

OECD SME and Entrepreneurship Papers

Enhancing SMEs' Resilience through Digitalisation

The Case of Korea



Enhancing SMEs' Resilience through Digitalisation: The Case of Korea

Marco Bianchini, Insung Kwon

The report investigates the role of government programmes in strengthening SMEs' resilience to external shocks, by focusing on SME digitalisation policies implemented in Korea during the COVID-19 outbreak. The report examines how digital tools and services contributed to enhancing SME resilience during the pandemic and how policy programmes facilitated the strong acceleration in SME uptake of digital technologies. The report also discusses long-standing challenges that Korean SMEs face in “going digital” and areas for strengthened policy attention. The analysis is complemented by evidence and insights from international policy experiences.

JEL codes: O, O14, O25, O38, O53

Keywords: SMEs, Digitalisation, Small Business, Resilience, Industry 4.0

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This paper is authorised for publication by Lamia Kamal-Chaoui, Director, Centre for Entrepreneurship, SMEs, Regions and Cities, OECD.

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Acknowledgements

This report was prepared by the Centre for Entrepreneurship, SMEs, Regions and Cities (CFE) led by Lamia Kamal-Chaoui, Director. It was produced as part of the programme of work of the OECD Committee on SMEs and Entrepreneurship (CSMEE), at the request of the Korean Permanent delegation to the OECD and in cooperation with the Ministry of SMEs and Startups of Korea.

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The team gratefully acknowledges the key contributions and the continued support throughout the project of H.E. Ambassador Hyung Kwon Ko (Permanent Representative of Korea to the OECD) and Mr Hang Lok Oh (Counsellor of the Korean Permanent Delegation to the OECD). The authors are also grateful to Mr Iljoon Lee, Deputy Director of the International Cooperation Division of the Ministry of SMEs and Startups of Korea, who has coordinated the cooperation between the Ministry and the OECD team.

The authors are thankful to Dr Jae Won Kang (Research Fellow, Policy Review and Evaluation Centre of the Korea Small Business Institute) for his support as knowledge partner and for his insights and comments to the final report.

The authors would also like to acknowledge the valuable contributions of the many experts from the Ministry of SMEs and Startups that have provided important information on the projects illustrated in this policy paper through interviews and written comments. In particular, we would like to thank – Mr Byung-jin Kim (Deputy Director, Smart Micro-Enterprises Development Division); Mr Hyung-cheol Kim (Assistant Director, Smart Micro-Enterprises Development Division); Mr Jae-ho Na (Deputy Director, Regional Business Development Division); Mr Jae-joon Lee (Deputy Director, Non-face-to-face Economy Team); Mr Jong-hyun Ko (Deputy Director, Micro-Enterprise Assistance Division); Mr Joon-young Kim (Deputy Director, Manufacturing Innovation Policy Division); Mr Jung-dae Shin (Deputy Director, Manufacturing Innovation Support Division); Mr Jung-su Yeom (Deputy Director, Manufacturing Innovation Support Division); Mr Man-Kyu Park (Deputy Director, Global Growth Policy Division); Ms Min-Ji Park (Deputy Director, Technology Policy Division); Ms Mi-ran Park (Deputy Director, ICT Management Division); Mr Seung-Pyo Baek (Deputy Director, Online Economy Support Team); Ms Yoo-kyung Ha (Deputy Director, Local Business and Commercial District Division).

The team would also like to thank Stephan Raes (Policy Analyst/Advisor, CFE) and Jeremy West (Senior Policy Analyst, Directorate for Science, Technology and Innovation of the OECD) for their insights and comments to the paper.

This report was approved by the OECD Committee on SMEs and Entrepreneurship (CSMEE).

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Abbreviations and acronyms

AI	Artificial Intelligence
B2B	Business-to-Business
B2C	Business-to-Consumer
ICT	Information and Communication Technology
IIoT	Industrial Internet of Things
KAMP	Korea AI Manufacturing Platform
KOSI	Korea Small Business Institute
KOSMO	Korea Smart Factory Office
KOSTAT	Statistics Korea
MOEL	Ministry of Employment and Labor
MOTIE	Ministry of Trade, Industry and Energy
MOU	Memorandum of Understanding
MSIT	Ministry of Sciences and ICT
MSS	Ministry of SMEs and Startups
SaaS	Software-as-a-Service
SMEs	Small and medium-sized enterprises
TP	Technology Park

Executive summary

Small and medium-sized enterprises (SMEs) have been hit hard by the COVID-19 pandemic, which exposed their vulnerability to market and supply chain disruptions, and to the sudden shift to contactless transactions. According to more than 180 surveys across OECD countries, since the start of the crisis between 70 and 80% of SMEs have experienced losses of around 30-40% in revenues. SMEs are disproportionately represented in many of the sectors that were most affected by social distancing and restrictive measures imposed by governments in response to the pandemic (e.g. retail trade, transport, accommodation and food, professional and personal services). Furthermore, many SMEs were limited in their capacity to adapt due to operational constraints, skills deficiencies and lags in the adoption of digital technologies.

Digitalisation can be a powerful driver of SMEs' resilience, enhancing their capacity to anticipate, react and adapt to large shocks. The severe impact of the COVID-19 crisis on small businesses and entrepreneurs has put SME digitalisation high on the agenda of policy makers across countries, representing for many core dimensions of their recovery packages. Accelerating digital uptake by SMEs is viewed as essential for economies to bounce back from the pandemic, and build the foundations for future resilience. However, important questions arise on how governments can support very diverse SMEs to pursue the digital transition under challenging market conditions and resource constraints, and how digital uptake can translate into SMEs' increased resilience and competitiveness over the long term.

Digitalisation has been a key pillar in the strategy of the Korean government to adapt to the crisis. The mix of existing programmes and new policy measures to support SME digitalisation in response to the pandemic has helped Korean SMEs tackle disruptions and weather the storm but it is also expected to address long-standing challenges to digital uptake by SMEs. The case of Korea provides interesting insights to the global policy community, for the rapidity of its policy responses, as SME digitalisation support was implemented since the beginning of the pandemic, as well as for the originality of some programmes such as promoting win-win relationship between SMEs and large corporations.

The present report investigates SME digitalisation policies implemented in Korea during the COVID-19 outbreak and their role in facilitating the acceleration in SME uptake of digital technologies. It discusses long-standing challenges that Korean SMEs face in "going digital", how policy responses to the pandemic may consolidate and contribute to long-term resilience, as well as areas that call for strengthened policy attention.

The first chapter provides a conceptual background to the analysis, based on a review of the literature and OECD work on business resilience and SME digitalisation. A resilience-based approach acknowledges the unpredictable and unavoidable nature of massive disruptions. Digital tools present features of importance to resilience, such as easy and immediate access and rapid scalability. Challenges and risks remain for SMEs, such as lack of digital readiness and skills or anti-competitive behaviours, and government policies can play a role to mitigate them, including through regulatory approaches, and horizontal and targeted policy programmes.

The second chapter provides a “snapshot” of SME digitalisation in Korea at the start of the pandemic, through benchmarking with international trends in key areas, such as broadband infrastructure, digital readiness and skills, use of cloud computing and e-commerce capabilities, digital government and teleworking. While Korea has a well-established digital infrastructure and ranks high among OECD countries in terms of digitalisation of government services, Korean SMEs lag behind the OECD average in the use of some key digital technologies. For example, unlike larger firms, they exhibit a relatively low level of adoption of cloud computing and low uptake of teleworking.

The third chapter delves into the policy measures undertaken by the government of Korea to support the digitalisation of SMEs during the pandemic, categorized into horizontal and sector targeted policies. The report highlights good practices, lessons learnt, as well as outstanding challenges. The analysis is based on a policy survey and interviews with knowledge partners and representatives of relevant Korean Ministries and agencies, which brought together first-hand information on policies and public programmes.

Conclusions

The report highlights the key role that the uptake of digital tools has played for the business continuity of many Korean SMEs during the pandemic. The flexibility of digital services and online platforms has allowed a large number of SMEs to digitalise some of their business operations without the need of heavy upfront investments. The strong acceleration in uptake of digital technologies was facilitated by several policy programmes introduced by the Korean government, although the rush exposed important challenges to the transition.

The Korean government responded rapidly to the crisis, strengthening established programmes and introducing a number of new policies to foster business uptake of digital tools. In cooperation with other Ministries and agencies, the Ministry of SMEs and Startups (MSS) spearheaded support to SME digitalisation, in the form of both horizontal policies and sectoral targeted measures, which leveraged some existing strengths of the system to deliver on their objectives (e.g. a well-developed digital infrastructure, strong networks between large and small firms, smart factory solutions, extensive digitalisation of government services). Key programmes included support to digital cross-border sales, measures to enhance cybersecurity, the automation of administrative processes and the establishment of a digital one-stop-shop, and the extension of support for businesses to adopt teleworking practices. Some new programmes were implemented, for example, to foster e-commerce and digital trade, such as a government-run online sales platform (“Buy Value, Live Together”), virtual trade fairs, and the creation of the “Export-Import Logistics Comprehensive Response Center”. A digital services voucher programme was created to encourage SMEs to experiment with digital solutions, while also responding to urgent needs. Furthermore, to support the cooperation between small and large companies, the “Win-Win index” was introduced and the existing cooperation framework was leveraged to relieve SMEs’ supply chain bottlenecks during the pandemic.

Many of the policies were introduced as temporary, but their success is leading the government to extend or expand their implementation, which makes monitoring and evaluation essential. It is important to have continued understanding of their usefulness and relevance, and assess how they impact SMEs’ resilience in a longer time horizon. Policy evaluation mechanisms with clear objectives and Key Performance Indicators embedded in such programmes from the beginning would help provide a clear picture about effectiveness. This should go hand-in-hand with further efforts to enhance digital skills among the population of entrepreneurs and SME employees, including the elderly.

1 SME digitalisation in the context of COVID-19

The COVID-19 pandemic has posed an unprecedented threat to the functioning of the global socio-economic system. What began as a health crisis has unfolded into a longer-term socio-economic crisis. Physical interactions entail risks due to the nature of the virus and governments have been forced to put in place stringent measures. Many countries have implemented stay-at-home orders restricted mobility and sanitary measures, resulting in precipitous falls in GDP. However, global economy has been recovering gradually. After its contraction in 2020, the global output is expected to rise by 5.8% in 2021, with most of the world economies expected to be back at pre-crisis level by the end of 2022 (OECD, 2021^[1]).

Businesses, particularly small and medium-sized enterprises (SMEs) have been hit hard by the pandemic. SMEs have a large presence in OECD economies, accounting for approximately 60% of employment and between 50% and 60% of business sector value added. Before the COVID-19 pandemic, the SME population was showing signs of recovery from the 2008-09 financial crisis (OECD, 2019^[2]). The pandemic has led to supply and demand shocks, disrupting SMEs' business operations to an unprecedented scale, with large shares of SMEs at risk of going out of business in a few months, due to limited cash reserves and financial buffers (OECD, 2019^[3]; OECD, 2020^[4]; WTO, 2020^[5]). According to the more than 180 surveys among SMEs in 32 countries that the OECD monitored since February 2020, since the start of the pandemic 70-80% of SMEs experienced a serious drop in revenues/sales. Several surveys indicate falls of between 30 and 50% (OECD, 2020^[4]). In the case of the United States, the Federal Reserve Banks' (2021^[6]) survey conducted between September and October 2020 found that the pandemic impacted on 95% of small businesses, with almost 90% of the businesses having sales below pre-pandemic levels. Similarly, Korea Federation of SMEs (2020^[7]) found that 46.3% of SMEs were experiencing worse financial conditions compared to the previous year, with decreased sales as the main reason.

Many SMEs are operating in the most affected sectors. It is estimated that the share of employment by SMEs in the sectors most affected by the crisis is at 75% on average in OECD economies (OECD, 2020^[8]). For instance, one in four persons employed in SMEs is working in the wholesale and retail trade sector (OECD, 2019^[2]), which is largely reliant on physical interactions. Therefore, in many countries, lockdown measures and restrictions on non-essential activities meant the interruption of businesses in brick-and-mortar shops.

Digitalisation for business resilience

Resilience is necessary for coping with massive disruptions. Extreme events might trigger shocks that disperse through interconnected social and economic systems, affecting people and firms alike, with the COVID-19 pandemic as an example. While conventional risk assessment and management systems focus on predicting and mitigating risks before they pose threat to the existing system, attempts to prevent

and withstand shocks may not be enough in handling such large disruptions. In comparison, a resilience-based approach acknowledges the unpredictable and unavoidable nature of massive disruptions and underlines the importance of the ability to adapt and recover (OECD, 2020^[9]). In other words, the readiness for recovery and adaptation is the essence of resilience. Resilience enables not only bouncing back, but also “bouncing forward”, seizing new or revealed opportunities for systemic improvements after the crises (Hynes et al., 2020^[10]).

Digitalisation can help small businesses become resilient. For businesses, being resilient means having the flexibility to adapt to disruptions and continue their operations, and digital technologies can serve as a tool for businesses in building their resilience capacity. In general, the limited capacity of SMEs, such as financial and human resources, leave them with little room for manoeuvre in challenging circumstances. However, advancement of digital technologies and development of digital service models offer small businesses enhanced accessibility to business tools, which enable SMEs to quickly adapt their activities during crises without the need for a large upfront investment. For example, cloud computing is among the enabling technologies that lower barriers to adoption of other digital applications and tools. With the adoption of cloud computing, businesses can easily use digitised services without having to acquire and maintain ICT equipment. The uptake of the technology shows a strong correlation with reduced investment on ICT equipment for businesses (OECD, 2019^[2]). In addition, cloud computing allows SMEs to use ICT resources with greater flexibility, where businesses can scale up or down their use of storage capacity or computing power based on their organisational needs. Advancement in digital infrastructure has further enabled servicing of applications based on cloud computing, called Software-as-a-Service (SaaS). Typical SaaS product offers subscription-based fees or pay-as-you-go model, which lower the financial burden in adoption.

Digitalised businesses are poised to adapt better to the crisis. Mobility trackers, as of early 2021, show that recovery in foot traffic has been slow since the beginning of the pandemic, and is yet to reach pre-crisis level, with visits to retail and recreation centres decreased by more than 50% in some OECD countries (Google, 2021^[11]; Apple, 2021^[12]). However, digital services and online platforms provide alternative ways of doing business for SMEs, with online platforms enabling small businesses to tap into a large pool of consumers at relatively low cost (OECD, 2021^[13]). For instance, as sanitary measures limit in-store purchases, brick-and-mortar retail shops can set up digital shops or use existing online marketplace to keep up their sales. To illustrate, they can receive orders online and offer delivery options, such as curbside pickup or door-to-door delivery. Similarly, restaurants can use their proprietary website or tap into delivery platforms to continue their business. Moreover, the matchmaking function of online platforms goes beyond e-commerce for goods, where services, ranging from fitness to telemedicine, can also be delivered online. Businesses can also conduct online marketing and advertisement, as well as maintain communications with their customers, through social media platforms.

Teleworking is another example of how digital technologies can enable business continuity, thus providing resilience for businesses. Sanitary measures limited presence of employees in workspace, to avoid crowding. Lockdowns and curfews, implemented to restrict mobility, also affected work as the measures made commutes difficult. While scepticism on teleworking and established business models inhibited managers from implementing the practice before the crisis (Morgan, 2004^[14]; Fintan Clear, 2005^[15]), the urgency of the situation made remote working practices essential to ensure business continuity for many SMEs. Remote access tools, video conferencing software, and e-signature support tools are some of the examples of digital solutions that enable remote and paper-less business operations.

Digitalisation is here to stay. Digital practices learnt during the crisis will enable the businesses to better adapt to future disruptions, such as natural disasters. However, SMEs need to digitalise also to be able to respond to longer-term changes. Consumers have been active in experimenting and adopting digital services during COVID-19 pandemic, which is seen as an acceleration of the existing trend (Standage, 2020^[16]). In addition, the changes to consumer behaviour is likely to stick, with people continuing their online purchase habits post-COVID-19 (Accenture, 2020^[17]; McKinsey, 2020^[18]; KPMG, 2020^[19]). For the

retail sector, the shifting of consumer preference implies that brick-and-mortar businesses will increasingly need to adopt omni-channel practices, managing activities both online and offline. The shifting preference to digital does not concern Business-to-Consumer (B2C) transactions only. The Business-to-Business (B2B) sector is also experiencing a shift to e-commerce, with the majority of businesses intending to keep current practices after the pandemic (McKinsey, 2020^[20]). As suggested by studies on businesses' ICT adoption, shifting trends and increase in demand for digital services from business partners will pressure firms to adopt and use digital applications (Oliveira and Martins, 2010^[21]; Bradford and Florin, 2003^[22]; Li, Lai and Wang, 2010^[23]).

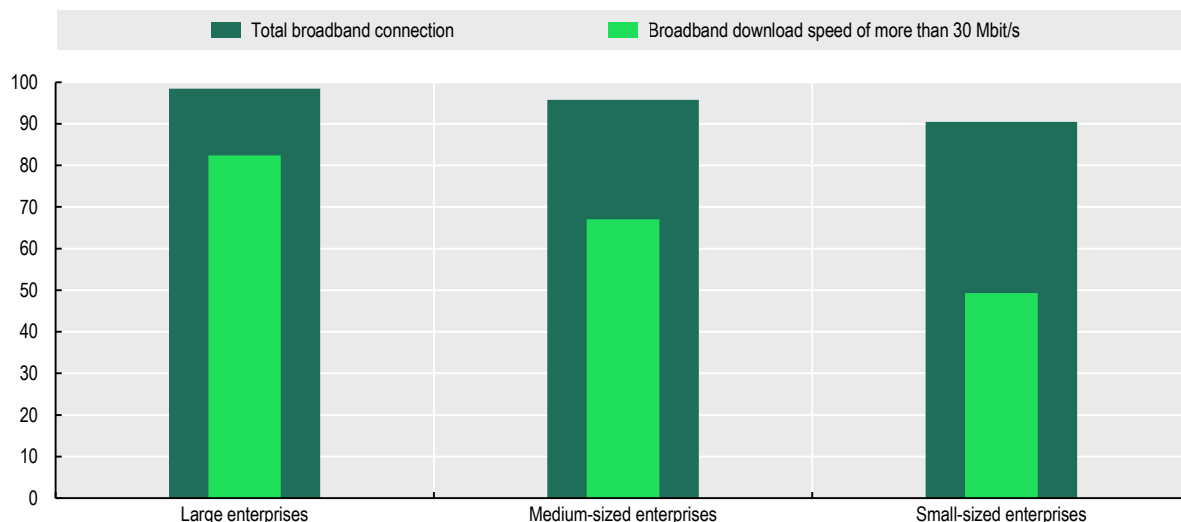
Furthermore, digital transformation of SMEs is inextricably linked with the green transition. At the systemic level, the resilience of an economic system relies also on its long-term sustainability. Digitalisation can provide businesses tools for undertaking greener practices in relation to energy and resource efficiency. Digital tools also have the potential to enhance transparency around eco-friendly practices, facilitating businesses' adoption and monitoring of environment-friendly processes. To illustrate, manufacturing SMEs can use Industrial Internet of Things (IIoT) sensors to track their emission, and optimise their manufacturing process with use of Artificial Intelligence (AI) systems. Similarly, distributed ledger technology can enhance transparency of supply chains, making it easier for SMEs to identify sustainable suppliers and source products with less environmental impact. Moreover, the green transformation can be a business driver for SMEs, having a positive impact on the firm's reputation and increasing consumers' confidence in the brand.

Multifaceted challenges of digitalisation

However, there is a size-related gap in firms' access to key digital infrastructure, such as fast internet connection. SMEs across the OECD are well connected to the Internet, with more than 90% of the businesses having access to it. However, the quality of access among firms of different sizes differ sharply. Having fast speed internet is a prerequisite for smooth running of digital services that require high-bandwidth, including SaaS (Xin and Levina, 2008^[24]). Figure 1 presents share of businesses with access to the broadband in OECD countries, highlighting portion of businesses with fast internet in each business population. Although the gap in access to broadband infrastructure between large and small firms decreased to less than 10% since 2015, the differences in terms of businesses with internet speed of more than 30 Mbps have gradually increased (OECD, 2021^[25]). Among the businesses connected to the Internet, 81% of the large businesses have fast internet connection, while the figure drops to 64% and 45% for medium- and small-sized businesses respectively.

Figure 1. Businesses with access to broadband at least 30 Mbps

Average of enterprises across OECD economies with ten or more persons employed, 2019 or latest year available, as a percentage



Note: Mbps = Megabits per second. Small-sized enterprises are defined as firms employing between 10 and 49 persons, medium-sized firms between 50 and 249 employees, and large firms with more than 250 employees.

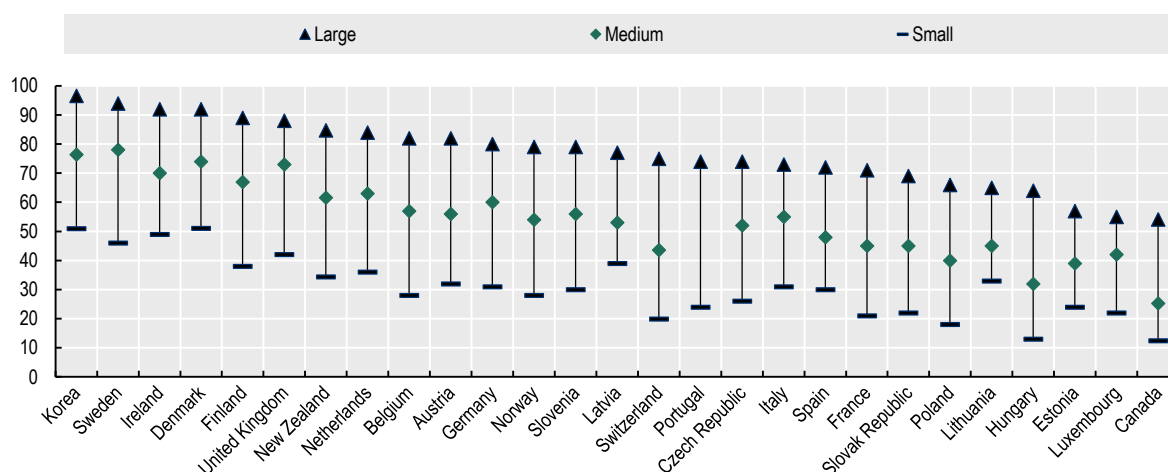
Source: OECD (2021^[25]), ICT Access and Usage by Businesses (database), <http://oe.cd/bus> (accessed on 03 May 2021).

In addition, SMEs generally lacked digital readiness before the pandemic. Lack of awareness and knowledge about the available digital technologies and the business case for adoption can hold back uptake by SMEs. Businesses typically experience challenges in formulating a reliable assessment of the impact of digital services on the organisation before adoption. The uncertainty of the benefits and risks, as well as mistrust in digital technologies can lead to low willingness to adopt (Cheng and Liu, 2012^[26]; Wu, Lan and Lee, 2011^[27]; OECD, 2020^[28]). Access to finance, organisational inertia, and incumbent systems are some of additional barriers for businesses in pursuing digitalisation, which are especially relevant for small businesses experiencing size-related constraints (Polites and Karahanna, 2012^[29]; European Commission, 2020^[30]; Waldman-Brown, 2020^[31]; Peillon and Dubruc, 2019^[32]; Kilimis et al., 2019^[33]).

Uptake of technology also requires mind-set and skills that many SMEs lack. Evidence shows that business uptake of digital tools is associated with employees' ICT skills (Andrews, Nicoletti and Timiliotis, 2018^[34]). However, SMEs in general experience digital knowledge gap, with low digital literacy in the workforce (European Commission, 2020^[35]). Furthermore, although adoption of digital technologies is largely associated with higher firm-level productivity gain, there needs to be complementary investments on intangible assets and skills to realise the benefits (Gal et al., 2019^[36]). Acquisition and basic usage of digital technology are the first steps of digital adoption, which also demand strategic decisions for effectively integrating the technology with the business model and process. For instance, establishing and enlarging digital footprint of a business involves answering to a new set of questions, in areas such as collating and managing data, consolidating orders across multiple online platforms, acquiring or upskilling talents to fully use the technology, organising logistics, conducting digital advertisement, and managing online reputation across online marketplaces and social media. Furthermore, increased digital presence and reliance on digital technology heightens cybersecurity risks of businesses. However, SMEs generally have low understanding of digital security risks and tend to invest less in their digital security (OECD, 2021^[13]). Figure 2 shows the spread between SMEs and large businesses in formal ICT security policy, with the average gap between large and small-sized businesses at 45% across OECD economies.

Figure 2. Businesses with formal ICT security policy

As a percentage of enterprises with ten or more persons employed, 2019 or latest year available



Note: Data on Canada, Korea, New Zealand and Switzerland are from the OECD ICT Access and Usage by Business dataset, with indicator on "Businesses with formal policy to manage ICT privacy risks". Data on Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden and United Kingdom are from Eurostat ICT usage in enterprises dataset, with indicator on "Enterprises have document(s) on measures, practices or procedures on ICT security". Data on medium-sized businesses in Portugal not available.

Source: OECD (2021^[25]), ICT Access and Usage by Businesses (database), <http://oe.cd/bus> (accessed on 03 May 2021) and Eurostat (2021^[37]), ICT usage in enterprises, <https://ec.europa.eu/eurostat/web/main/data/database> (accessed on 03 May 2021).

Utilising online platforms can also be a double-edged sword for SMEs. Online platforms offer SMEs wide range of benefits such as expanded access to markets and customers, cost-effective delivery solutions and easy to use digital storefronts (OECD, 2021^[13]; OECD, 2019^[38]). Although platforms make incorporating digital functions in businesses easier, by providing a full suite of tools that businesses otherwise need to arrange for themselves, the use of digital platform can present SMEs with additional challenges. Online platforms charge businesses service fees, with each platform providers having a unique fee structure, which can make it complex for small businesses to foresee the expenses. For example, e-commerce platforms typically charge product listing fees, with additional commission fee per transaction, ranging between 8 to 20% of sales generated through their websites and apps (Alexander, 2020^[39]). Businesses also need to cover for additional expenses, such as credit card transaction fee and administrative fee for product returns. In other words, small businesses are required to bear the costs associated with using online platforms on the top of their existing operation cost, which may further erode small businesses' profitability. On the other hand, larger businesses with greater bargaining power are able to negotiate for a lower commission (Dua et al., 2020^[40]). Dependency on online platforms can also expose small businesses to lock-in effects, and unforeseen operational risks due to issues related to platforms, such as sudden changes to platforms' policies and server outages (Mims, 2021^[41]; Porter, 2020^[42]; The Economist, 2021^[43]). In addition, online platforms may not allow user businesses direct access to their customer data, limiting the businesses' understanding of their customer pool (Wiener-Bronner, 2020^[44]). Platforms' anti-competitive behaviours can further harm SMEs using their services, distorting competition (OECD, 2021^[13]).

Governments have been active in supporting SMEs to become digital, with particular efforts put in place during the pandemic. In recent years, a mix of policy approaches has been implemented by governments to encourage digitalisation of SMEs, ranging from providing direct technological supports to promoting digital government practices for the benefit of SMEs prior to COVID-19 (OECD, 2021^[13]). As a response to the COVID-19 crisis, governments implemented various measures, whether by introducing new policies or readjusting existing policies, aimed at accelerating the availability and use of digital tools to support business continuity and resilience (OECD, 2020^[45]). Box 1 presents some of the policy examples. While financial supports and ease of access to credit have helped businesses invest in digital solutions during the pandemic (Cirera et al., 2021^[46]), more targeted policies have also been introduced to facilitate digital adoption by SMEs. Grants for business digitalisation, partnerships with private sector players, and longer-term strategies for SME digitalisation are some of the policy examples observed during the crisis. Such structural policies are expected to support SMEs in adopting new business processes and in enhancing their long-term competitiveness.

Box 1. Business digitalisation policies during COVID-19 : Selected examples

Responding to growing demand for connectivity

- The **Canadian** government granted temporary access to additional spectrum through both temporary authorizations and expedited temporary spectrum sharing between service providers to support supplementary capacity addressing increased internet usage and demand
- The **European Commission** and the Body of European Regulators of Electronic Communications have issued a call on streaming services, operators and users to prevent network congestion.

Enabling remote working

- In **Chile**, the government introduced changes to the Labour Code regulating teleworking in March 2020, which provides flexibility to both employers and employees in adopting teleworking. The new law also guarantees employees' rights to disconnect 12 hours per day.

Fostering digital upskilling through training

- The **Australia's** Higher Education Relief Package, announced on 12 April 2020, provides funding certainty to higher education providers and supports workers affected by COVID-19 who are looking to upskill or retrain.
- **Ireland** introduced "Digital Trading Online Voucher", where businesses can receive financial assistance of up to €2,500 on training sessions covering various aspects of trading online, including developing a website, digital marketing, and search engine optimisation.

Increasing access to digital services and tools

- The **French** government issued a call for large digital companies to provide access to a whole range of free or discounted digital offers in order to allow shopkeepers who were most affected by the crisis to continue their business during the lockdown.
- The Federal Ministry for Digital and Economic Affairs of **Austria** launched the "Digital Team Austria" initiative, where companies from the ICT sector offer digital services to SMEs free of charge for at least three months.

Fostering e-commerce, online business models and market access

- **Mexico** launched an initiative to promote the use of delivery applications to minimise the impact of the COVID-19 pandemic on small businesses. A collaborative working group has been established, involving both public and private sector.

Source: OECD (2020^[45]), Policy Options to Support Digitalization of Business Models During COVID-19: Report for the G20 Digital Economy Task Force, and OECD (2021^[47]), One year of SME and entrepreneurship policy responses to COVID-19: Lessons learned to “build back better”.

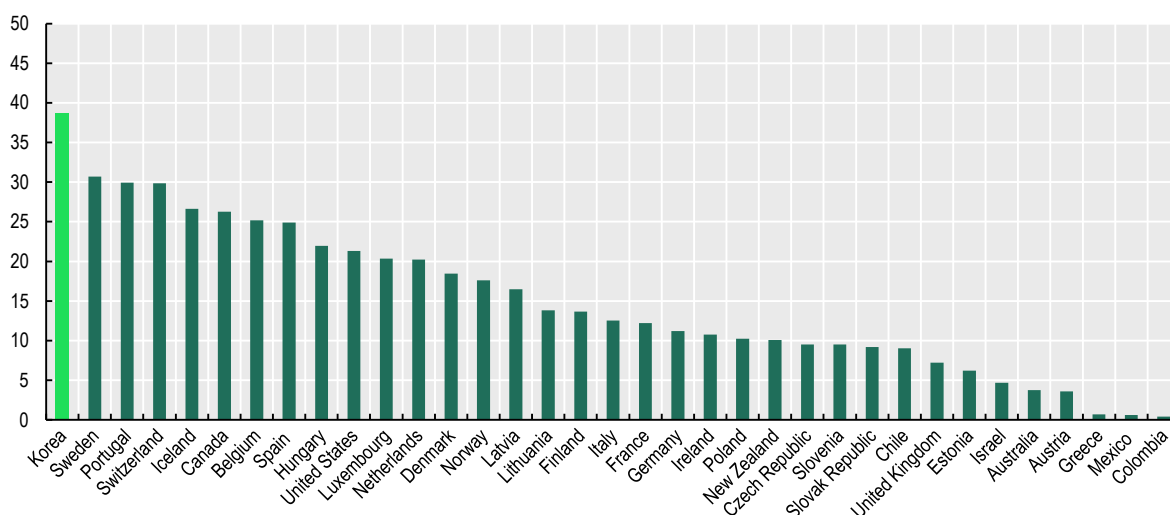
The present work aims at improving knowledge on how government programmes can support digitalisation of SMEs and make them more resilient to disruptions, by examining the case of Korea in the COVID-19 context. The second section of the paper presents a snapshot of the digital readiness of Korean SMEs before the COVID-19 pandemic, which is followed by a section on the Korean government’s policy measures to support the digitalisation of SMEs after the outbreak of COVID-19.

2 Snapshot of pre-COVID-19 SME digital readiness in Korea

Korea has a well-established digital infrastructure, which creates favourable conditions for digital adoption. High-speed internet is widely accessible and affordable. The number of fixed broadband subscriptions faster than 100 Megabits per second (Mbps) per number of inhabitants is the largest in OECD economies, with almost 40 subscriptions per 100 inhabitants. Korea is followed by Sweden (30.69) and Portugal (29.92) (Figure 3). Similarly, Korea has the highest level of internet availability across OECD members and non-members (The Economist Intelligence Unit, 2020^[48]). In terms of price of connection, 1 Gigabits per second (Gbps) of fixed broadband in Korea stands at USD Purchasing Power Parity (PPP) 39.88, which is among the cheapest options in the OECD (Figure 4). Korea is also one of the first countries to roll out the 5G network, which offers a faster mobile connection that can compete with fixed lines in terms of upload/download speed (Ookla, 2019^[49]).

Figure 3. Fixed broadband subscriptions of speed tier over 100Mbps, 2019

Per 100 inhabitants

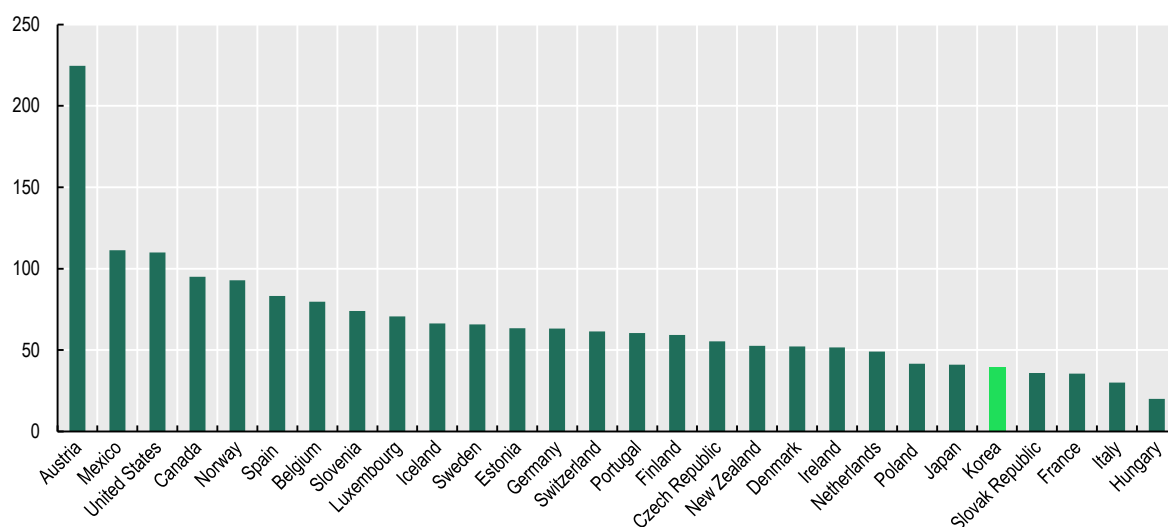


Note: Australia: Data reported for December 2018 and onwards is being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are incomparable with previous data for any broadband measures Australia reports to the OECD. Speed tier data are only for services purchased over the National Broadband Network (NBN), which comprise the majority of fixed broadband services in operation. There is no public data available for the speed of non-NBN services. Data for Switzerland and United States are preliminary. New Zealand: Speed tiers are for 2018 instead of 2019.

Source: OECD (2021^[50]), Broadband statistics (database), www.oecd.org/sti/broadband/broadband-statistics (accessed on 03 May 2021).

Figure 4. Baskets of fixed broadband offers for 1 Gbps, 2019

USD Purchasing Power Parity

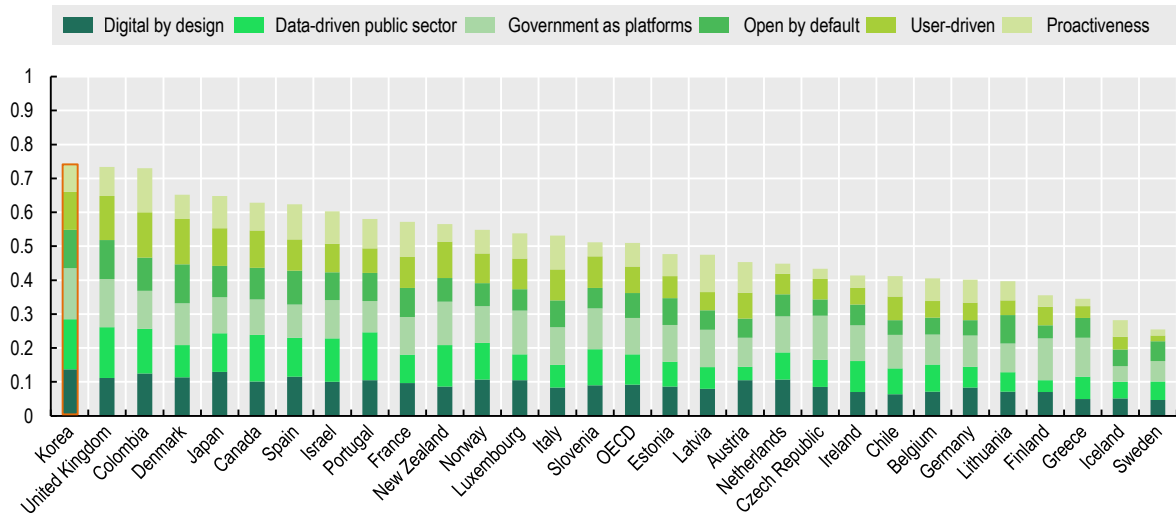


Note: Gbps = Gigabits per second. Calculation based on Teligen/Strategy Analytics (2020), "Teligen tariff & benchmarking market data using the OECD methodology", <https://www.strategyanalytics.com/access-services/service-providers/tariffs---mobile-and-fixed/> (accessed on 03 May 2020).

Source: OECD (2020_[28]), OECD Digital Economy Outlook 2020.

The Korean government has been pursuing digital government reforms, establishing the basis for digital interaction between the government and businesses. Digital government is an advanced form of e-government where digital technology becomes an integral part of the government's strategy to create public value (OECD, 2014_[51]). Implementation of digital government allows businesses to expand their online interaction with the government, where businesses can benefit from reduced administrative burdens and simplified regulatory procedures (OECD, 2017_[52]). According to an OECD survey conducted in 2019, Korea ranked high for the level of digital government maturity (Figure 5). The country is also one of the leading OECD countries in open data policies, with strong stakeholder engagement and support on data re-use (OECD, 2020_[53]). To encourage businesses to adopt data-driven decision-making practices, the Korean government provides data sets and insights from both the public and private sector, such as analysis of business districts for starting new businesses.

Figure 5. OECD Digital Government Index Composite Result, 2019

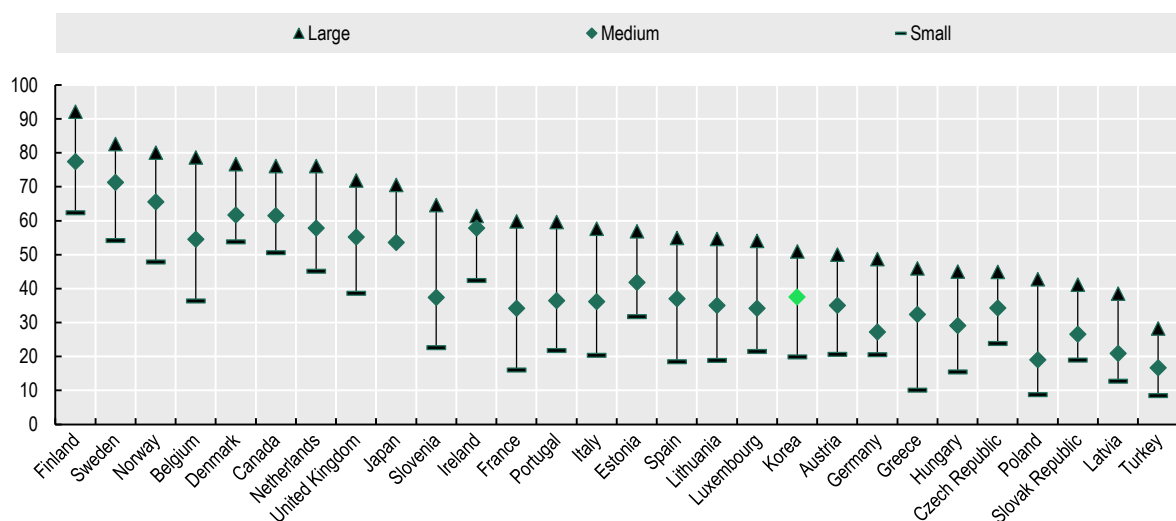


Note: Data are not available for Australia, Hungary, Mexico, Poland, Slovakia, Switzerland, Turkey and the United States of America
 Source: OECD Survey on Digital Government 1.0.

Despite favourable conditions for digital uptake, SMEs in Korea are not harnessing the full benefits of digitalisation. The use of some key digital technologies by SMEs lags behind the OECD average. For instance, Korean SMEs’ cloud computing uptake was lower than the OECD average before COVID-19 (Figure 6). Business populations in all sizes, including large companies, showed adoption rate below the OECD average. A little more than one-third (37.9%) of medium-sized enterprises in Korea were using cloud computing pre-COVID-19, compared to the OECD average of 42.4%. Among small businesses, only one-fifth (19.8%) of Korean companies adopted cloud computing. The rate is on par with that of Italy (20.3%) and the Slovak Republic (18.9%), below the OECD average of 28.2%.

Figure 6. Businesses purchasing cloud computing services

As a percentage of enterprises with ten or more persons employed, 2018 or latest year available

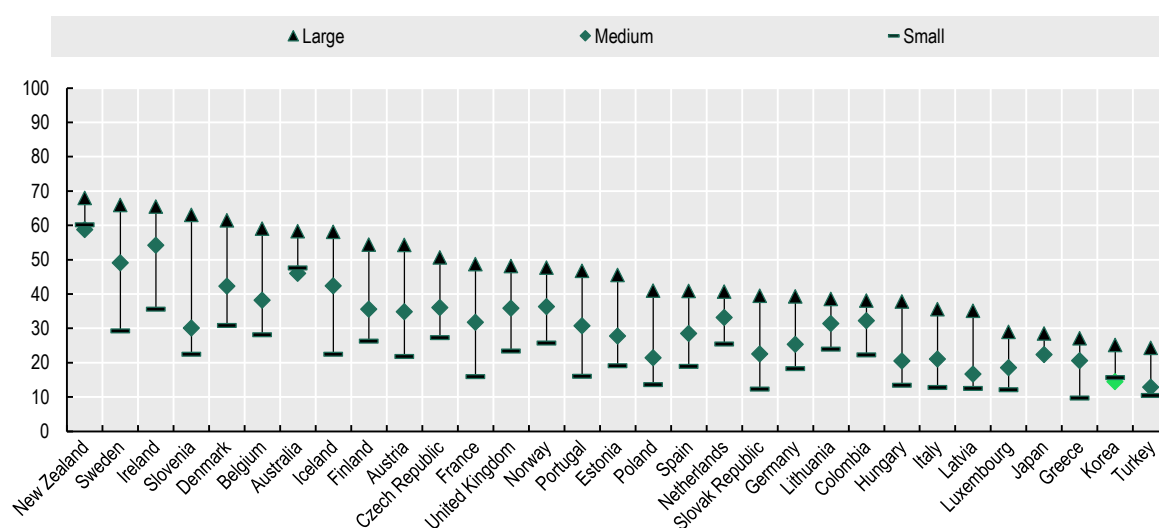


Note: Small-sized enterprises are defined as firms employing between 10 and 49 persons, medium-sized firms between 50 and 249 employees, and large firms with more than 250 employees. Data for small-enterprises in Japan not available.
 Source: OECD (2021_[25]), ICT Access and Usage by Businesses (database), <http://oe.cd/bus> (accessed on 03 May 2021).

Furthermore, Korean SMEs' participation in e-commerce had been low, despite rising e-commerce transaction in the country. According to Statistics Korea (KOSTAT), year-on-year increase in B2C commerce was 24.4% in 2018 and 17.6% in 2019. Koreans purchased a whopping KRW 12.6 trillion (EUR 92 billion) online in 2019 (KOSTAT, 2019^[54]; KOSTAT, 2018^[55]). However, in contrast to the growing e-commerce market in Korea, just a small portion of businesses was conducting sales online, including large companies (Figure 7). Compared to the OECD average of 22.5%, only 15.7% of Korean small-sized enterprises were receiving orders online. The figure is lower for medium-sized businesses in Korea, where e-commerce uptake was 14.4%, half of the OECD average (31.4%). While SMEs' participation in online sales has steadily increased across the OECD between 2010 and 2018, the level of e-commerce adoption of Korean SMEs has largely remained stagnant, with a slight increase from 2014 (OECD, 2021^[25]).

Figure 7. Businesses receiving orders over computer networks

As a percentage of enterprises with ten or more persons employed, 2019 or latest year available



Note: Small-sized enterprises are defined as firms employing between 10 and 49 persons, medium-sized firms between 50 and 249 employees, and large firms with more than 250 employees. Data for small-enterprises in Japan not available.

Source: OECD (2021^[25]), ICT Access and Usage by Businesses (database), <http://oe.cd/bus> (accessed on 03 May 2021).

Korean SMEs face a digital skills gap, which contributes to make digital adoption a challenge.

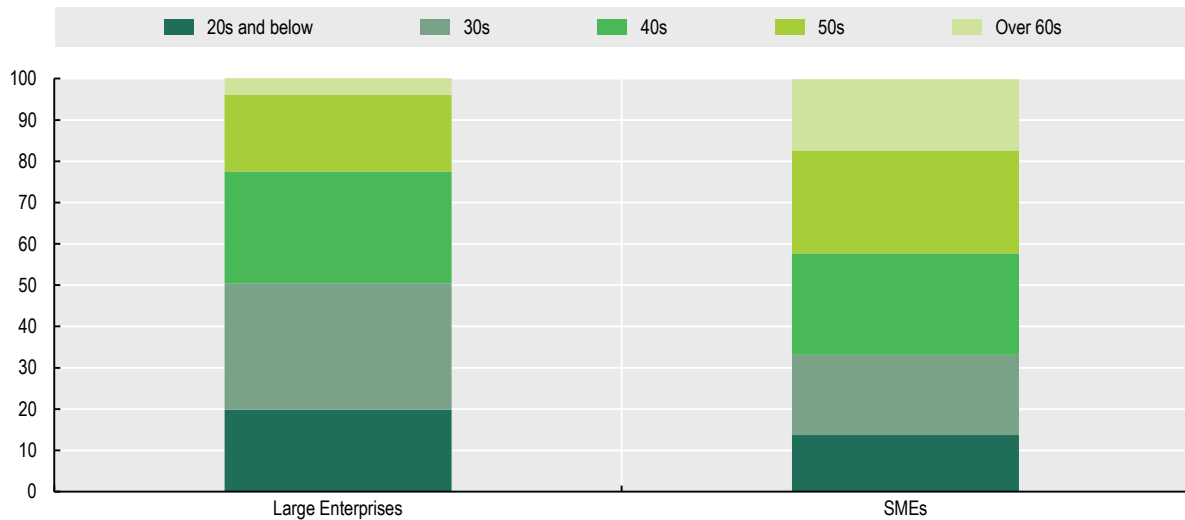
Human capital is one of the crucial factors associated with technology adoption. In other words, equipping the workforce with basic ICT skills, such as accessing information online and using software, is a prerequisite for the effective implementation and use of digital technologies (Andrews, Nicoletti and Timiliotis, 2018^[34]). However, according to an OECD report on skills (2020^[56]), 72% of workers in Korean micro-enterprises have low digital problem solving skills, making the country one with the widest digital skills gaps between micro- and large businesses in the OECD area. In addition, less than 15% of SMEs in Korea provide general ICT education to their employees.

Ageing of the SME workforce could partly explain the businesses' low digital skills. Among the employees working in for profit businesses, 88% of the workforce over 50 are concentrated in SMEs (KOSTAT, 2020^[57]). Compared to large enterprises, where 50% of the workers are below 40, the same age group in SMEs account for 33% (Figure 8). Ageing of the Korean SME workforce has been a long-term trend. According to a longitudinal study tracking labour gaps between large enterprises and SMEs in Korea, average age of workers in SMEs increased from 36.2 in 1999 to 43.1 in 2019, with smaller businesses experiencing larger increase (KOSI, 2021^[58]). Korean SMEs experience difficulties in hiring

young talents as they perceive working in SMEs as unattractive, and adults working in SMEs do so more for their necessity (OECD, 2020^[56]). Furthermore, Korea's generational digital gap is the highest among OECD economies (Figure 9). The share of Korean adults with limited or no digital skills is especially high in elder population. In short, large share of elder workers, added to their low digital skills, can present challenge for SMEs in adopting and using digital technology.

Figure 8. Age of workers in businesses, 2019

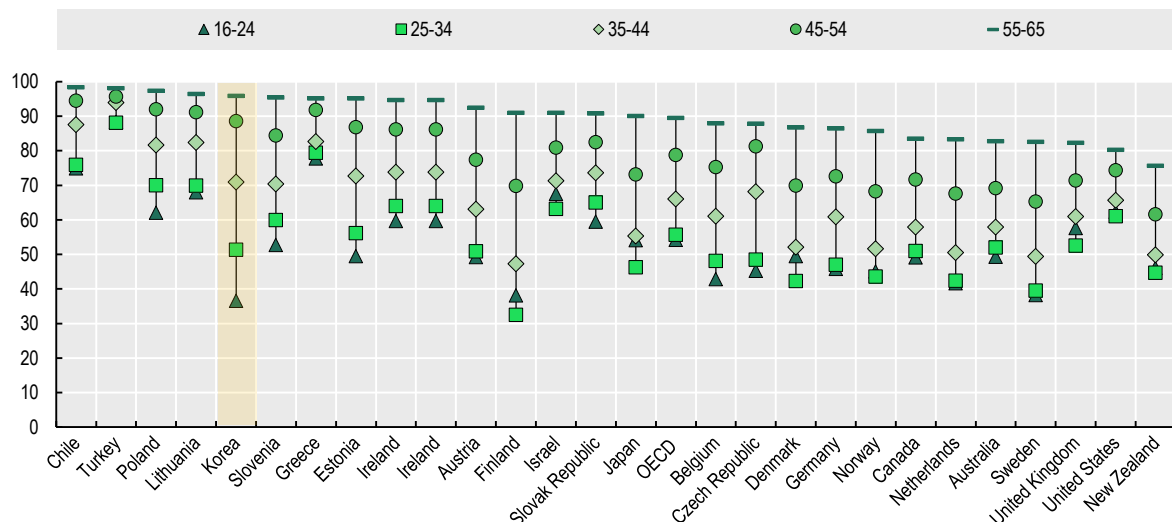
As a percentage of age of employees in businesses



Source: KOSTAT (2020^[57]), 2019 Job Administration Statistics Result.

Figure 9. Digital skills between age groups

As a percentage of adults with limited or no digital skills, 2012 or 2015



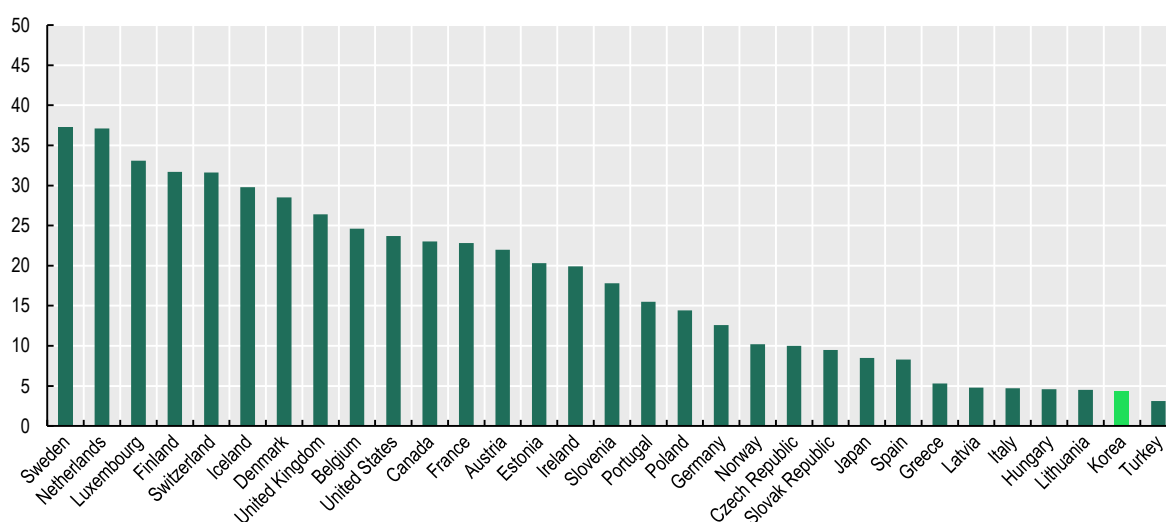
Note: "No digital skills" includes adults who have had no computer experience, failed the ICT core test or opted out of taking the test. "Limited digital skills" includes adults scoring below or at level 1 of proficiency in problem solving in technology-rich environments. Calculation based on OECD Survey of Adults Skills (PIAAC).

Source: OECD (2020^[58]), OECD Economic Surveys: Korea 2020.

Furthermore, teleworking was not widely practiced among Korean businesses before COVID-19. Aggregation of workforce survey results on teleworking shows that Korean employees were least likely to telework compared to some of the other OECD countries (Figure 10). In 2019, while around 30% of the workers surveyed practiced flexible working, only 4.3% of the workers responded that they conducted teleworking. Likewise, the share of Korean SMEs implementing teleworking before the pandemic was below 10% (MSIT, 2021^[60]), slightly below that of large businesses at 12%. A survey conducted by the Korea Federation of SMEs (2020^[61]) at the beginning of the COVID-19 pandemic shows that approximately 60% of SMEs surveyed were not aware of smart working practices, which include teleworking. Most pronounced reasons for not implementing teleworking in businesses were “investment burden”, “nature of the business making it unable to telework”, and “challenges of adapting to new working methods”.

Figure 10. Employees conducting teleworking before COVID-19

As a percentage of workers having experience in teleworking in current work, 2019



Note: Data on Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom are from Eurostat Population and social conditions dataset, with indicator on “Employed persons working from home as a percentage of the total employment, by sex, age and professional status”. The figures combine answers on “sometimes” and “usually”. Data on the United States is from Job Flexibilities and Work Schedules Summary produced by the US Bureau of Labor Statistics, with indicator on “Workers who did work at home”.

Source: KOSTAT (2019^[62]), Ministry of Internal Affairs and Communications of Japan (2019^[63]), Statistics Canada (2019^[64]), Eurostat (2021^[37]), Population and social conditions (database), <https://ec.europa.eu/eurostat/web/main/data/database> (accessed on 16 May 2021), and US Bureau of Labor Statistics (2019^[65]).

3 Korea's policies to support SME digitalisation during COVID-19

Digitalisation has been a key pillar for the Korean government in adapting to the crisis. Its well-developed digital infrastructure has enabled rapid delivery of the government supports (OECD, 2021^[47]). In addition, the Korean government has been encouraging contact-less interaction through digital adoption, dubbed as “contactless economy”. The concept was actively promoted across the government to mitigate the spread of the virus and while maintaining economic activities. The government also proposed digital, along with green, to be one of the two main concepts for its “New Deal” strategy in building post-pandemic recovery momentum.

Box 2. Korea's effort in flattening the curve

Korea has been one of the countries that has effectively contained the spread of the COVID-19 virus in the course of 2020. With the first case identified on 20 January, Korea was among the first countries to be affected by COVID-19. The government's early-stage interventions, as well as mobilisation of resources in conducting large-scale testing and contact tracing contributed to rapidly identifying cases and breaking transmission chains. The country also leveraged lessons learnt from previous epidemics, where the government was able to mitigate the crisis without imposing lockdowns or curfews.

ICT also played a key role in the response to COVID-19. The government disseminated disaster emergency messages to individuals, to inform on local outbreaks and sanitary guidelines. Private sector organisations and individuals utilised open government data to provide applications, including real-time mask stock tracker, showing pharmacies with mask stocks.

Source: (OECD, 2020^[59]; The Government of the Republic of Korea, 2020^[66]).

Digitalisation of SMEs is an integral part of the country's digital economy framework, with the effort spearheaded by the Ministry of SMEs and Startups (MSS) and its affiliated organisations. The government's SME digitalisation policies in response to COVID-19 focus on creating favourable conditions for SMEs to get their hands on digital systems and services. Approaches include introducing more tailored supports to meet SMEs' needs, as well as scaling up of existing policies during the pandemic. The former type of policies were typically ad-hoc, temporary measures, conceived to provide lifeline to SMEs and ensure their survivability. While most of them were pilots with small budget cap, some garnered a wide support and were continued with extended policy scope.

Korea's COVID-19 response policies for SME digitalisation can be categorised into horizontal and sector-targeted measures. While both types of policies target SMEs, horizontal policies pertain to SMEs across the business sector with policies mainly introduced after the spread of COVID-19. On the other hand, sector-targeted policies refer to longer-term policy packages that were strengthened in response to the COVID-19 crisis, which are addressed to SMEs in specific business populations. The two key focus

segments are manufacturing SMEs and micro-enterprises. The following section illustrates examples of multi-level government policies, from the national to the regional level, aimed at delivering both horizontal and sector-targeted digitalisation supports to SMEs.

Horizontal policy approach

The present section describes some of the Korean government's policy efforts to create a favourable environment for SME digitalisation during the COVID-19 pandemic. Most of the policies were designed and deployed in a relatively short time to address SMEs' challenges in pursuing digitalisation.

Lowering SMEs' barriers to digital adoption

The government mobilised resources to provide ICT software and equipment to SMEs. As mentioned in the previous section, uncertainty about the benefits and limited ability to try digital technology in advance to the acquisition can discourage SMEs from making investments on digital uptake. Therefore, the possibility to test and observe the effectiveness of the technology can contribute in overcoming barriers to digital adoption (Rogers, 2010^[67]; Yang et al., 2015^[68]).

To allow SMEs to experiment digital services while also responding to urgent needs during the pandemic, the MSS set up a digital services voucher programme, which subsidises SMEs' uptake of digital services with conditional grants. SMEs can use up to KRW 4 million (EUR 2 900) to acquire services, where the businesses need to bear 10% of the total cost (i.e. maximum of KRW 400 000). Beneficiary businesses can use the vouchers among pre-selected service vendors and platforms designated by the Ministry, with services including e-signature tools, cybersecurity software, videoconferencing solutions and on-line training. Teleworking parents also have the option to spend the voucher on childcare-related platforms, such as on-line education platforms for students and childcare provider matching platforms. The distribution of the vouchers began in September 2020, with the programme planned to continue throughout 2021.

The objective of the programme is to prime the pump of digital services market, offering SMEs the opportunity to try and test digital technologies at low cost. The programme connects SMEs to domestic providers that are able to provide services which are tailored to domestic businesses' needs in comparison to large international providers. At the initial stage, the Ministry issued calls for tender opened to ICT SMEs providing digital services or operating digital platforms, with preference for interoperability enabled services. The list of certified providers is made public on an on-line platform, where SMEs interested in using digital services can search the products offered and apply for the voucher programme. The businesses can also make payment of the service on the platform, with the remaining 90% subsidised by the government. Selection of beneficiaries is made on a rolling basis, with the goal to support up to 80 000 SMEs. While requirements are generous for SMEs, the Ministry continuously monitors the use of the programme and adjusts its conditionality to prevent its misuse (Table 1). For example, suppliers are not allowed to conduct anti-competitive practices such as tie-in sales and price-fixing activity, and voucher recipients are required to use the granted amount within 8 months.

As virtual meetings became the norm during the pandemic, a programme was devised to provide SMEs teleconference facilities. The "Shared-use teleconference room" programme aimed at upgrading existing facilities to make it easier for SMEs to conduct teleconference. SMEs and micro-enterprises related organisations, such as Techno Parks (TPs), Knowledge Industry Complex, Korea business incubation Association and Center for Creative Economy Innovation situated in SME clustered area, could apply for a grant of maximum KRW 12 million (EUR 8 800) to renovate their existing space to video conference rooms. The grant can be used for video conference equipment, including camera, microphone, projector and video conferencing software. The beneficiary organisations are required to provide the

teleconference facility to SMEs at no cost or at levels pre-defined with the government. The organisations are also responsible for maintaining the facility with dedicated personnel for at least 3 years, along with other requirements stated in Table 1. The target is to establish 1 562 shared conference rooms across the country, with conversion of 1 460 spaces completed as of April 2021.

Table 1. Conditionality and eligibility of grant programmes: Selected examples

Examples of conditionality clauses designed to avoid programme abuse

Name of programme	Concerned beneficiary	Conditionality & Eligibility
Digital services voucher programme	Digital services suppliers	<ul style="list-style-type: none"> • Selection as a supplier is cancelled and penalty is imposed if the business; <ul style="list-style-type: none"> - Resells existing products - Hires third party to attract users and pay incentives - Involves in price-fixing activity - Conducts tie-in sales - Provides cash or goods to voucher users both directly and indirectly in return for use of its service - Receives low satisfaction rate from voucher users.
	Voucher users	<ul style="list-style-type: none"> • In case of multiple businesses with same CEO, only one company is eligible • Businesses must apply to the programme directly on the platform • Obtained voucher needs to be used within 8 months after receiving it • Voucher should be returned if the recipient business closes temporarily or permanently.
Shared-use teleconference room programme	Space providers	<ul style="list-style-type: none"> • Grant cannot be used for purchasing of furniture • Recipient organisation is required to operate the facility (including administrative support, asset management and maintenance and organizing schedules) for a minimum of 3 years, otherwise the invested amount needs to be returned • Video equipment cannot be used for for-profit purposes.

Source: OECD interview, Korea Policy Brief webpage (<https://www.korea.kr/>), and Digital Services Voucher Programme webpage (<https://k-voucher.kr/>).

Interestingly, government at various levels created public sector platforms to help small firms conduct sales online. The MSS began operation of an e-commerce platform for small businesses called “Buy Value, Live Together” at the beginning of 2020. Conceived to provide micro- and small-sized enterprises an online sales channel for promoting their products, the public platform aims at offering small businesses the opportunity to try out e-commerce sales. The platform has a simple and low fee structure, charging businesses 3% of the sales generated, compared to 5-15% charged by private domestic players. In addition, several local governments began servicing delivery apps for local restaurants during the pandemic, giving them a low-commission alternative option to the private sector services. For instance, Gunsan municipal government was one of the first to introduce its commission-free delivery platform for local businesses, where listed businesses did not need to pay for business listing nor for advertisement. In comparison, delivery platforms in Korea generally charge businesses a service fee of around 15% of the sales generated through apps, along with advertisement fee, which can add up to 30% of the total cost (Moon, 2020^[69]).

In addition, the government has set up a programme to subsidise SMEs’ hiring of young digital talents. Intended to help SMEs in acquiring digital talents and allow young workers to build their career in ICT roles, the programme matches the businesses with the talents. The talent pool the businesses can tap into is largely divided into three categories, namely 1) websites and social media planning and management, 2) software development and data analysis, and 3) document digitisation. The businesses can receive subsidy up to 100% of legal minimum wage for a maximum of 6 months, depending on the new hire’s salary. The beneficiary businesses are required to retain the worker for at least 3 months, with

the employee working at least 15 hours per week. Albeit designed as a temporary measure, which was to expire at the end of 2020, the programme is being continued in 2021.

Facilitating SMEs' digital trade

SME digitalisation efforts also include helping businesses connect digitally across borders. Digital trade encompasses trade in goods and services conducted utilising digitally enabled transactions, including e-commerce (López González and Jouanjean, 2017^[70]). While B2B relationships previously relied on face-to-face interaction, travel restrictions have made business travels costly, which has impacted how businesses establish and maintain trading relationships (WTO, 2020^[71]). In the absence of large trade fairs, the Korean government hosted virtual trade fairs, providing networking and sales opportunity for the small businesses. The MSS, through its export support agency, collaborated with Korea International Trade Association and Korea Federation of SMEs, a business association representing SMEs, to organise series of virtual fairs at the beginning of the pandemic. The virtual trade fair has helped Korean SMEs connect with overseas buyers and sellers from more than 90 countries. Each virtual fair has specific themes, gathering SMEs from both manufacturing and services sector, with examples such as biomedical and healthcare, entertainment, environmental friendly and green products, food and beverage, and cosmetics.

The virtual trade fairs were first conceived as a short-term pilot between May and July 2020. After receiving a large interest from SMEs, the government has scaled up the support and is being continued as of first half of 2021. The supports provided during the trade fair included measures to accommodate the needs in virtual setting. In addition to business matching and translation services, the participating businesses could receive further assistance on the production of promotional material, including brochures and product videos. Businesses can also arrange expedition of product samples at a discounted price. Interested businesses could further receive support in listing their products on foreign online platforms. Furthermore, by leveraging partnering institutions' overseas centres and large businesses' distribution network, the virtual trade fair gradually expanded to a hybrid model, where the trade fairs are held on-site in foreign countries simultaneously. In the hybrid model, regional coordinators are informed of basic information on the product, which they promote to the buyers, allowing interested buyers to test products and connect virtually with the exporters.

Measures were set up to ensure continuation of SMEs' exports during the pandemic. Ease of cross-border purchases through e-commerce platforms, in addition to wide adoption of online shopping by consumers during the pandemic, has resulted in increase of digital trade activities (OECD, 2020^[72]). However, the pandemic also disrupted maritime shipping and airfreight, resulting in historical freight rate (UNCTAD, 2021^[73]; Reuters, 2021^[74]). To facilitate SMEs' cross-border trade and reduce the businesses' freight cost burden, the MSS provided temporary measures. The Ministry secured air cargo capacity for SMEs and partially subsidised the freight cost. The MSS further co-operated with the Ministry of Oceans and Fisheries, and the Ministry of Trade, Industry and Energy (MOTIE), to create an inter-ministerial one-stop shop dedicated to maritime shipping responses. Named "Export-Import Logistics Comprehensive Response Center", the centre works with maritime shipping stakeholders, including association of ship owners and trade association, to monitor and relieve bottlenecks of maritime shipping during the pandemic. In addition, the MSS signed a Memorandum of Understanding (MOU) with the country's flag carrier to secure freight space for SMEs for longer term. Exporting SMEs can access detailed real-time information on shipment schedule and apply for the quota online. The measures contributed to facilitating SMEs' digital sales activity, where in 2020, online sales generated by SMEs in Korea amounted to USD 730 million, more than doubling from the previous year (MSS, 2021^[75]).

Enhancing SMEs' cybersecurity

Apart from general digitalisation supports, the government implemented dedicated programmes to enhance cybersecurity of SMEs during the pandemic. While SMEs could acquire network and cybersecurity solutions and receive consultations on cybersecurity from the digital services voucher programme mentioned above, additional policy measures were conceived to address SMEs' cybersecurity vulnerabilities as businesses expand their digital footprint. As part of the country Digital New Deal strategy, the Ministry of Science and ICT (MSIT) launched the SME information protection service. Through the service, SMEs and entrepreneurs can receive tailored monitoring and consultation of the businesses' cybersecurity risks, supports on acquiring and implementing cybersecurity solutions, and on-site trainings on cybersecurity practices, with assistance worth up to KRW 8 million (EUR 5 850). On the other hand, the MSS provided temporary digital forensics support to SMEs by matching SMEs that may have suffered from technology leakage with digital forensics experts. Through the measure, SMEs can receive support on gathering and analysing digital evidence of security breaches and attacks, as well as legal advice on the evidences found.

Digitalising public services

The MSS established a digital one-stop shop during COVID-19 to ease administrative burden of SMEs. Previously, the Ministry and its 11 affiliated agencies maintained 36 online public systems to inform and receive application of the public sector SME supports, in areas such as R&D and marketing. The systems were operated separately from each other, indicating that the users had to sign up on each system. To reduce SMEs' inconvenience of searching and applying to government programmes on individual systems, the Ministry began servicing an SME online portal from August 2020 that aggregates information across 36 systems. The one-stop shop implements the once-only principle, where information is requested only once and shared between administrative services. In other words, the website enabled SMEs and entrepreneurs to access government information and aids under a single ID. For example, businesses and entrepreneurs can receive certifications issued on the one-stop shop to apply to government programmes. While the system currently aggregates information from agencies that the MSS directly oversees, the Ministry plans to incorporate public supports managed by other ministries and regional governments.

The government's digitalisation efforts include automation of administrative processes. Public agencies have begun exploring AI-based systems to strengthen data-based decision making and enable contact-less interaction with businesses. For example, Korea Technology Finance Corporation, a government institution providing financial support to businesses with innovative technology, created an AI-based technology evaluation system. Based on financial model, the system was trained using experts' previous decisions to evaluate monetary value of technology and patents. With enhanced evaluation accuracy, the corporation is using the system to provide guarantees to early stage start-ups and innovative SMEs that own promising technology but lack financial resources. The use of chatbots, automated chat services, is another example of government's use of AI. By communicating with chatbots, SMEs are able to acquire information on government programmes relevant to their business and ask basic questions 24/7.

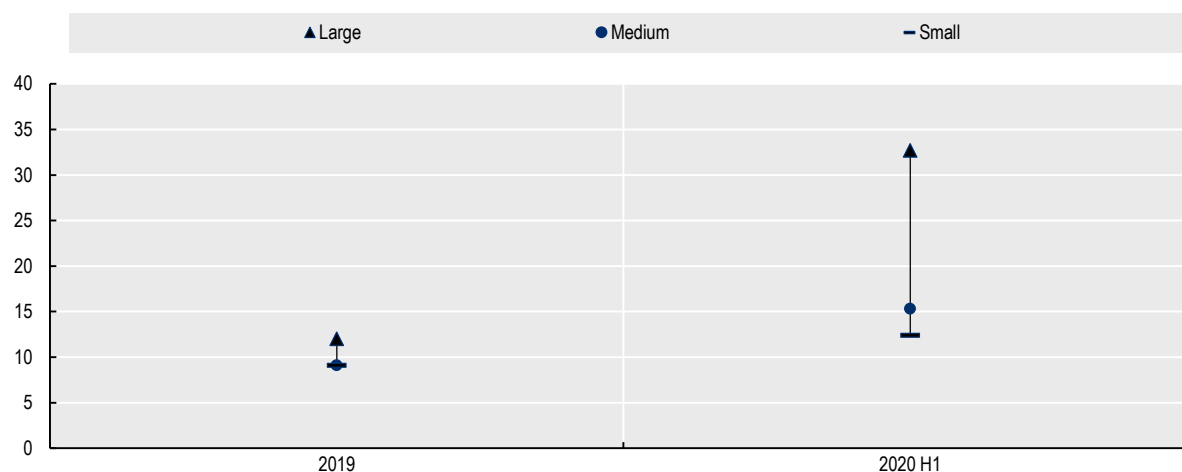
Promoting teleworking in businesses

During the pandemic, the government expanded its existing supports for businesses to adopt teleworking practices. The Ministry of Employment and Labor (MOEL) has been promoting SMEs' adoption of flexible working since 2016. The types of support included providing grants according to number of teleworking employees, consulting on legal aspects of teleworking, and training. The demand for implementing teleworking in SMEs increased significantly after the beginning of COVID-19 pandemic. Between January to May 2020, around 4 800 SMEs applied to receive the support, compared to 1 600 applicants in the same period a year earlier. As a response to the surge in demand, the Ministry temporarily simplified the application process, and increased the amount of grants provided to businesses.

While the Ministry’s focus on teleworking policy before COVID-19 had been on partially subsidising labour expenses to let businesses experiment remote working practises, the emphasis shifted more to helping businesses set up teleworking infrastructure during the crisis. Similar to the MSS’s digital services voucher programme, the MOEL further expanded its supports to provide grants to cover teleworking-related costs, including equipment, cloud computing tools and cybersecurity systems, as well as labour policy consulting and human resources training expenses. The MOEL also published a teleworking manual for businesses in mid-2020, explaining basics of teleworking, showcasing best practices, and answering key questions such as on legal issues. In addition, the MSIT distributed online security guidelines for businesses and employees, underlining the importance of limiting exposure to cyber attacks. Although SMEs’ uptake of teleworking increased in the first half of 2020, in part due to the government-wide supports, the increase has been modest, with the gap between larger companies widened during the pandemic (Figure 11).

Figure 11. Korean businesses practising teleworking, 2019 and 2020 H1

As a percentage of enterprises with ten or more persons employed



Source: MSIT (2021_[60]), 2020 Informatization Statistics Collection.

Strengthening SME-large enterprise relationship

The Korean government has been stressing the role of large companies in creating a win-win environment for SMEs in their value chain. In 2006, the Korean government enacted the “Act on the Promotion of Mutually Beneficial Cooperation between Large Enterprises and Small and Medium Enterprises”, creating a foundation for co-operation between large and small businesses. To monitor the co-operation, the government created the “Win-Win Index”, which evaluates large corporations’ activities with SMEs in a given year. Large corporations are assessed based on diverse criteria, including fairness of their contracts with SMEs, adherence to their legal responsibilities and their engagement in SME co-operation programmes, such as the win-win smart factory programme (see below section on “Modernising manufacturing sector”). The index also takes into account survey results from SMEs. Based on the result, large enterprises are categorised into five groups, from “Best” to “Insufficient”, where enterprises with positive evaluation are eligible for corporate tax credit, in addition to their enhanced brand image.

The efforts to foster co-operation between large and small businesses became more structured after the MSS launched the “Thoughtful Companies” initiative in 2019. The programme aims at strengthening

linkages between large corporations and SME-related organisations through MOUs. Examples include large automobile manufacturers co-operating with an automobile association to support suppliers' transition to the production of electric vehicles, and a delivery platform signing a MOU with the Korea Federation of Micro Enterprises to contribute to the federation's start-up fund for brick-and-mortar shops and to share their retail data, which can be used to provide tailored marketing to micro-enterprises.

Continued emphasis and systematic support on SMEs' relationship with large companies prior to COVID-19 contributed in solving bottlenecks during the crisis. For example, an electronics manufacturing conglomerate that have been partaking in the initiative helped relieve mask manufacturing SMEs' production bottleneck at the outset of the pandemic. The large company dispatched smart factory experts to the SMEs, where the experts provided technical support to streamline SMEs' manufacturing process, and helped in connecting the companies to mask part suppliers. The SMEs were able to increase their daily production by 51% in a short time without incurring large investments. The co-operation expanded to SMEs manufacturing personal protective equipment, which was facilitated by the MSS.

Creating an accommodative regulatory framework for digitalisation

The Korean government has been continuing its efforts to create conditions favourable towards digitalisation. To illustrate, the government amended the existing "Framework Act on Electric Documents and Transactions" in June 2020, which clarifies boundaries of digital documents and their legal force. The amendment grants electronic documents, including electronic contracts, the same level of legal force as paper documents, which can lower businesses' transaction cost in printing and sending physical copies of documents. Businesses are also relieved from the requirement to store and maintain physical copy of documents. In addition, the government adopted the "Act on the Revitalization of Data-Based Administration", mentioned above, to facilitate data sharing across government organisations and acquisition of private sector data. By aggregating data onto an integrated public data management platform, government organisations are expected to engage more in evidence-based policymaking, including for businesses.

Sector-targeted policy approach

The Korean government has placed particular attention on SMEs in sectors that lack the capacity to invest in digitalisation, notably manufacturing and brick-and-mortar micro-enterprises. While being part of the longer-term strategy, the policy support targeted to the two SME sectors have strengthened during the COVID-19 pandemic.

Modernising the manufacturing sector

The Industry 4.0 strategy has been one of the main tools to invigorate the SME manufacturing sector. Accounting for around a quarter of GDP, manufacturing is an important component of the Korean economy (OECD, 2020^[76]). However, the gap between large manufacturers and smaller players has widened continuously. The operating margin gap between the two groups increased from 0.2% in 2014 to 5.1% in 2018 (Bank of Korea, 2019^[77]). SMEs' investment in equipment retracted as well, decreasing by 34% between 2015 and 2017, while large corporations expanded their investment by 34% (Korea Development Bank, 2019^[78]). Decrease in profitability and lower capacity to invest in facility led to gaps in the level of wage, where manufacturing workers in SMEs were receiving on average 34.9% lower wages than those working in large companies (Korea Federation of SMEs, 2019^[79]). Jobs in manufacturing SMEs have been typically perceived as strenuous and dangerous and it became harder for the companies to recruit workforce.

To assist manufacturing SMEs in modernising their facilities, an inter-ministerial group, composed of the MSS, MSIT and MOTIE, introduced the “Smart manufacturing diffusion and advancement strategy” at the end of 2018. The strategy underlined the importance of converting conventional manufacturing facilities into smart factories, which refers to the modernisation of manufacturing processes. Smart factory system utilises computerised systems, including enterprise resource planning (ERP) software and factory energy management system, as well as more advanced technologies, such as IIoT, 5G, robotics, 3D printing and AI. The strategy consolidated programmes dispersed across ministries, with the MSS leading the effort. The government has set a goal to convert 30 000 factories to smart factories by 2022, which translates to a half of manufacturing SMEs with 10 or more employees in Korea. As the cost of investment has been the biggest obstacle for Korean manufacturing SMEs in modernising their system (Kang and Park, 2020^[80]), the programmes focuses mostly on providing grants for acquiring equipment and services, and consulting. Smart factories are categorised in four levels, depending on their level of digitalisation (Table 2). While the focus was on the spread of the smart factory in the basic stage through the installation of basic data collection tools, it is gradually shifting to an advanced smart factory with real-time monitoring, analysis and optimisation control.

Table 2. The levels of smart factory

Stages	On-site Automation	Factory Operation	Company Resource Management	Product Development	Supply Chain Management
Advanced	CPS based on IoT/loS				Business CPS Network Collaboration on the Internet Space
	IoT/loS-based operation	Modularization of IoT/loS Analysis and operation based on Big Data			
Intermediate-2	Equipment-Control Automation	Real-Time Factory Control	Factory operation integration	Simulation and Batch Process Automation	Multi-product development collaboration
Intermediate-1	Automatic aggregation of equipment data	Real-time Decision Making	Integration Inter-functions	Automation and collaboration through creation of technical information	Multi-product production collaboration
Basic	Performance aggregation automation	Point of Production	Individual operation of management-oriented functions	Technology/delivery management through server	Dependence on Corporate that place an order

Note: Acronyms are as follows; CPS (Cyber-Physical Systems), IoT (Internet of Things), and loS (Internet of Service).

Source: Korea Agency for Technology and Standards (2016^[81]), KSX9001-1 Smart Factory – Part 1 Basic Concept and Structure.

In addition to consolidating policy efforts, the strategy revamped the delivery and funding scheme of the smart factory programme. The programme delivery became more decentralised to address local needs. Rather than the central government providing grants to businesses, the support is provided through regional industrial complexes. The MSS established Korea Smart Factory Office (KOSMO), a dedicated agency overseeing the execution of smart factory supports. KOSMO co-operates with regional TPs, which are regional industrial development agencies that serve as nexus between industry, academia, research institutions and government. Created under partnerships between ministries, research institutions and local governments, 19 TPs are operating across the country, each with their own industrial specialisation. The TPs operate Smart Manufacturing Innovation Centers that are responsible for smart manufacturing policy delivery, from processing applications to testing and certifying smart manufacturing technologies to matching SMEs with solution providers to conducting evaluation of the adoption.

While former programmes mostly relied on one-off government support, the strategy aims to promote involvement of the private sector players, including large corporations. The government induces continuous advancement of smart factories by providing up to KRW 70 – 400 million (EUR 51 660 – 295 200), 50% of the total project cost, according to the level of advancement of the smart factory. In addition, the government promotes dissemination of private-voluntary smart factory project through win-win projects that collaborate with the private sector such as large corporates. In the case of a win-win project, large corporations and public institutions support more than 30% of the construction cost to small and medium-sized enterprises, and the government provides additional support up to 30%, so that the cost burden of SMEs is less than 40%. The large businesses participating in win-win programme can further receive credit to their Win-Win Index.

The MSS monitors operational improvements of SMEs adopting smart factory practices. Performance of the programme beneficiaries are monitored in annual basis starting from 6 months after finalising the implementation. As a result of comprehensive manufacturing process improvement and business outcomes analysis, the beneficiaries of the programme have seen an average of 28.5% in productivity, 42.5% increase in product quality, and 15.5% decrease in cost of production, and the smaller the company, the better the performance (MSS, 2019^[82]). In addition, the implementation of smart factory is associated with increased employment, and reduction of industrial accidents.

The Ministry continued its efforts to test and provide smart factory solutions to SMEs during the COVID-19 crisis. Promotion of smart factory systems and use cases have been communicated online in lieu of on-site visits. During 2020, a total of 7 139 facilities have received the support compared to 1 757 the previous year. To help companies respond to disruptions to global value chains (GVC) during the pandemic, the MSS provided reshoring manufacturers support for setting up smart manufacturing facilities and robotics. As a part of the Digital New Deal on manufacturing sector digitalisation, the Ministry began servicing Korea AI Manufacturing Platform (KAMP) from December 2020. Developed under a co-operation with ICT companies and a national research university, the online platform for manufacturers provides cloud computing resources for AI application in manufacturing. Businesses, AI researchers and developers can access manufacturing data sets on the platform to train algorithms and develop new services. As KAMP is developed on the top of a public cloud system, which has top-notch security standards, manufacturers can use the cloud service without cybersecurity risks. While most of the companies are using the cloud servers to store and manage their data, some of the manufacturers are utilising intensive computing resources to train algorithms. For instance, a refractory manufacturer used the KAMP cloud computing system to train X-ray image data to automate defect inspection process, increasing accuracy rate from 90% to 96%. In addition, the government designated a Regulation-Free Special Zone dedicated to applying 5G technology within the smart factory model in November 2020.

Box 3. Regulation-Free Special Zones

Regulation-Free Special Zone, first introduced in 2019, provides a regulatory sandbox for a regional sandbox for emerging industries. Under the sandbox, companies can verify new technologies without restrictions on regulations, leading to fostering local industries and vitalization of the local economy. Except for the metropolitan area, cities and provinces can apply for the Regulation-Free Special Zone to promote a regional business innovation.

If it is designated as a Regulation-Free Special Zone, it can get the benefit of special cases necessary for the region along with the regulatory sandbox among 201 regulatory special cases. Companies located in special zones can check whether there is any regulation within 30 days. During testing their

products and services, the companies are temporarily (for two years) subject to regulation-free special cases in terms of demonstrations and permits.

Twenty four RFSZs have been designated as of May 2021. Examples of RFSZs are illustrated below;

- Digital health care (Kangwon): Data-enabled health care service with use of IoT sensors, and remote diagnosis for patients in rural areas
- Blockchain (Busan): Blockchain-based maritime freight platform and distributed ledger-based local currency
- Green Energy Storage System (Gwnagju): Establishment of Energy Storage System (ESS) infrastructure and allowing ESS operators to sell energy directly
- 5G smart factory (Gyeongnam): Development and testing of digital twin-based intelligent production system using hyper connected Industrial Internet of Things

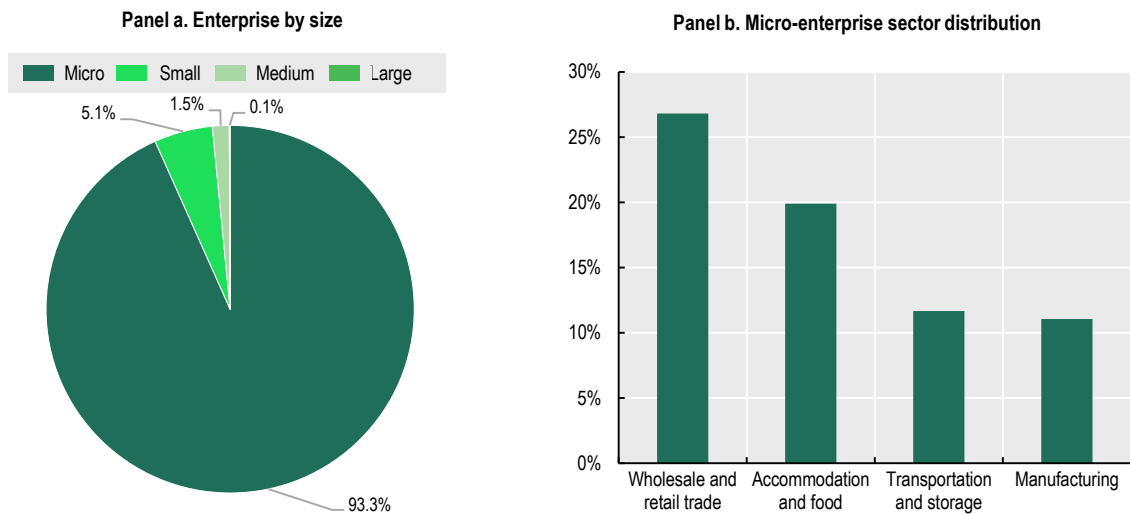
Source: Regulation-Free Special Zone website (<http://rfz.go.kr/>).

Supporting micro-enterprise digitalisation

Prior to the pandemic, creating digital sales channels for micro-enterprises has been one of the main policy focus. Micro-enterprises account for 93.3% of Korean enterprises (Figure 12 Panel a). As depicted in Figure 12 Panel b, around 27% of the micro-enterprises are in the wholesale and retail trade sector, followed by accommodation and food (20%), transportation and storage (12%) and manufacturing (11%). Efforts to digitalise micro-enterprise have focused on serving the needs of the brick-and-mortar businesses in wholesale and retail trade, and accommodation and food. As small businesses generally do not have a well-established understanding about how to conduct business online, policy programmes have focused on providing a support package in various stages so that the businesses can receive tailored support. Before the pandemic, the MSS offered consultancy services on product commercialisation, covering business process from product planning to sales on online platform. Micro-enterprises could also receive direct support in listing their products on online marketplace. The MSS also partnered with domestic e-commerce platforms to conduct timed thematic sales, aggregating products of micro-businesses that do not have the capacity to manage online sales. In addition, businesses could receive support on digital marketing, from creating product images and videos to matching with social network influencers. The public e-commerce platform, mentioned above, is another example of the governments' support in this area.

Figure 12. Characteristics of Korean micro-enterprises, 2018

Panel a: As a percentage of all enterprises in business economy, Panel b: As a percentage of micro-enterprises



Source: Panel a: Ministry of SMEs and Startups (2020^[83]), Basic statistics of SMEs 2018, Panel b: Small Enterprise and Market Service (2021^[84]), Status of Micro-enterprises (2017-2019).

The measures supporting micro-enterprises expanded in the wake of the COVID-19 pandemic. To illustrate, the MSS earmarked KRW 76.2 billion (EUR 57.2 million) for supports related to promoting digital sales of micro-enterprises, which is an eight fold increase since 2019. At the beginning of the pandemic, the Ministry increased the number of beneficiaries for its existing micro-enterprise digitalisation support. Emphasis was also placed on helping small businesses produce digital contents, which can support their online sales activity. The Ministry conceived the policies to guide businesses in creating multimedia contents for their digital storefront and digital advertisement.

Public payment system is another type of existing support that was utilised during the crisis. Zero Pay is a QR code-based payment system created through a public-private partnership between the MSS, regional governments, financial businesses, and business associations. Set up in 2019, the payment system was created to relieve micro-enterprises from credit card transaction fees. While businesses need to cover between 0.8% and 1.6% commission of credit card payments, Zero Pay charges zero to 1.2% of the transacted amount, depending on the businesses' size and its yearly revenue. During the pandemic, the emergency relief funds were also distributed via Zero Pay, where households could use the grant received in small businesses. With wide acceptance of the payment system during the pandemic, the total transacted amount reached KRW 2 trillion (EUR 1.4 billion) in two years since its launch, making the payment system self-sufficient.

Modernising facilities of brick-and-mortar businesses has also been a policy focus during the pandemic. The government began promoting digital technologies and systems that physical stores can adopt to improve their business efficiency, including digital kiosks and menus for receiving orders, self-checkout counters, and cooking robots. Grants were offered to businesses interested in implementing the technologies. In addition to digitalising individual shops, policy measures were also devised to modernise wider business areas. For example, local governments established delivery infrastructure for traditional markets. As traditional markets were among the hardest hit from the significant decrease in foot traffic, the governments helped modernise the logistics and digital infrastructure to allow market sellers to receive orders and deliver their produces and goods. The MSS has further announced its plans to provide digitalisation policy package to retrofit commercial districts.

Furthermore, efforts have been directed at strengthening digital training and online training offered to micro-enterprises and entrepreneurs. The Ministry introduced additional digital training programmes to help owners of micro-businesses become acquainted with digital technology. Prior to the pandemic, the government has been operating online training platform with courses designed for entrepreneurs, such as on starting a business, re-starting business, managing business and business knowhow, and opening a franchise business. The platform has seen around 14.5% increase in course attendees in 2020, which has led to opening of new interactive courses delivered through both the platform and other social media channels.

4 Concluding remarks

Digitalisation has been a lifeline for SMEs during the COVID-19 pandemic, offering some degree of business continuity amid the uncertain period. Digital tools and systems enabled small businesses to cope with the changing circumstances and become resilient. Especially, availability of digital services and platforms allowed SMEs to quickly adapt their activities during the crisis without the need for a large upfront investment and lengthy business process adjustment. Businesses have been learning on the go, whether delivering their food via delivery platforms or implementing remote working for their workers, experimenting digital tools and fine-tuning their process along the way. The digitalisation trend is likely to stick beyond the pandemic, as digital practices have permeated our lives. Changes to consumer and business behaviour and their accelerated adoption of digital technology will reshape B2C and B2B relationship in the longer time horizon. Furthermore, digitalisation can serve as a tool for achieving a greener society.

To help businesses become more resilient and adapt to disruptions induced by the COVID-19 crisis, governments have been providing a wide array of supports, with SME digitalisation being one of the key areas. However, the digitalisation rush also exposed pre-existing challenges. SMEs typically experience difficulties in adopting and fully utilising digital technologies, as digital adoption is more than just pressing a power button. It rather demands complementary investments, change of mind-set and business organisation, and entails a continuous effort to adapt to changing digital technologies overtime.

The present paper took a deep dive on SME digitalisation policies in response to the COVID-19 pandemic, by examining Korea's experience. Despite having a well-established digital infrastructure, and favourable conditions for digital uptake, Korean SMEs were yet to realise the full potential of digitalisation prior to COVID-19. Small businesses in Korea were experiencing a significant digital skills gap, which can be explained in part by ageing workforce and low attractiveness of SMEs among the youth. The Ministry of SMEs and Startups (MSS) has been spearheading SME digitalisation efforts, especially during the COVID-19 crisis. Where there is an intersecting interest, the Ministry has co-operated with other relevant ministries and agencies.

The Korean government has been swift in introducing policy pilots to meet SMEs' urgent digital needs during the COVID-19 crisis. The government has underlined the importance of making digital services and equipment more accessible to small businesses, and helping them make rapid transition to digitally enabled business practices. While aimed at helping small businesses become more resilient, the policies were also conceived to address the long-standing challenge of low digital adoption among SMEs. Support for exporting digital sales, measures to enhance cybersecurity, and digitalising public services are some of the novel policies introduced during the pandemic to this aim.

Table 3. Korea's SME digitalisation response during COVID-19

Examples of SME-targeted policies during the COVID-19 pandemic, as of the first half of 2021

Horizontal / Sectoral	Policy type	Policy examples	Timing and type of responses
Horizontal (concern SMEs in all sectors)	Lowering barriers to digital adoption by SMEs	<ul style="list-style-type: none"> Grants for purchasing digital services Shared-use teleconference rooms Operating public sector platforms with lower commission fees Subsidising hiring of young digital talents 	Policies newly introduced during COVID-19
	Facilitating digital trade of SMEs	<ul style="list-style-type: none"> Hosting of virtual trade fairs Securing air and sea freight space for SME export 	
	Enhancing cybersecurity of SMEs	<ul style="list-style-type: none"> Grants for purchasing cybersecurity solution Comprehensive cybersecurity support on monitoring, consultation, and training Digital forensics support 	
	Digitalising public services for SMEs	<ul style="list-style-type: none"> Creation of a digital one-stop shop Automation of application evaluation process Usage of chatbots for answering basic inquiries 	
	Promoting teleworking in businesses	<ul style="list-style-type: none"> Grants for purchasing teleworking solutions Consultations on legal aspects and trainings on teleworking Distribution of teleworking manual on best practices and online security guidelines 	Policies building on existing measures
	Strengthening SME-large enterprise relationship	<ul style="list-style-type: none"> Connecting SMEs with large companies to help ease their operational bottlenecks 	
	Creating an accommodative regulatory framework for digitalisation	<ul style="list-style-type: none"> Clarification on electronic documents and their legal force Facilitating data sharing across government organisations and the acquisition of private sector data for evidence-based policymaking 	
Sectoral (concern SMEs in targeted sectors)	Modernising manufacturing SMEs	<ul style="list-style-type: none"> Providing reshoring manufacturers smart manufacturing facilities and robotics support Servicing of AI-based cloud computing platform for advanced computation and data storage 	Policies building on existing measures
	Supporting micro-enterprise digitalisation	<ul style="list-style-type: none"> Comprehensive e-commerce support from product planning to sales Provision of equipment and expertise for creating multimedia contents for digital advertisement Grants for implementing digital technologies and systems in physical spaces, from stores, to markets and commercial districts Providing trainings on the use of digital technology and offering trainings online 	

Korea's policy experience also illustrates some of the country's unique policy focuses, which are built on existing strategies. The existing framework for fostering win-win relationships between SMEs and large corporations was leveraged during the pandemic to relieve SMEs' supply chain bottlenecks. Moreover, the government has been playing a key role during the pandemic in aggregating SMEs' digitalisation demands to enhance their bargaining power, and in resolving challenges they face in relation to large digital businesses. Also, the government's advanced digital capability enabled rapid delivery of its policies, including through the establishment of a digital one-stop shop, helping SMEs save time and effort in searching for policy supports. Furthermore, digitalisation policies targeted at manufacturing and the micro-enterprise sector, which were initiated pre-COVID, expanded to accommodate changes in the business environment during the pandemic.

While most of the measures have been conceived as temporary, SMEs' growing interest and their willingness to embrace digitalisation, in addition to the prolonged pandemic, resulted in the

government extending the programmes. Although it is early to conduct evaluation of these policies, the Korean government should continue its efforts in monitoring the measures, adjusting specificities and conditionality of the programmes to meet the evolution of SMEs' demand and challenges.

While measures have mainly focused on providing short-term resilience capacity to small businesses, in other words ensuring their business continuity during the pandemic, policy monitoring can further focus on how these policies impact SMEs' resilience in the long term. For example, the government's monitoring efforts of the digital voucher programme can expand from the current monitoring of grant misuses to monitoring SMEs' usage of the tools provided. Since it is possible that businesses could discontinue their use of digital services, such monitoring could help the government in understanding businesses' usage patterns and in identifying difficulties and expectation gaps that might keep SMEs from continuing the use of digital services, such as lack of organisational capacity or inability to observe a return on investment. The evidence gathered, in turn, could lead to further adjustment of existing measures or implementation of new tailored measures to help SMEs sustain their digital practices beyond temporary adoption.

Enhancing digital skills in SMEs is another area in which the government can further strengthen its efforts. While policy measures have allowed SMEs to try new systems and software, realising longer-term resilience will demand further efforts on complementary investments, such as organisation capacity and skills. Since Korean SMEs typically have low digital skills, which hinder them from making the most of the digital tools, the government should further focus efforts on strengthening basic ICT skills in the SME workforce. Attracting talents with digital skills is another way in which SMEs can boost their digital readiness. In this regard, the government could consider assessing and continuing its experiment with policy pilots, such as those devised to help SMEs hire young digital workforce.

The surge in demand for business digitalisation has prompted the government to expand its measures in a very short time. There are a number of policies that have been introduced as contingent measures, and expanded during the pandemic. However, as policy programmes could well be extended beyond their initial timeframe, after the pandemic, it will be important to have continued understanding of their usefulness and relevance. To this aim, the Korean government should consider identifying in a systemic manner the outputs, outcomes, and impacts that each policy is expected to bring. Defining such evaluation criteria will be helpful in understanding the efficacy of the policy, and in making decisions on whether to phase out, continue or readjust the policy.

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