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Digitalization in Asia-Pacific Region: Ready for Growth, but Ready for Inclusion?

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I. Introduction

The pandemic which hit the world in early 2020 has been not only changing the global economic order and industrial structure, but also bringing a new social and cultural environment to humanity. On the one hand, the COVID-19 pandemic is further lowering confidence in the efficiency of the global supply chain, already weakening due to the US-China trade conflict. However, on the other hand, international communities and governments are emphasizing the necessity of digital innovation and digital trade as key means to overcome the pandemic. As a result, digitalization is rather accelerating.

Digitalization should be encouraged in that it can create new growth opportunities throughout innovation processes. For example, as the economy becomes digitalized, productivity can be improved and new industries developed. Throughout these processes the economy can grow, increasing the average income and enhancing the convenience of life. However, digitalization is also accompanied by negative effects such as winner-takes-all markets or the digital divide. For example, the gap in accessibility and use of digital devices such as smartphones and the Internet causes political, economic, and social divides, and this creates a vicious circle structure that deepens the inequalities between rich and poor groups.

The Asia-Pacific Economic Cooperation (APEC) has been promoting digital transformation as a key mean for regional economic growth and economic integration. Recently at the APEC Leaders' Meeting in November 2020, the APEC Putrajaya Vision 2040 was adopted, which includes "Innovation and Digitalization" addressing inclusive economic participation through digital economy and technology as a focus area for the next 20 years. However, it is still difficult to expect visible outcomes in the field of digital inclusion

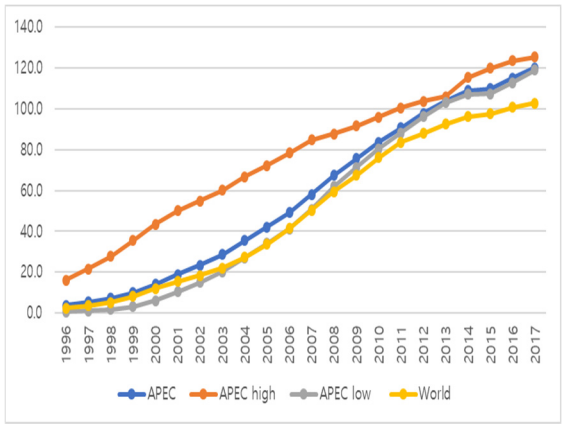
within APEC. According to the APEC Secretariat (2019), as of 2017, 40 percent (approximately 1 billion people) of the Asia-Pacific region's population is said still not to have access to the Internet.

This article examines the progress of digitalization in the Asia-Pacific region, compares and analyzes the digital transformation policies of major economies in the region, demonstrates the effect of the digital gap on economic performance in the region, and goes on to produce policy implications.

II. Digital Transformation in Asia-Pacific Region and Digital Cooperation in APEC

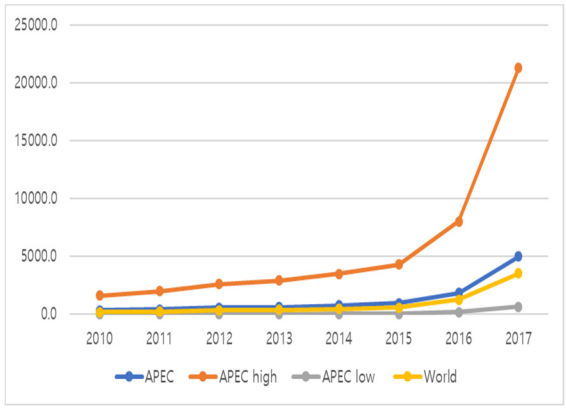
The progress of digitalization in the Asia-Pacific region differs across APEC economies depending on the stage of economic development and the types of digitalization, while digitalization in the region proceeds more rapidly compared to the average speed of world economy. More specifically, the digital gap between high- and low-income member economies of APEC shows distinct differences when digitalization is measured in the context of ICT accessibility and ICT utilization using ICT indicators published by the International Telecommunication Union (ITU). Figure 1 and 2 each illustrate that the gap of mobile phone subscription between high- and low-income member economies of APEC from 1996 to 2017 has decreased while the number of Internet servers, which could be related to higher level of digitalization, has widened between the two groups from 2010 to 2017. In line with these facts, the degree of exploiting the opportunities offered by ICT, the World Economic Forum's (WEF) Networked Readiness Index in major developing economies in the region confirms the digital gap by income group within APEC in terms of quality of ICT infrastructure utilization and companies' ICT utilization.

Figure 1. Mobile Cellular Subscriptions per 100 People



Source: Word Bank WDI

Figure 2. Number of Secure Internet Servers per 100 Million People



Source: Word Bank WDI

This study, utilizing text mining methodology, compares and analyzes critical areas of digital transformation policy from 2010 to 2019 pursued by major developing economies such as Malaysia and Vietnam and leading APEC members in the digital sector such as Korea, the United States, China, and Japan. Figures 3 and 4 show that certain differences exist across the six countries.

Digitally leading countries tend to focus on basic and applied research, talent attraction, and development. In contrast, digitally developing economies focus on public sector reform and infrastructure creation. The results also confirm that both digitally developed and developing economies' groups have focused on using digital transformation as a tool for economic growth rather than improving digital inclusion. Also, these policies have been implemented within each country rather than as a form of international cooperation within APEC.

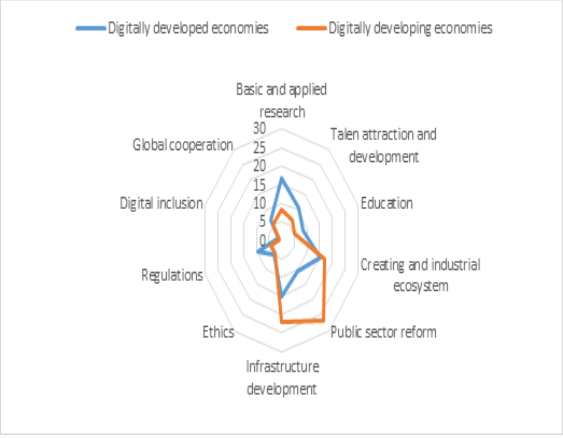
Within APEC, significant efforts have been made to utilize digitalization for integrating regional economy and reducing the digital divide within the region. After adopting the APEC Action Agenda for the Digital Economy and APEC Internet and Digital Economy Roadmap for the first time in APEC's core agenda in 2017, the number of digital economy-related cooperation projects within the APEC fora has steadily increased. Recently in 2020, both of the terms “digital” and “inclusiveness” were simultaneously included in the core agenda. From January 2006 to September 2020, 723 projects out of 2,215 (32.6%) have been related to digital economy. However, despite the convergence characteristics of digital economy it was difficult to find mutually connected and jointly cooperated projects among different fora in APEC.

Figure 3. Priority Area of Digital Transformation Policy (2010-2019)

	Korea	US	China	Japna	Vietnem	Malaysia
Basic and applied research	9.5%	30.7%	13.0%	20.1%	10.1%	5.8%
Talent attraction and development	17.5%	8.8%	9.5%	7.6%	4.4%	8.9%
Education	8.1%	5.6%	7.0%	10.5%	4.6%	5.8%
Creating an industrial ecosystem	17.0%	7.2%	17.9%	15.2%	10.5%	24.3%
Public sector reform	10.3%	10.0%	11.7%	9.7%	33.6%	18.6%
Infrastructure development	13.5%	19.1%	14.6%	15.7%	23.4%	20.3%
Ethics	4.3%	9.3%	8.9%	2.4%	4.9%	3.6%
Regulations	8.6%	6.3%	11.3%	10.1%	4.0%	4.5%
Digital inclusion	2.0%	0.8%	1.1%	1.1%	0.6%	1.2%
Global cooperation	9.1%	2.2%	4.9%	7.5%	4.0%	6.8%

Source: Author

Figure 4. Comparison of Policy Priority Areas between Digitally Developed and Developing Economies



Source: Author

III. Effects of Digitalization on Economic Performance in Asia-Pacific Region

1) Effects on Economic Growth and Income Inequalities

This research comprehensively analyzes the impact of progress on digitalization in the Asia-Pacific region on economic growth and income inequalities. For this, we measure the degree of digitalization at the country level by ICT accessibility (e.g., the sum of fixed telephone subscriptions per 100 people and mobile cellular subscriptions per 100 people) and ICT use intensity (e.g., the ratio of fixed broadband subscriptions to individuals using the internet). We first study the relation between digitalization and economic growth using country-level panel data. We construct two samples for comparison: one the total sample, which consists of 114 economies globally, and the other the APEC sample, which consists of 17 out of the 21 APEC member economies for which data was available.

Table 1. The Effect of Digitalization on Economic Growth in the APEC Region

Explanatory variable	Explained variable: the real GDP growth per capita					
	(1)	(2)	(3)	(4)	(5)	(6)
Rate of change in number of fixed telephone subscriptions	0.150					
(per 100 subscribers)	(0.141)					
Rate of change in number of mobile subscriptions		0.086***				
(per 100 subscribers)		(0.015)				
Rate of change in number of fixed and mobile telephone subscriptions			0.087***			
(per 100 subscribers)			(0.015)			
Rate of change in share of internet users				0.099***		0.105***
(%)				(0.035)		(0.038)
Rate of change in number of broadband subscriptions					0.122	
(per 100 subscribers)					(0.114)	
Share of broadband users among internet users						8.790***
						(3.124)
Number of observations	374	374	374	370	288	284
Numbers of economies	17	17	17	17	17	17

Note. The figures are estimated using a random effect model.
Source: The World Bank WDI Database, Penn World Table (accessed on July 20, 2020)

Table 2. The Effect of Digitalization on Income Inequality in the APEC Region

Explanatory variable	Explained variable: Gini coefficient						
	(1)	(2)	(3)	(4)	(5)	(6)	
Number of fixed telephone subscriptions *High income	-0.086						
	(0.051)						
Number of fixed telephone subscriptions *Low income	0.123						
	(0.079)						
Number of mobile subscriptions *High income		0.031*					
		(0.016)					
Number of mobile subscriptions *Low income		-0.015					
		(0.010)					
Number of fixed and mobile telephone subscriptions *High income			0.029				
			(0.017)				
Number of fixed and mobile telephone subscriptions *Low income			-0.016				
			(0.010)				
The share of internet users *High income				0.012			-0.005
				(0.020)			(0.034)
The share of internet users *Low income				-0.091***			-0.099***
				(0.023)			(0.024)
Number of broadband subscriptions *High income					0.078		
					(0.060)		
Number of broadband subscriptions *Low income					-0.250**		
					(0.102)		
Share of broadband users among internet users *High income						4.983	-0.039
						(3.804)	(1.771)
Share of broadband users among internet users *Low income						-6.120	-3.539
						(4.376)	(3.231)
Number of observations	389	390	389	387	319	316	316
Numbers of economies	18	18	18	18	18	18	18

Note. The figures are estimated using a fixed-effect model.
Source: The World Bank WDI Database, Penn World Table, The Standardized World Income Inequality Database, Version 8 (accessed on 20 July 2020)

According to the estimation results in Table 1, economies with larger ICT accessibility have higher economic growth rates for both samples. We also find that ICT use intensity increases economic growth rates for both samples. We then study the relation between digitalization and income inequality using country-level panel data. We construct two samples for comparison: one the total sample, which consists of 134 economies globally, and the other the APEC sample, which consists of 18 out of 21 APEC member economies for which data was available.

Table 2 shows that ICT accessibility tends to reduce Gini coefficients for both samples. Regarding the effects of ICT use intensity, the results are reversed: ICT use intensity tends to raise the Gini coefficient for both samples. But the estimates are not statistically significant for the APEC sample. We further study if the effects of digitalization on income inequalities are different across income levels. For high-income economies, ICT accessibility and ICT use intensity negatively affect income inequalities, while for low-income economies, ICT accessibility tends to improve income inequalities.

2) Effects on Labor Market Outcome

Digitalization also affects labor markets throughout individuals' digital skills. These effects can be identified by empirically investigating how individual workers' digitalization affects the probability of being employed and wages. For this, we produce the survey data of individual workers in Korea and Vietnam. Korea belongs to the high-income group in the APEC economies, and Vietnam is included in the low-income group. We measure the level of individual workers' digitalization classifying individual workers' ICT accessibility, ICT use intensity, and interaction between ICT use intensity and human capital.

According to the estimation results in Tables 3 and 4, workers who use ICT more intensively are more likely to be employed and to receive higher wages for both the Korea and Vietnam samples. However, the statistical relationships are weak in the Vietnam sample. The different results between Korea and Vietnam samples may be because there are more ICT skill-related jobs in Korea than in Vietnam. Here, workers' ICT use intensity is measured by the ratio of working hours spent using the internet (or computer or mobile phone) to total working hours.

ICT use intensity is also qualitatively applied by constructing an index based on information about workers' various ICT-related activities such as obtaining data and information via the internet, looking for and applying for a job via the internet, internet banking experience, etc. We find that workers with higher ICT use quality index are more likely to be employed and have higher wages for the Vietnam sample. These results imply that the variables that measure ICT use intensity qualitatively are better at capturing the labor market impacts than quantitative approaches.

Table 3. The Effect of ICT Use Intensity on Employment Probability

Independent variable	Dependent variable: employment probability											
	Korea						Vietnam					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Computer usage time		0.012**						-0.002				
(for work)		(0.005)						(0.004)				
The share of computer usage time	0.875***	0.558***					0.706***	0.756***				
(for work)	(0.170)	(0.215)					(0.206)	(0.242)				
Mobile device usage time				0.003						-0.003		
(for work)				(0.007)						(0.004)		
The share of mobile device usage time			0.724***	0.653**					0.351	0.444		
(for work)			(0.239)	(0.298)					(0.259)	(0.292)		
Internet access time						0.007						-0.001
(for work)						(0.005)						(0.003)
The share of internet access time					0.660***	0.440*					0.145	0.172
(for work)					(0.214)	(0.256)					(0.257)	(0.289)
Number of observations	656	656	656	656	656	656	736	736	736	736	736	736

Note: Author's estimation using Maximum Likelihood Estimation on Probit model
Source: Survey results data conducted by Hankook Research.

Regarding the effects of ICT accessibility, we find that the results are different between the two samples. For the Korean sample, ICT accessibility did not significantly affect labor market outcomes, while ICT accessibility improved the probability of being employed for the Vietnam sample. This result is mainly due to the difference in ICT accessibility between Korea and Vietnam: almost all workers in the Korea sample can access ICT-related devices such as mobile phones and computers and the internet.

Table 4. The Effect of ICT Use Intensity on Wages

Independent variable	Dependent variable: wages											
	Korea						Vietnam					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Computer usage time		0.006						0.005				
(for work)		(0.005)						(0.006)				
The share of computer usage time	0.986***	0.819***					0.141	-0.021				
(for work)	(0.211)	(0.262)					(0.489)	(0.538)				
Mobile device usage time				-0.008						-0.005		
(for work)				(0.006)						(0.008)		
The share of mobile device usage time			0.503*	0.722**					1.313***	1.459**		
(for work)			(0.291)	(0.366)					(0.494)	(0.566)		
Internet access time						-0.002						-0.004
(for work)						(0.004)						(0.006)
The share of internet access time					0.846***	0.926***					0.455	0.638
(for work)					(0.260)	(0.297)					(0.492)	(0.542)
Number of observations	482	482	482	482	482	482	517	517	517	517	517	517

Note: Author's estimation using OLS
Source: Survey results data conducted by Hankook Research.

IV. Policy Recommendations for Strengthening Digital Inclusiveness in APEC

The analyzed results above indicate that APEC and its member economies should focus their policy capabilities on digital inclusion to minimize the side effects of the national and individual digital divide which can appear as digitalization progresses. This study presents three criteria to be considered when APEC sets the direction to strengthen its function as an international cooperation platform for digital inclusion in the region. First, considering convergence is a prevalent feature of the digital economy, collaboration within APEC fora should be emphasized in digital inclusion cooperation across various subjects and areas. Second, in consideration of APEC's economic status as the world's most extensive regional cooperation body, cooperation among the APEC economies should be emphasized so that the different interests of the economies in various economic development stages on digitalization and digital inclusion can be synchronized and balanced. Third, considering how APEC has consistently emphasized public-private cooperation, unlike other international

organizations and regional councils, the triangular cooperation channel between government, private enterprises, and experts within APEC should be effectively utilized on digital inclusion.

Under these three principles, in strengthening the APEC's function as a platform for digital inclusion, we present five cooperation initiatives for Korea, as a leading economy in the digital sector, to establish itself early on in the agenda for digital inclusion within APEC and become a rule-setter in the area. First, we propose that Korea lead a collaborative culture among APEC fora by improving project evaluation criteria. Considering the issues have cross-cutting and convergence features, this improvement could induce APEC to address more digital inclusion issues and endorse more joint projects on digital inclusion. Second, Korea could propose a project to discover effective digital inclusion policies within APEC economies and sharing their success stories. For example, based on its experiences with the Digital New Deal policy, Korea could play a leading role in proposing research projects on holding workshops or publishing books about best policies and practices regarding digital inclusion. Third, Korea can position itself as an early mover in digital inclusion agenda in the healthcare sector by proposing or cooperating with other APEC economies on digital healthcare projects, considering the importance of digital healthcare in the post-pandemic world. For example, building and improving on the “K-Quarantine” online platform in cooperation with other economies interested in the platform could be a promising approach. It would be possible for Korea to beneficially share its strong experience and rich data in combating COVID-19 with other APEC members through the online platform. Fourth, we also suggest that Korea should play a leading role in devising and improving digitalization measurement indexes and indicators, taking into account the stages of economic development and conditions in the APEC region. These could contribute to strengthening research on digital inclusion within the APEC regions by providing essential data to study digital inclusion, such as measuring the impacts of digitalization or digital divide on economic growth or inequality. Fifth, we propose establishing a digitalization integrated data information system for the APEC region to collect and manage data showing the status of digitization of APEC member economies in the long term. To make this possible, as an ICT leader, Korea should play an active role in the process of designing and constructing the system. KIEP