkit that the EU lacks. To begin with, the EU has no equivalent to the ROK's Ministry of SMEs and Startups (MSS). The Moon government recognised that having a one-stop shop helps to bring coherence to the ROK's startup policy. Located in Daejeon – that is, where KAIST is – the ministry brings together government officials and representatives from startups, *chaebol*, research institutes, universities, and civil society. It acts as a focal point helping to develop policy and underscore the importance of entrepreneurship and startups to the ROK and its innovation capacity. In the case of the EU, the DG for Internal Market, Industry,

[138] European Commission. 2021b. *EU Go To Market Support for Entrepreneurs*.
[139] European Commission. 2021o. *Internal Market, Industry, Entrepreneurship and SMEs – Innovation Procurement*.
[140] European Migration Network. 2019. *Migratory Pathways for Start-ups and Innovative Entrepreneurs in the EU*.
[141] Erasmus for Young Entrepreneurs Support Office. 2021. *Erasmus for Young Entrepreneurs*.
[142] Eureka. 2021. *Home*.

Entrepreneurship, and SMEs could potentially play a similar role. Currently, however, the EU's work in this area remains fragmented.

The other aspect in which the ROK differs from the EU is in the way that large firms (*chaebol,* in the ROK) are being embedded in the entrepreneurial ecosystem. This dates back to the aftermath of the East Asian Financial Crisis, and became more institutionalised when the Park government launched the CCEIs in January 2014. The aims to advance an open innovation system, with large firms as contributors and beneficiaries to startup activities, has deepened with the launch of the MSS. Certainly, there has been criticism of the allegedly predatory practices of *chaebol* copying the products of SMEs and using their market power to drive them out of business. But *chaebol* often provide mentoring, an exit strategy, and/or funding to innovative SMEs. The EU emphasises Public-Private Partnerships.[143] But it does not have a strategy for large firms and small firms to cooperate with each other, or the physically embed large firms in startup ecosystem infrastructure as in the CCEIs in the ROK.

d. Firm size

The EU and the ROK support both big and small firms as part of their respective innovation strategies, as befits their preference for an open innovation system. In the case of the EU, the Innovation Union, dating back to 2010, embraced open innovation in 2015 as one of its key three goals – together with open science and open to the world.[144] With the foreseen European Innovation System, Open Innovation 2.0 will drive the EU's approach to innovation. In an open innovation system, government, industry, academia, and civil society cooperate with each other since none of them can engage in innovation at the frontier stage by its own.[145] Falling under the responsibility of DG Connect, the Open Innovation Strategy and Policy Group (OISPG) supports Open Innovation 2.0 strategy and activities.[146]

Multinational firms are a key component of the EU's innovation strategy and will continue to play a crucial role under Horizon Europe and, more generally, the 2021-27 budget cycle. OISPG itself is a case in point. Its members include several multinational firms, both from the EU and from outside the bloc.[147] And the Commission regularly emphasises that industry is at the core of the EU's innovation strategy. In this respect, the EU and the ROK are similar, since *chaebol* remain a cornerstone of the latter's innovation strategy. But whether in the EU, the ROK, or elsewhere, big, innovative firms have their own large R&D and innovation budgets. They can be competitive regardless of whether they are engaged in public-private cooperation or not.

This explains why both the EU and the ROK put SMEs and startups at the heart of their innovation support initiatives. In the case of the EU, 70 percent of the EIC budget is earmarked for SMEs.[148] And as the Horizon 2020 programme more broadly and the COSME demonstrate, the EU is prioritising the channelling of funding to innovative SMEs and startups. In fact,

[143] European Commission. 2021h. *Horizon 2020 – Innovation*.
[144] European Commission. 2021k. *Innovation Union*.
[145] European Commission. 2021q. *Open Innovation 2.0*.
[146] European Commission. 2021s. *Policies on Open Innovation*.
[147] European Commission. 2021r. *Open Innovation Group Members*.
[148] European Commission. 2019b.

Horizon Europe could go a step further in institutionalising the role of innovative SMEs in the EU's innovation policy by establishing an Institutionalised European partnership based on Article 185/7 of the TFEU.[149] The EU's growing focus on innovative startups resembles the process driving the ROK's innovation policy since the aftermath of the East Asian Financial Crisis. Both the EU and the ROK acknowledge the role that startups can play a central role in supporting and driving their innovation.

4. Case study: Spain

Spain's technological innovation strategy includes a mixture of policies. However, it is not as comprehensive as the policies of the EU – which of course Spain also benefits from – or the ROK. Indeed, in 2018 Spain spent 1.2 percent of its GDP on R&D. This is below the EU and OECD averages, and well below the ROK. The Spanish R&D figure has also decreased from a peak of 1.3 percent in the period 2008-11.[150] As a result, the European Innovation Scorecard 2020 classifies Spain as a "moderate innovator", in contrast to much of Western Europe including its neighbours France and Portugal.[151]

Having said that, Spain's performance as an innovator has increased relative to that of the EU since 2015.[152] And in 2008-11 and 2018-today, Spain has had a Ministry of Science and Innovation (also including Universities in 2018-20), which suggests that several governments have grasped the importance of making innovation a cornerstone of their policy.[153] Furthermore, the Spanish government's R&D budget for 2021 is the biggest in history in absolute terms, and builds on the funding and priorities of the EU's Recovery Fund.[154] The €3.2 billion budget is six times lower than the ROK's, but it is a step in the right direction nonetheless.

Research, Development and Innovation (RD&I) funding in Spain is mainly disbursed through three agencies. They are the State Research Agency (Agencia Estatatal de Investigación, AEI), which funds R&D&I projects to promote S&T research and coordinates national and international projects;[155] the Centre for the Development of Industrial Technology (Centro para el Desarrollo Tecnológico Industrial, CDTI), which supports the innovation and internationalisation of Spanish technology firms;[156] and the Institute for Health Carlos III (Instituto de Salud Carlos III, ISCIII), which promotes research and innovation in the health sciences in collaboration with research centres and other bodies across Spain.[157]

Spain performs well in terms of the number of STEM graduates, especially by EU standards. With 22.8 graduates per 1,000 of population aged 20-29, it was ranked seventh among EU

[149] Ibid.
[150] OECD. 2021.
[151] European Commission. 2020c. European Innovation Scorecard 2020. June 22.
[152] Ibid.
[153] Ministry of Science and Innovation. 2021b. Ministerio de Ciencia e Innovación.
[154] Ministry of Science and Innovation. 2020. Duque presenta en el Congreso los PGE con mayor inversión directa en I+D+I, claves para "acelerar la recuperación y garantizar la prosperidad". December 2.
[155] Ministry of Science and Innovation. 2021a. Agencia Estatal de Investigación.
[156] CDTI. 2021. Presentation.
[157] Instituto de Salud Carlos III. 2021. Mission and Vision.

member states in 2018.[158] However, the job market is not able to absorb all STEM graduates, leading to relatively high rates of emigration. Furthermore, precarious employment is common among STEM graduates. This includes short-term contracts and part-time contracts. Thus, there are programmes to promote entrepreneurship among STEM and other graduates. The Ministry of Industry, Commerce and Tourism offers funding programmes for start-ups and SMEs at the launch and scaling up stages, as well as to support business angel networks. In addition, the ministry also offers a mentoring and training programme for SME business owners together with the EOI Foundation.[159] In addition, the Chamber of Commerce of Spain manages the Spain Launches Programme (Programa España Emprende) to mentor and support entrepreneurs.[160] Having said that, these programmes remain under-resourced compared to EU peers and the ROK. Indeed, SME innovation and the export of high-tech goods and knowledge-intensive services remain low by EU standards.[161]

To boost entrepreneurship by attracting international talent, the Spanish government launched a Bill to Support Entrepreneurs and their Internationalisation in 2013 (Ley 14/2013). The bill was last updated in May 2020.[162] There are not, however, specific programmes, competitions, or other measures to attract foreign entrepreneurs to Spain. Similarly, there are no specific government programmes to attract VCs, business angels, or other would-be investors in Spanish start-ups.

More fundamentally, there is no overarching strategy for the development of entrepreneurial ecosystems in Spain, a long-term demand expressed by entrepreneurs as far back as the 1990s. There are bills including To Support the Entrepreneur and to Stimulate Growth and Job Creation (Ley 11/2013),[163] To Boost Business Financing in relation to crowdfunding (Ley 5, 2015),[164] and Of Mechanism for Second Change (Ley 25/2015).[165] Together with R&D&I funding programmes or entrepreneur funding and mentoring initiatives, they are part of the patchwork of initiatives in place to support entrepreneurship. But they are not components of a broader strategy.

This could change soon though. The current government has presented a draft Bill to Promote Startup Ecosystem that should become law later in 2021.[166] The law should include tax incentives and measures to support investment. It would be launched along with policies to boost investment in startups, boost the role of the public sector in supporting innovation,

[158] Eurostat. 2021. Graduates in tertiary education, in science, math., computing, engineering, manufacturing, construction, by sex - per 1000 of population aged 20-29.
[159] Ministry of Industry, Commerce and Tourism. 2021. Programas de la DGIPYME.
[160] Chamber of Commerce of Spain. 2021. Programa España Emprende.
[161] European Commission. 2020c.
[162] Agencia Estatal Boletín del Estado. 2013b. Ley 14/2013, de 27 de septiembre, de apoyo a los emprendedores y su internacionalización. September 28.
[163] Agencia Estatal Boletín del Estado. 2013a. Ley 11/2013, de 26 de julio, de medidas de apyo al emprendedor y de estímulo del crecimiento y de la creación de empleo. July 27.
[164] Agencia Estatal Boletín del Estado. 2015b. Ley 25/2025, de 28 de julio, de mecanismo de segunda oportunidad, reducción de la carga financiera y otras medidas de orden social. July 29.
[165] Agencia Estatal Boletín del Estado. 2015a. Ley 5/2025, de 27 de abril, de fomento de la financiación empresarial. April 28.
[166] Ministry of Economic Affairs and Digital Transformation. 2019. Consulta públia previa a la elaboración del texto del anteproyecto de "Ley de fomento del ecosistema de Startups", en virtud del artículo 26.2 de la Ley 50/1997, de 27 de noviembre, del Gobierno.

support startup scaling up, and attract and retain talent. These measures are all part of the Spain Entrepreneurial Nation Strategy (Estrategia España Nación Emprendedora), launched in February of this year and which lays out a blueprint for the government to support Spanish entrepreneurship.[167]

5. Boosting technological innovation between the EU and the ROK

Building on the analysis of the previous sections, here we analyse how the EU can boost technological innovation cooperation with the ROK in the short- and medium-term. The section develops this comparison with reference to the EU's existing growth and innovation strategies, existing and potential bilateral dialogues and cooperation initiatives between the EU and the ROK, and the ROK's existing cooperation in the field of innovation with other countries.

At their 17th Joint Committee held in February 2021, the EU and ROK agreed to prioritise research, innovation, and ICT cooperation. The recently launched EU-ROK High-Level Policy Dialogue and the Digital Economy is the venue that both partners have identified to promote these three areas of collaboration.[168] The first session of the dialogue took place in November 2020, led by DG CONNECT on the EU side. Areas of potential cooperation identified at the dialogue include data sharing, the computing necessary for AI, 5G/6G including standardization, connectivity in data infrastructures, and smart cities standardization. As a specific example, European and South Korean researchers are working together on supercomputing and clinical trials to develop a treatment for COVID-19.[169] The EU and the ROK ought to use the dialogue to identify, promote, and take stock of existing and potential joint technological innovation. Since the ROK is one of the only countries in the world with science and technology cooperation, Euratom cooperation on fusion energy research, and ERC international scientific agreements already signed and in effect,[170] political leadership can boost technology innovation cooperation by promoting use of existing structures.

Also, in the 17th Joint Committee, the EU and the ROK stressed research and innovation cooperation under the framework programme of Horizon Europe.[171] European and ROK research institutions, universities, startups, SMEs, and firms can tap these funds to focus on areas of common interest including, above all, green growth. Indeed, the ROK meets the requirements of having the good capacity in science, technology and innovation that the Commission has established for international participants in Horizon Europe.[172] In fact, the European Green Deal and the ROK's Green New Deal have several points in common, including a commitment to achieve carbon neutrality by 2050.[173] To this end, the ROK plans to prioritize energy transition towards renewable energies, smart industrial complexes, smart

[167] Government of Spain. 2021a. Estrategia España Nación Emprendedora. February 23.
[168] European External Action Service. 2021. *EU-Republic of Korea: 17th Joint Committee*. February 10.
[169] European Commission. 2020b. *EU-Republic of Korea High Level Policy Dialogue*. December 4.
[170] European Commission. 2019a. *Countries with EU International Agreements on Science and Technology*. March.
[171] European External Action Service. 2021.
[172] European Commission. 2019b. *Horizon Europe*. May.
[173] European Commission. 2021a. *A European Green Deal*; Government of the Republic of Korea. 2020. *Address by President Moon Jae-in at National Assembly to Propose Government Budget for 2021*. October 28.

buildings, or electric and hydrogen-powered transportation.[174] These are all specific sectors in which the EU and the ROK can conduct joint research to improve existing technologies and develop new ones, considering that they are also part of the European Green Deal.[175] As a case in point, in February 2021 the ROK government announced plans to build the world's largest offshore wind farm in the West Sea (Yellow Sea).[176] World-leading EU firms and research institutes working in this and other renewable energies should tap onto the ROK's push in this area.

The experience of EU-ROK cooperation with the EIC under Horizon 2020 is instructive in this respect. Seoul National University has partnered with eight EU universities and research centres, two Israeli partners, and one Swiss university for a project to develop a unified manufacturing pipeline using microstructures and focusing on all stages involving analysis, design, and manufacturing. This project could potentially change computer aided design and tool manufacturing in Europe.[177] Meanwhile, the Electronics and Telecommunications Research Institute (ETRI) in Daejeon – the ROK's main high-tech innovation hub – is working with seven EU partners to demonstrate a cheap and easy-to-use quantum simulator, based on the full integration of silicon nitride photonics with silicon electronics. This project has the potential to establish a new technology simulating quantum mechanical projects.[178] These two cases show the potential for the EU and the ROK to bring together their research strengths in order to develop new technologies and processes. EURAXESS Korea, launched in 2018 to link EU and ROK researchers through the dissemination of information and the hosting of events, can serve as an initial point to continue to foster this type of research collaborations.[179]

Also, cluster collaborations with the ROK have been formally underway since the Korea-EU Cluster Cooperation Workshop was held in 2011. Further exchanges have been organized between EU clusters and ROK government partners, primarily the Korea Industrial Complex Corporation (KICOX), which was appointed as the central contact point by the Ministry of Trade, Industry and Energy (MOTIE). The emphasis for collaboration across EU and the ROK's SMEs is in the digital realm. A 2018 European Cluster Collaboration Platform briefing explained that this is because "Korea's comparative advantage lies in technology and design, not in resource-intensive heavy-manufacturing industries."[180] Also in 2018, DG Growth, MOTIE and KOCIX signed a memorandum of understanding to foster cluster collaboration.[181]

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[174] Government of the Republic of Korea. 2020.
[175] European Commission. 2021a.
[176] Shin, Hyonhee. 2021. "South Korea Unveils $43 Billion Plan for World's Largest Offshore Wind Farm." *Reuters*. February 5.
[177] ADAM^2. 2021. *Consortium*.
[178] CORDIS. 2020. *Electronic-photonic Integrated Quantum Simulator Platform*. July 3.
[179] European Commission. 2021d. *EURAXESS Korea*.
[180] The 2018 ECCP preparatory briefing document on ROK collaborations is available at European Cluster Collaboration Platform. 2016. *Preparatory Briefing on the Republic of Korea*.
[181] The administrative arrangement is available at European Cluster Collaboration Platform. 2018. *Administrative Arrangement Between The Ministry of Trade, Industry and Energy and The Korea Industrial Complex Corporation of the Republic of Korea and the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs of the European Commission on Cluster Cooperation*. May 23.

The ROK has cluster promotion agreements and strategies devised at the European level, and also directly between member states, or even particular accelerator hubs. For instance, government entities and companies are active in the startup ecosystem in France, especially at Station F, a large startup campus in Paris. In addition, the HEC Incubator is partnering with KISED at Station F and the ROK's unicorn, Naver, established an incubator called Space Green at Station F in 2017, so they can "reach out to early-stage consumer teams based in France and discover exciting new trends and talent".[182] In addition, in November 2019, the ROK's MSS announced that it was to establish a startup support centre in in Stockholm in 2020 (The Business Times 2019). Altogether, from 2011 ROK startup collaborations with European partners have been growing, and well received, in both policy and commercial terms.

There is an opportunity to further institutionalise the presence of EU and ROK startup activities across the two regions, as has occurred between the ROK and the US, specifically in Silicon Valley. Since the onset of the Global Financial Crisis in 2008, the ROK's startup-centric innovation policies have encouraged founders to build a presence and partnership with Silicon Valley. Beginning in 2011, the ROK's KISED has been sending startups to the US, through its collaboration with Plug and Play and GSVLabs. This is consistent with other initiatives that have worked to support the presence of ROK startups in Silicon Valley. The Korea Innovation Center (KIC) Silicon Valley, for example, has supported a number of startups by providing connections and subsidized office space. KIC Silicon Valley is funded by the ROK's National IT Industry Promotion Agency (NIPA) and the Ministry of Science and ICT, and has sister branches in Washington, DC (focused on influencing American policy dialogues) and in Europe (based in Brussels). The KIC bolthole in Brussels could be expanded to other European cities, to further embed ROK startup activities across the EU, as the KIC Silicon Valley has done through its expansion to Washington DC in the US.

Another notable model for deepening EU and ROK cluster integration is KOTRA's K-Global Silicon Valley program, which began in 2012 in partnership with NIPA and KIC, to bring the ROK's large technology firms and startups to network with, and pitch to, Silicon Valley startups and investors.[183] The ROK government has also provided a platform for showcasing ROK startup talent and opportunities in Silicon Valley, via the Tech Incubator Program for Startups (TIPS) and the K-ICT Born2Global program.[184] The TIPSX beSUCCESS Korean Startup Showcase @Silicon Valley was first run in 2019, with nine ROK deep-tech startups pitching to Silicon Valley investors (Jinju 2020). The orientation for the KIC and TIPS efforts is very much one of promoting more and deeper links between the ROK startup ecosystem and Silicon Valley. The EU could work with the ROK's NIPA and KIC to establish EU versions of each of these programmes.

There are also models for deepening cluster collaboration, particularly around R&D investment and venture capital funding, in operation elsewhere. Bilateral investment programs, such as the U.S.-Israeli Binational Industrial Research and Development (BIRD) Foundation, established in 1977, promote collaboration between innovative firms across the two countries, often supporting activities in specific sectors or technologies. In 2019, for

[182] The Space Green website has more details on the activities at Station F. See Space Green. 2021. Space Green.
[183] For more on the K-Global Silicon Valley program, see: https://kglobal.tech/introduction/
[184] TIPS is run by the ROK's MOTIE with the Small and Medium Business Administration co-signing. The Born2Global program is headed by the ROK's Ministry of Information and Communications Technology.

instance, the BIRD program supported match-making for companies operating in "the areas of homeland security, communications, electronics, electro-optics, software, life sciences, and renewable and alternative energy, among others" (Congressional Research Service 2019). This bilateral R&D investment model has been replicated by numerous countries, including the ROK and Israel signing, in 1998, a bilateral cooperation agreement aiming to benefit R&D initiatives through a joint fund.[185] The resultant funding body is the KOR-IL fund, a bi-national funding apparatus – modelled after the BIRD Foundation – supports technological collaboration in innovative R&D between companies from the two countries. A KOREU-RDF could, similarly, provide grants for collaboration in innovative joint R&D by EU and ROK companies.

Another model of bilateral innovation promotion is a jointly funded and run fund of venture capital fund. An example of this is the bilateral fund run by the Taiwan National Development Fund and the New Zealand Venture Investment Fund (NZVIF). The fund's capital is invested into Taiwanese and New Zealand-based startups looking to expand their markets, in particular, to encourage New Zealand startups to use Taiwan as a springboard for their expansion into the Asian markets.[186] The ROK and EU could see a similar structure, with the KVIC and EIF launching a joint VC fund that would invest in startups looking to expand to the other markets.

6. Overall strategic lessons and specific recommendations

Technological innovation is at the heart of the EU's post-COVID-19 pandemic growth strategy. In fact, the EU has identified innovation as a key element of its economic growth blueprint dating back to, at least, the Lisbon Strategy. But as the European Innovation Scorecard shows, the EU is lagging behind innovative countries elsewhere – and the gap has only grown in recent years. One of these countries is the ROK, which indeed the Bloomberg Innovation Index 2021 identifies as the most innovative country in the world.[187] The EU, therefore, can take and adapt strategic lessons from the ROK as it seeks to improve its technological innovation performance.

What makes the ROK innovation strategy successful? To begin with, funding. The ROK government spends the second largest amount in R&D among OECD countries when measured as a percentage of GDP. In fact, the ROK government has developed a comprehensive range of funding programmes dating back to the aftermath of the East Asian Financial Crisis of 1997-98. In addition, the ROK government has created the conditions for VC firms to invest in startups, for scale-ups to "go public" on startup-friendly stock markets, and for both equity and credit to enable the increasingly vibrant entrepreneurial ecosystem. The mix of public and private capital – and the crucial role of the former – are a distinct advantage for the ROK. Every government over the past two decades has understood this.

[185] For more on KOR-IL, see Israel Innovation Authority. 2021. *KORIL – Israel – Korea*.
[186] The Taiwan New Zealand Venture Investment Fund's supports VC fund; for an example of the structure and aims, see Philip, Joji Thomas. 2016. "NZVIF, Taiwan's NDF to Jointly Anchor Second VC Fund." *Deal Street Asia*. January 22.
[187] Jamrisko, Michelle, Wei Lu, and Alexandre Tanzi. "South Korea Leads World in Innovation as U.S. Exits Top Ten." *Bloomberg*. February 3.

In addition, the ROK has nurtured public-private R&D collaboration. The government has been investing in training the necessary human resources for decades, providing large amounts of funding to universities and research centres. This way, the private sector has a pipeline of highly-skilled STEM graduates who can then go on to join the big *chaebol* or launch dynamic startups that together are the backbone of the ROK's innovation system. The ROK's public institutions also collaborate closely with private firms in fostering and commercializing innovation. In fact, "open innovation" – that sees the large firms, startups, universities and the public sector collaborate - is central to the ROK's innovation strategy. For the ROK government, this is the best way to nurture the firms and industries of the future.

Furthermore, the ROK has worked to create the necessary regulatory framework and exit strategy for innovation to thrive. Particularly important has been the focus on implementing and enhancing measures for startups to develop original ideas and products, commercialize them, and for their owners to have exit strategies available. This allows startups to avoid having their products and services being snapped up by big firms, which was identified as a problem in the past. But the ROK government has also created the conditions for startups to collaborate with the *chaebol*, which sometimes can be the preferred exit strategy for startup founders. In short, the thinking is that successful startups should have as many exit options available to them as possible.

Based upon this identification of ROK strengths, and the preceding sections' comparative insights into the two innovation systems (and the dive into the Spanish context), we close by outlining a set of recommendations for EU action. Our recommendations, listed below, are tangible strategies for boosting the European innovation system in its own right, and then through increased collaboration with the ROK, in terms of institutional adaptation, research and development, and the startup ecosystem.

Recommendations:

A. Related to EU instruments and programmes

1. Continue to have Horizon Europe as the cornerstone of innovation funding, since the existence of a single, multi-purpose, well-resourced programme covering multiple areas of innovation funding helps to sustain and boost innovation by allowing (would-be) entrepreneurs and researchers to understand where and how to access financing for their ideas.
2. Scale up both funding and mentoring under EIC, since start-ups and innovative SMEs are often the drivers behind "pathfinding" and frontier-stage research and innovation thanks to their bigger appetite for risk-taking and nimbleness, yet have more trouble accessing both.
3. Emphasise the link between innovation and jobs more explicitly and regularly, since young graduates, other groups, and sometimes governments tend to be unaware of the job creation dimension of innovation and this can serve to boost support for this area.
4. Continue and scale up the incipient work by the Commission to foster female entrepreneurship and investment in start-ups and SMEs, taking into consideration

that the specific needs and concerns of women need to be addressed to boost their participation in this area.

5. Making use of existing programmes to integrate large firms more systematically in all stages and all aspects of the innovation process, including support for start-ups and SMEs through mentoring, funding, commercialisation, and joint projects also involving universities.

B. For further consideration ("blue sky thinking") based upon the ROK comparison

Institutional adaptations

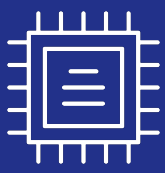
6. The creation of a KONEX-like (and AIM as well as Nasdaq-similar) technology startup-friendly stock exchange to enable the exit environment for European startups.
7. Designate an agency similar to the ROK Ministry of SMEs and Startups (MSS), that is responsible for coordinating startup policies across a range of issues.

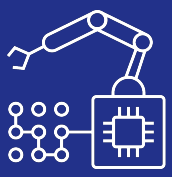
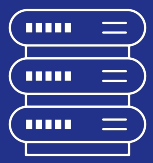
Research and development

8. To further foster innovation collaboration in research and development across the EU and the ROK, create a version of the KORIL-RDF (The Korea-Israel Industrial R&D Foundation), in which both countries contribute to bilateral R&D projects.

Startup ecosystem

9. Create a version of the K-Startup Grand Challenge programme focused specifically on bringing ROK entrepreneurs to the EU. The EU-Startup Grand Challenge would – like the K-Startup Grand Challenge does for inviting international entrepreneurs to the ROK – invite ROK entrepreneurs to participate in an incubator in the EU, striving to foster partnerships with European firms.
10. Establish a Bilateral Fund of Venture Capital Funds structure to support European startups expanding to the ROK, and ROK startups looking to expand to the EU (modelled after the Taiwan New Zealand Venture Investment Fund).
11. Create ROK-EU versions of the K-Global Silicon Valley programme, as well as the various accelerators that the ROK government is facilitating in Silicon Valley and elsewhere in the U.S., to further connect the European and ROK startup ecosystems.
12. Create an EU-ROK Startup Centre in Seoul to strengthen collaboration between startup clusters.



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