DIGITAL ECONOMY INTEGRATION IN ASIA AND THE PACIFIC: INSIGHTS FROM DIGISRII 1.0

*Witada Anukoonwattaka, Pedro Romao, Preety Bhogal, Thomas Bentze, Richard S. Lobo and Arushi Vaishnav**

This paper presents the results from using the Digital and Sustainable Regional Integration Index version 1 (DigiSRII 1.0) framework of ESCAP (2020b) to uncover digital economy integration trends across the Asia-Pacific region. The results show that Asia and the Pacific has made good progress with regard to conventional digital economy integration, especially because of the significant improvements in the digital economy infrastructure and liberalization of trade of information and communications technology (ICT) goods. However, capacity-building of the workforce and investment in infrastructure are required to bridge the digitalization gaps among the digitalized economies in the region. Moreover, the fairly low regulatory uniformity among regional economies further highlights the importance of regional regulatory harmonization in order to foster regional trade in digitally enabled goods and services. From a sustainable development perspective, inclusivity and equity of access to digitalization and required infrastructure remain key challenges. While Internet penetration in the region has been rising, female participation in the digital economy has remained relatively low in general and extremely low in low-income economies. In addition, there is room to enhance cybersecurity in most Asia-Pacific economies. Regional digital policies should focus on harmonizing data protection protocols and building a safer network of servers that would promote economic activity and enable sensitive matters to be conducted online. Fostering a more inclusive digital transformation may considerably boost network-effects and accelerate the transition to a competitive and sustainable regional digital economy.

JEL classification: F15, O24, O53

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I. INTRODUCTION

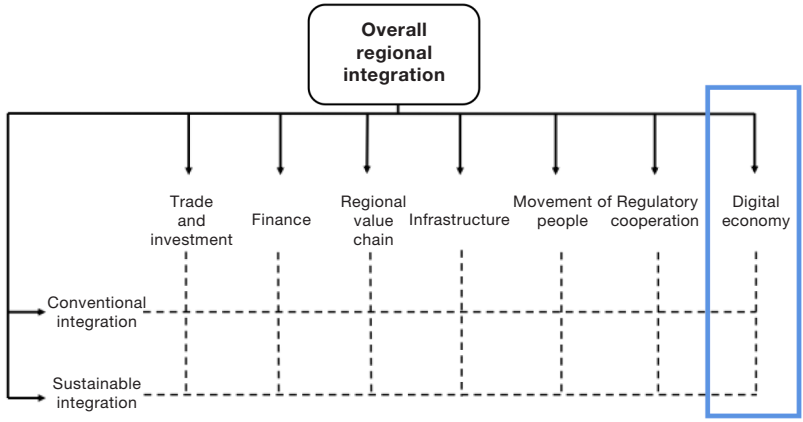
Increased participation in regional trade, investment, labour movement and information flows are expected to bring significant economic development opportunities for regional economies and improve cooperation on a wide array of global issues (ESCAP, 2017). Concomitantly, the rise of the digital economy over the past few decades and its enhanced role during the COVID-19 pandemic have highlighted digitalization as being not only one of the world's most powerful engines for growth and innovation, but also as a key part of developing resilient and sustainable twenty-first-century economies (ESCAP, 2017; OECD, 2017; Ferracane, Makiyama and van der Marel, 2018).

Accordingly, freer flow of digital goods, services and information and communications technology (ICT) products is viewed as one of the most rapid ways to narrow digital capacity gaps among economies (ESCAP, 2020b). This is not only because developing economies can significantly streamline their digital capacity by exchanging knowledge with more advanced economies, but also because regional integration aligns incentives by creating economic opportunities for both developing and developed economies.

For that reason, in 2020, the Economic and Social Commission for Asia and the Pacific (ESCAP) (2020b) rolled out the Digital and Sustainable Regional Integration Index version 1 (DigiSRII 1.0), looking at regional integration in the Asia-Pacific region from 2010 to 2017 across seven core dimensions (figure 1). Compared to other indices of regional integration, such as those associated with Huh and Park (2018), Park and Claveria (2018), ECA, African Union and African Development Bank (2016), ECA (2019) or ESCAP (2020b), the DigiSRII includes for the first-time indicators on digital economy integration and a special index that focuses solely on assessing sustainable regional integration. In DigiSRII, conventional and sustainable regional integration are looked at separately under which conventional integration is comprised of all the indicators most commonly used in regional integration indices, whereas sustainable integration is focused on whether regional integration is likely to contribute towards achieving the Sustainable Development Goals.

The focus of the present paper is to analyse the results of the digital economy integration index of DigiSRII – covering the conventional and sustainable integration perspectives separately – in order to identify digital economy integration trends across the Asia-Pacific region and outline policy recommendations and opportunities to improve the region's digital connectivity. The rest of the paper is organized as follows.

Figure 1. Structure of the ESCAP Digital and Sustainable Regional Integration Index



Source: Author's, based on ESCAP (2020b).

In section II, important conceptual considerations on regional integration and the digital economy are explored. Section III contains a concise description of the methodology behind the construction of regional integration indices. In section IV, the results are analysed by exploring conventional and sustainable digital integration separately through different perspectives across indicators, dimensions, economies, and subregions. Section V concludes with main policy recommendations and insights.

II. CONCEPTUAL FRAMEWORK[1]

2.1. Theoretical background – regional integration and the digital economy

Regional integration is a complex, multidimensional concept that is defined based on varied disciplines. International organizations usually resort to broad definitions of this concept in order to measure integration through a framework of engagement, cooperation and entanglement among economies across many different dimensions. For instance, ECLAC (2009) states that "[r]egional integration is the process by which diverse national economies seek mutual gains by complementing one another more".

[1] For an in-depth technical description of all indicators and indices please refer to ESCAP (2020b). This paper uses the same framework as the original paper while attempting to be more comprehensive by encompassing a larger data set with more economies and years.

In this spirit, DigiSRII builds on other indices, such as the one discussed in Huh and Park (2018), Park and Claveria (2018), ECA, African Union and African Development Bank (2016) and ECA (2019), to define regional integration across seven key dimensions: (a) trade and investment; (b) finance; (c) regional value chains; (d) infrastructure; (e) movement of people; (f) regulatory cooperation; and (g) digital economy. In particular, the digital economy integration dimension of the index – under review in this paper – is understood to entail the freer flow of digital goods and services across regional economies, as well as ICT products that facilitate this trade (ESCAP, 2020b).

While there is no universally accepted definition of the "digital economy", this paper uses the broad approach taken by OECD (2020) that the digital economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data.[2]

Naturally, given the ubiquity of platforms and electronic equipment, such as mobile phones and computers, a considerable part of current economic activity is already encompassed within the digital economy. For that reason, judging economies' conventional regional digital integration requires considerations on economies' differing levels of digital capability – looking at, for example, infrastructures and financial inclusion, – as well as evaluations of their engagement and cooperation with other regional players – namely, assessing existing trade flows and regulations.

However, as digital economy integration per se does not guarantee an equitable or efficient distribution of "digital dividends" (the benefits accruing from digitalization (World Bank, 2016)), it is necessary to consider further dimensions to understand digitalization's impact in promoting efforts to achieve the Sustainable Development Goals. In this regard, two major concerns are inclusiveness and security.

An inclusive digital economy is a key characteristic of a sustainable digital transition. Indeed, as poorer and rural communities often record considerably lower Internet access rates, the "yawning gap between the under-connected and the hyper-digitalized" has the potential to further accentuate existing inequalities (UNCTAD, 2019). In particular, women tend to be especially vulnerable to digital exclusion, as income disparities, educational differences and social norms tend to penalize this demographic: in 2017, 250 million more men were estimated to be online than women (OECD, 2018).

[2] The concept is generally consistent with the literature. For example, according to Barefoot and others (2018), the digital economy encompasses (a) all digital transactions of goods and services (both domestic and cross-border); (b) the infrastructure required to access computer networks, such as software and telecommunications equipment; and (c) all digital media – namely, the content created and accessed through digital devices, as well as all data flows.

On the other hand, digitalization has created additional security and privacy risks that may put its overall benefits at risk. For instance, data breaches have become increasingly common over the past decade. In 2020, they cost companies an average of $3.9 million per breach (IBM Security, 2020). Furthermore, tech giants' continuous abusive use of power over users' personal information has significantly eroded public trust in the digital economy. Lastly, security concerns regarding the deployment of 5G networks around the globe have slowed this process, which has potentially elevated costs.

2.2. Indicators – measuring regional digital integration

Each of the indicators comprising of the conventional and sustainable indices of digital integration are shown in table 1. Owing to scarce data availability, and in line with the approach taken by ESCAP (2020b) (full DigiSRII report), two different indices for conventional and sustainable integration are calculated: (1) a "comprehensive" index, comprising all the indicators, but including only a few economies for which data are available for all indicators,[3] and (2) a "simplified" index encompassing a reduced number of indicators, but covering more economies.[4] In table 1, indicators highlighted in blue are only considered in the comprehensive index, whereas indicators in white are considered in the simplified and comprehensive indices.

Furthermore, as some indicators vary in nature – some are bilateral, such as exports, whereas some are country-specific, such as the share of the population with Internet access – each has to be suitably adapted to fit the framework of integration. In particular, country-specific indicators are transformed into bilateral indicators first by averaging reporting and partner economies' figures, meaning that not only the overall level of an indicator but its disparity compared to others is considered. This reflects the view that integration is first and foremost a measurement embodied at the economy-pair level and as such it should, therefore, depend on both. Taking a closer look at the composition of each of the integration indices:[5]

[3] Only 19 and 32 economies are included in the comprehensive indices of conventional and sustainable digital integration, respectively.

[4] A total of 46 and 43 economies are included in the simplified indices of conventional and sustainable digital integration, respectively.

[5] For an in-depth technical description of all indicators and indices please refer to ESCAP (2020b). For this paper the same framework of the original paper is used while attempting to be more comprehensive by encompassing a larger data set with more economies and years.

Table 1. Components of the conventional and sustainable digital integration indices

Index		Description
Conventional digital integration index	1.	Share of ICT goods exports in intraregional exports
	2.	Share of ICT goods imports in intraregional imports
	3.	Average tariff on intraregional imports of ICT goods
	4.	Average share of the population with a financial institution or mobile money account
	5.	Average share of the population that uses Internet for online purchases
	6.	Digital trade regulatory similarity with regional partners
Sustainable digital integration index	7.	Average proportion of households with Internet access
	8.	Average number of secure Internet servers per million of population
	9.	Average share of females with a financial institution or mobile money account
	10.	Average share of females that use Internet for online purchases

Source: ESCAP (2020b).

Note: Indicators in blue cells are only considered in the comprehensive index, in addition to the ones in white cells, which are considered in the simplified and comprehensive indices.

The *conventional* regional digital integration index is composed of the share of ICT goods in (1) intraregional exports, (2) intraregional imports, (3) the average tariff on intraregional imports of ICT goods, (4) the average share of the population with a financial institution or mobile money account, (5) the average share of the population that uses the Internet for online purchases and (6) the digital trade regulatory similarity between regional partners. Each of these indicators represents a different sphere of participation in the regional digital economy.

Indicators 1 and 2 on the ICT goods exports and imports intensity[6] in intraregional trade, respectively, are a direct measurement of economies' regional integration through trade in hardware that is considered relevant for digital infrastructure and digital transactions. These metrics gauge a country's digital capacity by measuring its ability to produce ICT exports and its involvement in ICT global value chain via ICT goods imports. Furthermore, higher ICT imports are also associated with higher infrastructural necessities and increased digital activity supported with goods

[6] Trade intensity, in this case in ICT goods, refers to the share of ICT trade to total trade. A high ICT trade intensity signifies a high share of ICT goods traded to total trade and vice-versa. The terms are applied equivalently when referring solely to exports or imports.

purchased from abroad. Accordingly, the higher the ICT trade intensity in both exports and imports, the higher economies are ranked for regional integration.

Next, indicators 4 and 5 – the share of the population with a financial institution account or online money and the share of the population using the Internet for online purchases, respectively – are aimed at measuring participation in digitally enabled transactions and the physical and digital economies' degree of entanglement. Indicator 4 captures a basic infrastructure needed for e-payment development, which is an essential component for digital economy readiness, while indicator 5 captures specifically the existing level of e-commerce participation. Indeed, the more people have access to online financial services, the more individuals and businesses can conduct transactions online. In addition, as disadvantaged communities are often excluded from conventional financial services, digital financial inclusion – accessing financial services and products online – is regarded as an effective tool to deepen digital economy integration (World Bank, 2017). Moreover, as Jack and Suri (2014) highlight, this can actually contribute to these communities' economic well-being by allowing them to engage in better financial planning, access credit lines and government subsidies or widen their ability to receive payments instantly and securely anywhere. Accordingly, these indicators are considered to contribute to a higher regional integration through digital economy participation.

Lastly, regarding indicators 3 on the average tariff on ICT goods imports and 6 on the digital trade regulatory similarity (looking at convergence and openness in 11 digital trade-relevant regulatory areas),[7] ESCAP (2020b) directly measures economies' economic integration by assessing regulatory barriers that might add costs to cross-border economic activities or discourage foreign businesses. As the digital economy has brought new kinds of tradable goods and services, popularized cross-border trade in small value products and transformed the understanding on the separation of goods and services – a key distinction often underpinning regional trade agreements – these issues are of particular importance to enhance digital integration across the region. Lower tariffs on ICT goods and higher digital trade regulatory similarity contribute towards achieving a higher integration score.

The sustainable regional digital integration index includes indicators 7 on the average proportion of households with Internet access; 8 on the average number of secure Internet servers per million of population; 9 on the average share of females

[7] The 11 digital trade-relevant regulatory areas in indicator 6 are trade defense, public procurement, foreign direct investment, intellectual property rights, telecom infrastructure and competition, cross-border data policies, domestic data policies, intermediary liability and content access, quantitative trade restrictions, standards, and online sales and transactions. This indicator was developed by ESCAP for specific use in DigiSRII 1.0 and is defined by ESCAP (2020b) as such. Please refer to the original document for a detailed explanation of how this indicator is calculated.

with a financial account or mobile money account; and 10 on the average share of females that use the Internet for purchases. Notably, many of the indicators selected above are the sustainable counterparts of indicators already included in the conventional index.

Both indicators 9 and 10 – the average share of females with a financial account or mobile money account and that use the Internet for purchases, respectively – deals with digital integration from the same dimensions as captured by their conventional index counterparts – indicators 4 and 5, respectively. The key difference is the focus of indicators 9 and 10 on the perspective of female inclusion, which regularly trails behind men. Furthermore, indicator 7 on the average proportion of households with Internet access – rather than simply population – adds to this inclusivity effort by providing a more realistic approach to a country's overall Internet penetration. Accordingly, a higher inclusiveness through female participation in the digital economy and higher Internet penetration is considered to increase economies sustainable digital integration.

Finally, indicator 8 on the average number of secure Internet servers per million of the population takes into account each country's Internet safety, as accessibility to secure servers determines the overall security consistency of the whole network. More secure servers are considered to contribute to a higher sustainable digital integration index score.

III. METHODOLOGY[8]

To aggregate indicators expressed in different units of measurements into a single composite index, a min-max panel normalization methodology – namely, across all available economies and years – is followed according to the given transformation:

$$I_i^t(x_q) = \frac{x_{q,i}^t - \min(x_q)}{\max(x_q) - \min(x_q)} \quad (1)$$

where $x_{q,i}^t$ is a general indicator x_q for country i in year t and $I_i^t(x_q)$ is the normalized indicator of $x_{q,i}^t$ (varying from 0 to 1) for country i in year t; $\min(x_q)$ and $\max(x_q)$ are the overall minimum and maximum values across all years and all economies for indicator x_q, respectively. For indicators that have a negative direction of change, higher values indicating a lower level of integration (for instance, the average tariff on intraregional imports of ICT goods), the additive inverse of the normalized indicator is taken – $[1 - I_i^t(x_q)]$ – to ensure that all indicators correlate positively with the integration index.

[8] For an in-depth technical description of all indicators and indices, please refer to ESCAP (2020b).

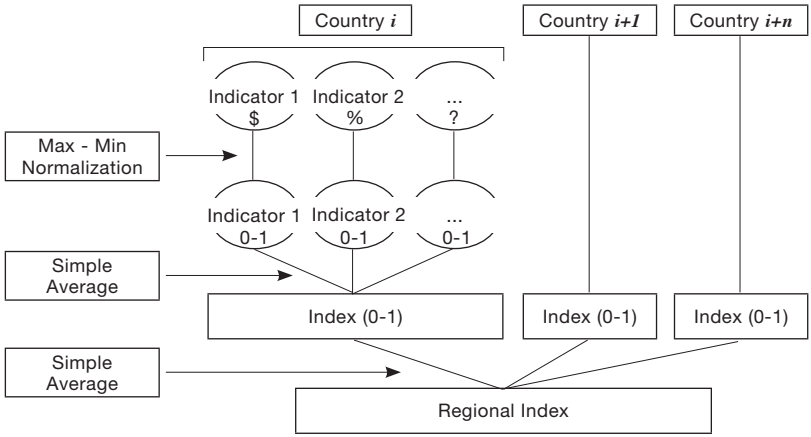
Normalizing all indicators allows comparing progress across dimensions, time and economies. However, this approach comes with the caveat that as new data points become available – potentially setting a new minimum or maximum value – all indicators must be normalized again using the updated sample.

Next, in order to aggregate the normalized indicators onto a single country-wide integration index, a simple average of all indicators is taken, as per the transformation below:

$$Index_i^t = \frac{\sum_q I_i^t(x_q)}{m} \tag{2}$$

where $Index_i^t$ is the desired index (simplified or comprehensive; conventional or sustainable) for country i in period t given by the equal-weighted average of all indicators x_q, where $q = 1, \ldots, m$. While there are many different methodologies available to aggregate individual indicators onto a single composite index, such as principal component analysis (PCA) and weighted average, equal weighting is deemed the most appropriate. Accordingly, this method is applied herein for every indicator and every dimension. Furthermore, equal weighting is also applied to further aggregate country indices into regional, subregional or any other desired cluster indices. Figure 2 shows graphically the methodology explained above. Given that equal weighting is used, indicators have equal contributions to the aggregate index. The index results and their changes reflect the difference caused by the average value of the indicators, not the weight of indicators.

Figure 2. DigiSRII (1.0) – digital economy dimension methodology



Source: Author's based on DigiSRII version 1 (ESCAP, 2020b).

IV. RESULTS[9]

In this section, the results of digital regional integration as per DigiSRII 1.0 are reviewed. Discussed first is conventional integration (section 4.1) and then sustainable integration (section 4.2). Within each section, the simplified and comprehensive indices are analysed consecutively to paint a detailed picture of regional integration across countries, subregions and indicators. The results based on conventional and sustainable measurements of digital economy integration are summarized in section 4.3.

4.1. Conventional regional digital integration

4.1.1. Simplified index of conventional regional digital integration

Comparing the average index levels from the period 2010–2013 with the period 2014–2017 for the simplified conventional regional digital integration index for the Asia-Pacific region (including all economies), there was only a mild improvement throughout the period 2010–2017 (figure 3a). Cambodia, the Lao People's Democratic Republic, the Republic of Korea, Vanuatu and Viet Nam are shown to be the most progressive

[9] Discrepancies between the original paper's results and the ones presented herein can be attributed to a differing data set as the methodology calculates regional integration as a cross-country comparison, including a more comprehensive data set, means that all index values have to be recomputed.

economies in the region. Brunei Darussalam; China; Hong Kong, China; India; the Russian Federation and Singapore also fared better than most other economies. Conversely, Macao, China is the significant regressive-performing economy of all, and declines are reported for Timor-Leste and Tuvalu.

Across Asia and the Pacific, digital integration's geographical distribution is highly uneven (colour coding shown in figure 3). For instance, South-East Asia (SEA) (in light blue) and East and North-East Asia (ENEA) (dark blue) completely dominate digital integration, with the top 10 most integrated economies belonging to either of these subregions. Conversely, least developed economies (written in red) – concentrated in the Pacific (PAC) (in yellow) and in South and South-West Asia (SSWA) (in orange), are among the least integrated economies in the region.

In particular, low intraregional tariffs on ICT products are a uniform characteristic among well-integrated countries (figure 3c). This reflects these economies' priority in fostering a fairly liberalized ICT trade environment, with international trade agreements playing a vital role in it. Furthermore, ICT goods play a key role in these countries' economies (figures 3a and 3b). In 2017, East and North-East Asia captured an estimated 70 of the world's value added in ICT manufacturing (UNCTAD, 2019). In Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam, ICT goods represented 4 per cent of their combined exports value; this figure is expected to rise to exceed 8 per cent in 2025 (Google, Tamasek, and Bain and Company, 2019).

In contrast, poorly integrated economies – often least developed countries and landlocked developing countries – are characterized by a lack of digital infrastructure and a restrictive digital trading environment. Indeed, tariffs on imported ICT goods in these economies are among the highest in the region, while both ICT trade intensity indicators are also appearing at the very end of the spectrum. Naturally, by raising the associated costs with importing ICT goods and by underproviding vital ICT infrastructure, domestic businesses in low digitally integrated economies face considerable barriers to digitalize and reap the benefits of connectivity and higher productivity. Moreover, this environment makes it considerably more difficult for economies to attract foreign investment opportunities in ICT-related industries, which are key in accelerating economies' digitalization processes.

Out of all individual indicators in figure 3, Asia and the Pacific is by far the most integrated in terms of tariffs on ICT imports (indicator 3). This pattern reflects the region's relatively liberalized trade environment in ICT goods, highlighting the number of regional initiatives aimed at fostering international cooperation and trade.

For instance, an initiative implemented by the Association of Southeast Asian Nations (ASEAN) was among the first in the world to take concrete and tangible steps to regulating e-commerce and harmonize regulatory frameworks (UNCTAD, 2013).

This initiative successfully reduced tariffs (on all products) among South-East Asian countries, from approximately 13 per cent in 1993 to 0.2 per cent in 2015 (Hoppe, May and Lin, 2020), with tariffs on ICT products following concomitantly. Furthermore, the Information Technology Agreement was another landmark initiative launched in 1996 with the aim of abolishing tariffs on high technology products, such as computers, telecommunication equipment, semiconductors and software. To date, there are 81 signatories to the agreement, many of which are in the Asia-Pacific region; the agreement remains open to the further adherence of interested nations (WTO, 2020).[10]

Regarding the 2010–2017 period in particular, the indicator on ICT imports tariffs also progressed the most. In particular, Brunei Darussalam, Cambodia, the Lao People's Democratic Republic, Maldives, the Republic of Korea, the Russian Federation, Thailand and Vanuatu registered the highest increases (largest decline in ICT tariffs). This indicator reflects these economies' continued efforts to further liberalize trade in ICT goods. For instance, in 2015, 53 signatories of the above-mentioned Information Technology Agreement concluded negotiations to considerably expand the range of products encompassed by the agreement (WTO, 2020). China; Hong Kong, China; Japan; Malaysia; New Zealand; the Philippines; the Republic of Korea; Singapore and Thailand were among the Asia-Pacific economies that participated in the agreement. Also in 2015, the creation of the Eurasian Economic Union (EAEU), a single market involving Armenia, Belarus, Kazakhstan, Kyrgyzstan and the Russian Federation, contributed to lower intraregional tariffs on ICT goods, with the Russian Federation benefiting the most. Furthermore, more recently, EAEU has announced plans to implement a digital agenda by 2025 to harmonize legislation to facilitate digital trade and digitalization towards higher regional digital integration (World Bank, 2017). Other noteworthy preferential trade agreements covering ICT goods that entered into force between 2014 and 2017 and that are expected to have eased tariffs on ICT goods are the bilateral agreements between: Australia-China, -Japan and -Republic of Korea; Republic of Korea-Canada, -Colombia, -China and -New Zealand; and Viet Nam-Chile and -Eurasian Economic Union (EAEU) (ESCAP, 2020a).[11]

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[10] Asia and the Pacific signatories of the Information Technology Agreement are Australia; China; Georgia; India; Indonesia; Japan; the Republic of Korea; Kyrgyzstan; Malaysia; New Zealand; the Philippines; Singapore; Thailand; Turkey; Viet Nam; Hong Kong, China; Macao, China; and Taiwan Province of China.

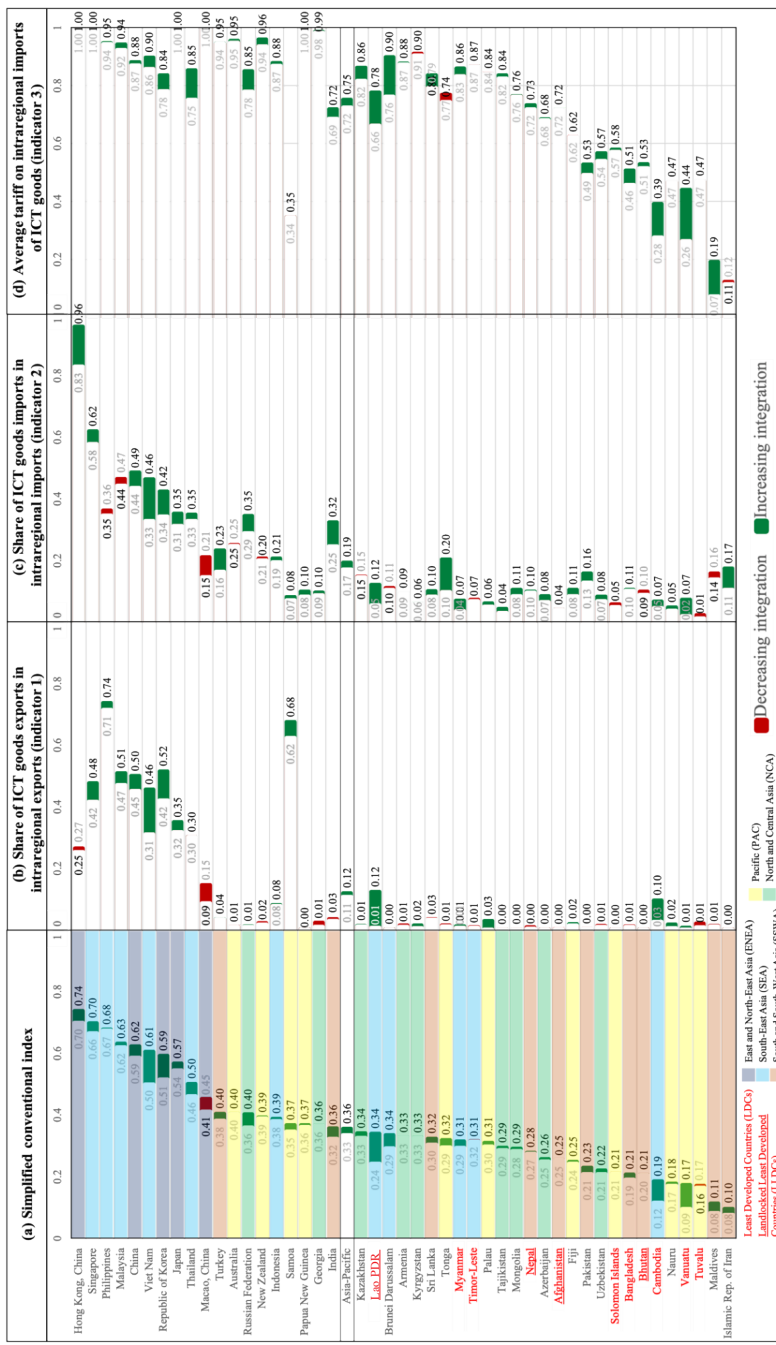
[11] Please refer to the ESCAP Asia and the Pacific Trade and Investment Agreements Database for a comprehensive look at agreements being signed where there is at least one ESCAP member. Available at www.unescap.org/content/aptiad/. On an annual basis, ESCAP also publishes the *Asia and the Pacific Trade and Investment Trends* in which a specific report provides a review of the most important developments pertaining to preferential trade agreements in this topic. All reports are available at www.unescap.org/knowledge-products-series/APTIT.

Conversely, the intraregional export intensity in ICT goods (indicator 1) is the region's lowest integrated dimensions and where the least progress has been achieved. This indicator is particularly marked by a stark contrast between exporters and non-exporters of ICT products. Out of 56 economies only nine recorded a significant level of ICT goods exports (score above 0.3 in figure 3b), namely China, Japan, Malaysia, the Philippines, the Republic of Korea, Samoa, Singapore, Thailand and Viet Nam. All other economies registered either marginal or no ICT goods exports whatsoever. Naturally, this dynamic reflects economies' socioeconomic structures, whereby digitalized economies have an enormous comparative advantage over their less developed counterparts. As mentioned above, this is particularly the case for well digitally integrated economies in East and North-East Asia and South-East Asia (UNCTAD, 2019).

In general, economies that are exporting a lot of ICT goods have made considerable progress in this area, capitalizing on the growing global demand for these products. The only two exceptions of major ICT exporters recording declines in indicator 1 are Macao, China; and Hong Kong, China. On the contrary, economies producing very little or no ICT goods have barely registered any improvements in their export capacities, highlighting the need for government policies to reverse this trend and incentivize foreign and domestic investment in digital-related areas. Exceptions to these trends are the South-East Asian economies of Cambodia and the Lao People's Democratic Republic, which have successfully expanded their ICT export intensity from being almost non-existent in 2010. As ASEAN members, these economies have significantly lowered trade barriers on ICT goods. As a result, foreign investment in labor-intensive ICT exports, such as communication equipment and consumer electronic equipment (together representing 65 per cent and 92 per cent of the ICT exports from Cambodia and the Lao People's Democratic Republic, respectively), which have mostly spilled-over from other locations previously offering similar wage conditions.

Regarding indicator 2 on the country's ICT imports share, it is possible to ascertain that the ubiquity of digital technologies is rising everywhere. Results from this indicator also shows the least amount of variability, albeit not by a large margin, as all economies move towards digitalization. Despite considerable differences among the top performers and the rest of the economies in Asia and the Pacific, increases in the share of ICT imports have been more equal when compared to the difference in economies' overall export production. China; Hong Kong, China; India; the Islamic Republic of Iran; the Lao People's Democratic Republic; the Republic of Korea; the Russian Federation; Tonga; Turkey; Vanuatu and Viet Nam are among the economies that have registered the sharpest increases. These are good signs for integration in these economies, as a higher ICT import intensity is associated with a shift towards

Figure 3. Conventional simplified regional digital integration index and indicators per economy, 2010-2017



Source: Author's calculations based on data obtained from ESCAP DigiSRII database and methodology (ESCAP, 2020b).

Note: Figures may diverge from the original paper as a different sample size was used. Economies are ordered according to their 2017 scores in panel (a).

digitization and infrastructural investments. Interestingly, increases in the ICT import intensity are strongly and positively correlated with increases in the ICT export intensity, highlighting the need for low integrated economies to kickstart the digitalization process through key infrastructural investments. Macao, China; Malaysia; Maldives; and the Philippines have registered the largest declines in their share of ICT imports.

4.1.2. Comprehensive index of conventional regional digital integration

A first look at the Asia and the Pacific comprehensive digital integration index – comprising of three additional indicators – depicts a more integrated and better improving region than explored above.[12] However, as sample sizes differ (19 compared to 46 economies for the comprehensive and simplified indices, respectively), a direct comparison between both is not correct.[13] A better suited same-sample comparison between the 19 economies reviewed in both indices indicates that regional integration is actually quite similar across indices.[14] This means that, while country-level integration indices and relative rankings change quite substantially with the addition of new dimensions, the simplified index produces unbiased results at the regional level. Moreover, as dimensions, such as Internet penetration, financial inclusion and regulatory distance are considered, the simplified index's overemphasis on ICT trade intensity (two out of three indicators) becomes evident.

In particular, developed and highly digitalized economies that are not very involved in the production of ICT goods, such as Australia and New Zealand, have logged the largest gains when compared with the simplified index of integration. In fact, New Zealand went from being moderately integrated to being the most digitally integrated economy in Asia and the Pacific. Moreover, integration scores and rankings increased considerably for other advanced economies that enjoy fairly high levels of Internet penetration and have in place strong regulatory frameworks, such as Japan, the Republic of Korea and Singapore.

On the contrary, some of the largest negative changes in integration scores were recorded for China, India, Indonesia, the Philippines, and Viet Nam. This is because while these economies are highly involved in the production and exports

[12] Over the period 2014–2017, the regional comprehensive index was set at 0.49, having increased by 0.05 points since the period 2010–2013 (figure 4). This would be compared with the simplified index's 0.36 score and 0.03 growth during the same period.

[13] In fact, due to the comprehensive index's inherent bias towards high integration performers – resulting from better data availability – this index will likely yield higher overall integration results than its simplified counterpart when considering full sample sizes.

[14] The simplified index's regional score in the periods 2010–2013 and 2014–20217 for the 19 economies considered in the comprehensive index was 0.44 and 0.48, respectively. This represents only a slight 0.01 increase when compared to the regions' comprehensive index for the period 2014–2017.

of ICT goods, they have yet to achieve the full potential offered by digital economy integration. Indeed, the mentioned economies fared relatively poorly across all newly considered spheres, highlighting the need for complementary policies to accompany these economies' successful business environment digitalization. Exceptions to this trend are good score for the share of population with financial institution (indicator 4) for China and a good score for digital trade regulatory similarity for the Philippines.

Finally, despite maintaining a stable score across both integration indices, the ranking of Hong Kong, China dropped from the first to the fifth place in the region.[15] This can be attributed to the relatively low degree of regulatory similarity (indicator 6). The score for Malaysia put the country three places lower, while for the Lao People's Democratic Republic, it enabled the country to climb two places, and for Cambodia and Thailand, it enabled both countries to rise one place.

Once again, looking at each of the specific indicators in figure 4, it is easily identifiable that between the periods 2010–2013 and 2014–2017 only for indicator 4 – the share of population with an online financial account – there were significant changes; no changes were shown for indicators 5 and 6. This may be due to the data particularities of these indicators, which are not time-variant across sample (calculated once for each economy).[16] As a result, despite weighing on economies' perceived progression in the comprehensive index, the available data points are used to calibrate country's integration levels and to identify potential shortcomings and relevant policy proposals.

Turning towards panel (b) of figure 4 (indicator 4), the share of the population with an online financial account has grown significantly across the whole region, mirroring the Internet's increasing penetration and importance around the world. This is highlighted below in indicator 7 of the sustainable integration index (figure 6) – the share of households with Internet access – and corroborated by the International Telecommunication Union (ITU) (2019), which estimates that the share of the world's population using the Internet has increased from close to 30 per cent in 2010 to almost 50 per cent in 2017. This was made possible by the rising ubiquity of smartphones – even in least developed countries, landlocked developing countries and low digitally integrated economies (World Bank, 2016), which has facilitated Internet access to everyone everywhere and allowed mobile phones to reach vast parts of the population.

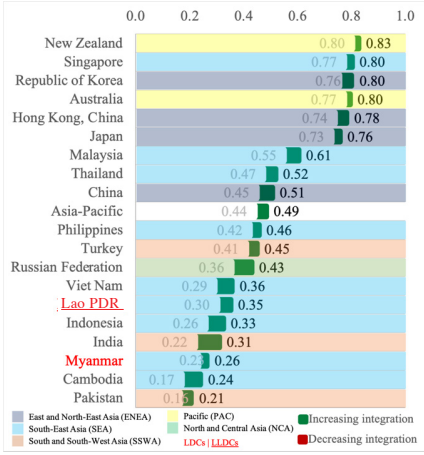
Further analysing the performance of this indicator, it is possible to ascertain that while all economies registered strong growth, economies with a high score in 2010 have made relatively less progress. This is natural since highly connected economies

[15] Relative integration rankings consider only the 19 economies included in the comprehensive index looking at their relative position in the simplified index comparatively to the comprehensive index.

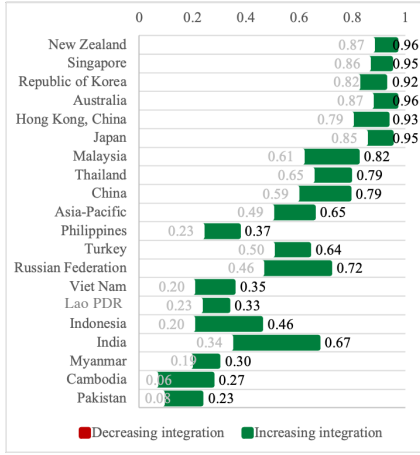
[16] Indicator 5 was calculated for 2017 only; indicator 6 was calculated over the period 2010–2017.

Figure 4. Conventional comprehensive regional digital integration index and additional indicators per economy, 2010-2017

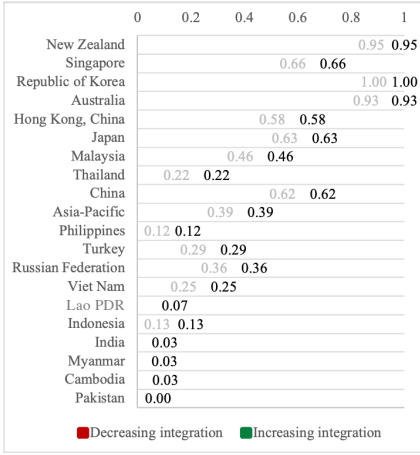
(a) Comprehensive conventional index



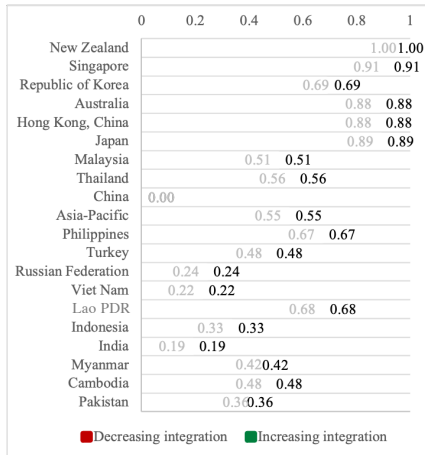
(b) Share of population with online financial account (indicator 4)



(c) Share of population using the Internet for purchases (indicator 5)



(d) Digital trade regulatory similarity (indicator 6)



Source: Author's calculations based on data and methodology from ESCAP DigiSRII (ESCAP, 2020b).

Notes: Only additional indicators to the simplified indicator reported in figure 3 are displayed here. Economies' overall comprehensive score is given as the simple average of all the simplified indicators reported above and the comprehensive ones herein. Figures may diverge from the original paper as different sample sizes were used.

had fewer integration room left to progress and vice versa. Exceptions to this trend were the South-East Asia economies of the Lao People's Democratic Republic and Myanmar, which, despite being poorly integrated, still struggled to make progress and those of Cambodia and Pakistan, which despite improvements in their integration scores since 2010, remained the two lowest financially integrated economies in the whole region. India, Indonesia and the Russian Federation, on the contrary, advance rapidly in terms of financial inclusion.

Regarding the share of the population using the Internet for online purchases in 2017 (indicator 5), advanced economies, such as Australia, the Republic of Korea and New Zealand ranked the highest, scoring at very close to the highest level of existing integration. These economies enjoy widespread Internet access and well-developed online payment systems, delivery services and consumer protection frameworks, among other complimentary services and characteristics that are essential for a flourishing digital economy.

However, when reviewing Japan; China; Hong Kong, China; and Singapore – economies where these characteristics are similarly well-developed – it is possible to identify a persistent gap between both groups. This pattern points towards disparities regarding their sustainable integration indices. In particular, looking at indicator 10 – the proportion of the female population using the Internet for online purchases – it is immediately observable that the top performers (Australia, the Republic of Korea and New Zealand) were among the highest ranked in this indicator. Naturally, the correlation between female digital inclusion and overall digital inclusion is close to one, pointing to the need to develop inclusive digital policies towards women in order to widen overall digital accessibility.

Excluding well-integrated economies, the other regional economies performed poorly with regard to the share of the population using the Internet for online purchases in 2017 (indicator 5). In particular, the South-East Asia economies (with the exception of Malaysia) scored particularly badly in this dimension, with Thailand standing out for its poor performance relative to its overall ranking, and Cambodia, Myanmar and the Lao People's Democratic Republic – the subregion's least developed countries – scoring very close to 0.0 (no integration at all). India – a country, which has secured impressive gains in terms of financial inclusion and in ICT imports – also scored very close to 0.0, reflecting that only 1 per cent of all purchases in this country in 2015 were performed online, compared to 60 per cent in developed economies and 16 per cent worldwide. Despite increased accessibility to the Internet across the region (indicator 7), the very limited use of online purchases highlights the need for policies to create safer and more efficient digital markets.

Finally, analysing indicator 6, on the digital regulatory similarity among regional partners, advanced economies, such as Australia; Hong Kong, China; Japan; New Zealand and Singapore are once again among the top performers. This pattern sheds a light on these economies' strong emphasis on maintaining close regulatory relationships with regional partners. An exception to this trend is the Republic of Korea, which scored below other advanced economies due to its tighter restrictions on online sales and transactions from abroad (Ferracane, Makiyama and van der Marel (2018). This is also in line with this country's relatively high tariffs on ICT imports as seen in indicator 3.

Next, South-East Asia economies scored heterogeneously with regard to digital regulatory similarity. Despite many successful preferential trade agreements signed under ASEAN and their impact in lowering import tariffs, more can be done in terms of harmonizing regulatory frameworks within the subregion. Indeed, as Mitchell and Mishra (2020) noted: "the ASEAN model of digital trade integration [provides] a relatively weak form of digital trade integration" due to the lack of strict enforcement mechanisms and binding frameworks of action. Some examples of barriers to the digital economy are quantitative trade restrictions in Viet Nam, foreign direct investment restrictions in Myanmar and an anti-competitive stance in the telecoms sector of the Lao People's Democratic Republic (Ferracane, Makiyama and van der Marel, 2018). As such, South-East Asia economies should push to further deepen and modernize the current ASEAN framework to address issues related to regulatory similarity and non-tariff measures, which are currently dampening intraregional digital trade, similar to what prohibitively high tariffs did in the pre-ASEAN era.

While performing generally well in terms of digital economy integration, the heavily regulated digital economy of China has attained a low score for regulatory openness and similarity (0.0). This finding echoes other indices' results – such as the Digital Services Trade Restrictiveness Index (DSTRI) of the Organization for Economic Co-operation and Development (OECD) and the Digital Trade Restrictiveness Index (DTRI) of the European Centre for International Political Economy (ECIPE) – which ranks China as the most restrictive country in the world when it comes to digital trade regulation (Ferracane, Makiyama and van der Marel, 2018, and box 1).

Box 1. Digital economy regulation in China

The rising importance of China in the global and regional digital economy is hard to understate. China represents 22 per cent of the market capitalization of the world's 70 largest digital platforms (second only to the United States of America, which accounts for 68 per cent), whereas it is estimated that in 2017, China accounted for 42 per cent of the world's online transactions (Hinrich Foundation, 2019; UNCTAD, 2019). In addition, China boasts the highest number of Internet users in the world – despite lagging in overall Internet penetration – and plays a significant part in regional global value chains due to its role as a major ICT exporter and importer (World Bank, 2016).

As a result, the country's strict regulatory regime has a profound impact on the region's trading landscape. As Ferracane, Makiyama and van der Marel (2018) note, China has become a major player in the digital economy, but the provision of digital products was almost exclusively located within its own domestic market. For that reason, relaxing some of its regulatory burdens would offer significant digital trade opportunities for the Asia and the Pacific region and China.

Ferracane, Makiyama and van der Marel (2018) have outlined some of the particularly heavy regulations in China, which can add costs when doing digital trade transactions:

- Public procurement restrictions – in many instances, there are restrictions on procuring digital products from foreign providers.
- Intellectual property rights restrictions – concerns regarding transparent and open process for granting patents, and requirements for companies with secure Internet systems to share confidential information.
- Foreign investment on telecommunication services restrictions, including screenings, licence requirements, and caps on foreign ownership.
- Data flows restrictions – companies can only store data within the country.
- Transparency of procedures in terms of certification, testing and encryption which differ from those of regional partners.

Box 1. *(continued)*

Additionally, China has recently strengthened its regulations on privacy and data flow, including enacting the Personal Information Protection Law (which came into force in November 2021), the Cybersecurity Law, and the new Data Security Law. These laws now form the main legal framework governing data security and the handling of personal and non-personal data in China.

4.2. Sustainable regional digital integration

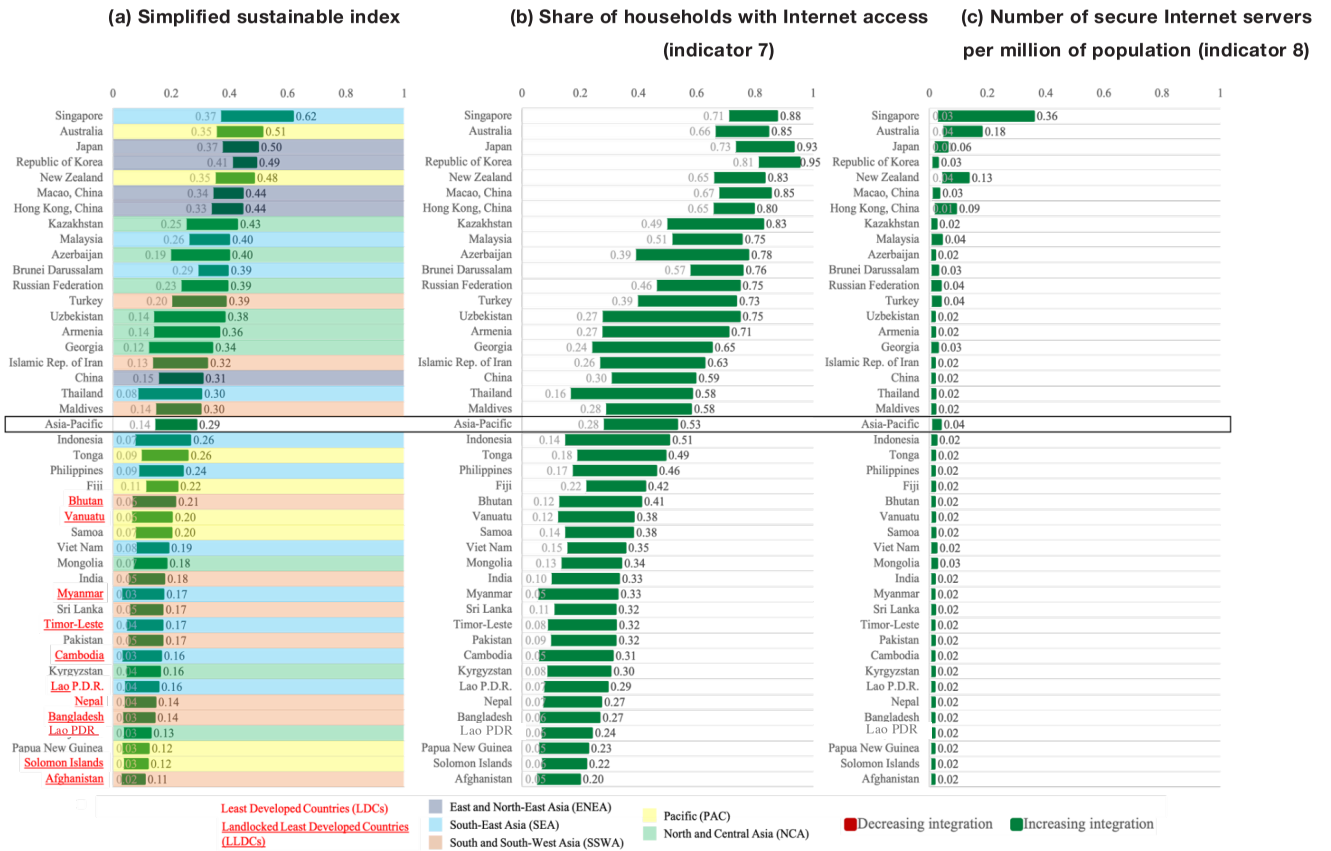
4.2.1. Simplified index of sustainable regional digital integration

Albeit starting from a very low position, over the 2010–2017 period, digital integration has increased considerably based on the simplified sustainable digital integration index. As shown in figure 5, most of the gains can be attributed to an increase in the proportion of households with Internet access across the region, mirroring above-explored trends of rising Internet penetration globally (panel b). In contrast, regionally, little to no progress in the number of secure Internet servers per million of population (panel c) has been made.

At the country and subregional levels, the distribution of the simplified index of sustainable integration is similar to that of the comprehensive index of conventional integration (figure 4). This may be because there is a possible association between the inclusivity of digital trade – a sustainable indicator, and the performance of a country in digital trade integration – a conventional indicator. For example, digital trade readiness, measured by the share of the population that has a financial account or makes purchases online may be affected by the affordability and accessibility of households to Internet network.

Accordingly, advanced economies in South-East Asia (light blue in figure 5) and East and North-East Asia (dark blue) such as Singapore; Hong Kong, China; Japan and the Republic of Korea, along with developed economies in the Pacific (yellow) such as Australia and New Zealand, are the most sustainably digitally integrated. Noteworthy are also North and Central Asia economies (green), which when compared to the simplified index of conventional integration scored relatively higher, with most scoring from below the regional average to above it. In contrast, least developed countries (in red), landlocked developing countries (in red underlined) and other developing economies such as Afghanistan, Bangladesh and Nepal, in South and South-West Asia (in orange), and Papua New Guinea and Solomon Islands in the Pacific subregion are the worst performers on the sustainable digital integration index.

Figure 5. Sustainable simplified regional digital integration index and indicators per economy, 2010-2017



Source: Author's calculations based on data obtained from ESCAP DigiSRII database and methodology (ESCAP, 2020b).

Notes: Figures may diverge from the original paper as a different sample size was used. Economies are ordered according to their 2017 scores in panel (a).

Looking at indicator 7 (figure 5, panel b), all countries have secured positive gains with regard to their share of households with Internet access. However, differing dynamics across economies are apparent. For instance, among the poorest performers in the region are the top six most digitally integrated economies in the region: the Republic of Korea; Japan; Singapore; Macao, China; Australia; and New Zealand – in descending order of Internet penetration. In these economies, widespread high-speed Internet connectivity and broadband penetration since 2010 can help explain their top positions across years despite below-average improvements.

In contrast, Afghanistan, Solomon Islands, Papua New Guinea, Tajikistan, Bangladesh, and Nepal, which are among the least integrated economies in the region, also recorded some of the lowest levels of improvements in indicator scores in the region – 30 per cent to 40 per cent lag compared to the regional average. This is a worrying signal for underconnected economies and for the region as a whole, as the digitalization gap widened during this period. Finally, Uzbekistan, Armenia, Thailand, Georgia and Azerbaijan, in descending order, made the most progress, as their percentage share of households with Internet access increased by more than 50 per cent in comparison to the rest of the region.

Regarding indicator 8 on the number of secure Internet servers per million of population, Singapore has considerably outperformed all other economies, expanding at a rate that is more than double of the second-best performer and eightfold the regional average. This can be attributed to the Government's proactive approach to dealing with cybercrimes and securing its digitally enabled economy by building resilient critical information infrastructures, safer cyberspace and strengthening international partnerships, especially with ASEAN member countries (Cyber Security Agency of Singapore, 2016). Australia and New Zealand, followed by Hong Kong, China; and Japan are the second to the fourth in line, respectively, for providing a more secure online environment to its businesses and essential services. Other economies that have performed at par with the regional average are Malaysia, the Russian Federation and Turkey, while all other economies recorded marginal progress and level off secure Internet servers per million. Indeed, the higher availability of secure Internet servers pertains to more sustainable integration in digital trade.

4.2.2 Comprehensive index of sustainable regional digital integration

Further to the indicators on Internet penetration and security, the comprehensive sustainable digital integration index, which is comprised of two additional indicators, gauges a country's digital inclusion by measuring female online participation across different indicators. As UNCTAD (2019) notes, the proportion of women online persistently lags that of men in approximately two thirds of economies around the world, making this a key topic in understanding sustainable digital integration.

As with the conventional indices of integration, the introduction of new indicators has produced significant changes to economies' overall rankings and scores. In general, the integration scores of top performers have risen, while the scores for low performers have either stagnated or declined slightly. Indeed, the top 10 most integrated economies have the nine steepest score increases: the Republic of Korea (now the region's most integrated country), Australia, New Zealand and China rose the most (figure 6). The score for the Islamic Republic of Iran also rose considerably. Despite positive score increases for Singapore; Japan and Hong Kong, China, their poor level of female participation in online purchases adversely effected these economies' performance compared to other highly integrated economies. Meanwhile, 7 out of the 10 worst performances belonged to the bottom 10 least integrated economies in the region. Afghanistan, Nepal and Pakistan were the worst performing countries in this regard, recording a slight decline in their scores (less than 0.01).

As for the indicator of female digital financial inclusion, the results vary greatly. Some frontrunners are Australia; New Zealand; Japan; Singapore; Hong Kong, China; and the Republic of Korea. These economies have made significant progress in including more females in the digital financial systems. The major drivers of formal bank account penetration among females in these economies are greater access to mobile technology, increased ownership of mobiles and smartphones by females, and several government initiatives extending financial services to women. Moreover, other economies, such as China, the Islamic Republic of Iran, Malaysia, Mongolia, Sri Lanka and Thailand, have also made good progress in providing financial services for women online. The gender gap in financial inclusion in these economies is gradually diminishing. On the contrary, Afghanistan, Cambodia, Myanmar and Pakistan appear to have persistent gender disparities in access to digital financial accounts, owing to inadequate digital infrastructure and low ownership of mobile phones by women.

This trend continues for the indicator of the proportion of the female population using the Internet for online purchases in which top and bottom performers are even more segregated. Such factors as greater access to mobile phones, high Internet connection speed, and world-class information technology infrastructure are driving growth in e-commerce purchases by females in Australia, New Zealand and the Republic of Korea. Surprisingly, China has also recorded a very positive integration score for this indicator. As the largest retail e-commerce market in the Asia-Pacific region, the positive integration of females in China for online purchases can be attributed to middle- and high-income female shoppers (Feifei, 2020). On contrary, among the worst performing economies in this regard are Afghanistan, Bangladesh and Nepal. These results indicate that there are persistent and substantial gaps in extending Internet services to the female population, thus hindering their inclusion in the digital space.

4.3. A summary of the performance of the Asia-Pacific region

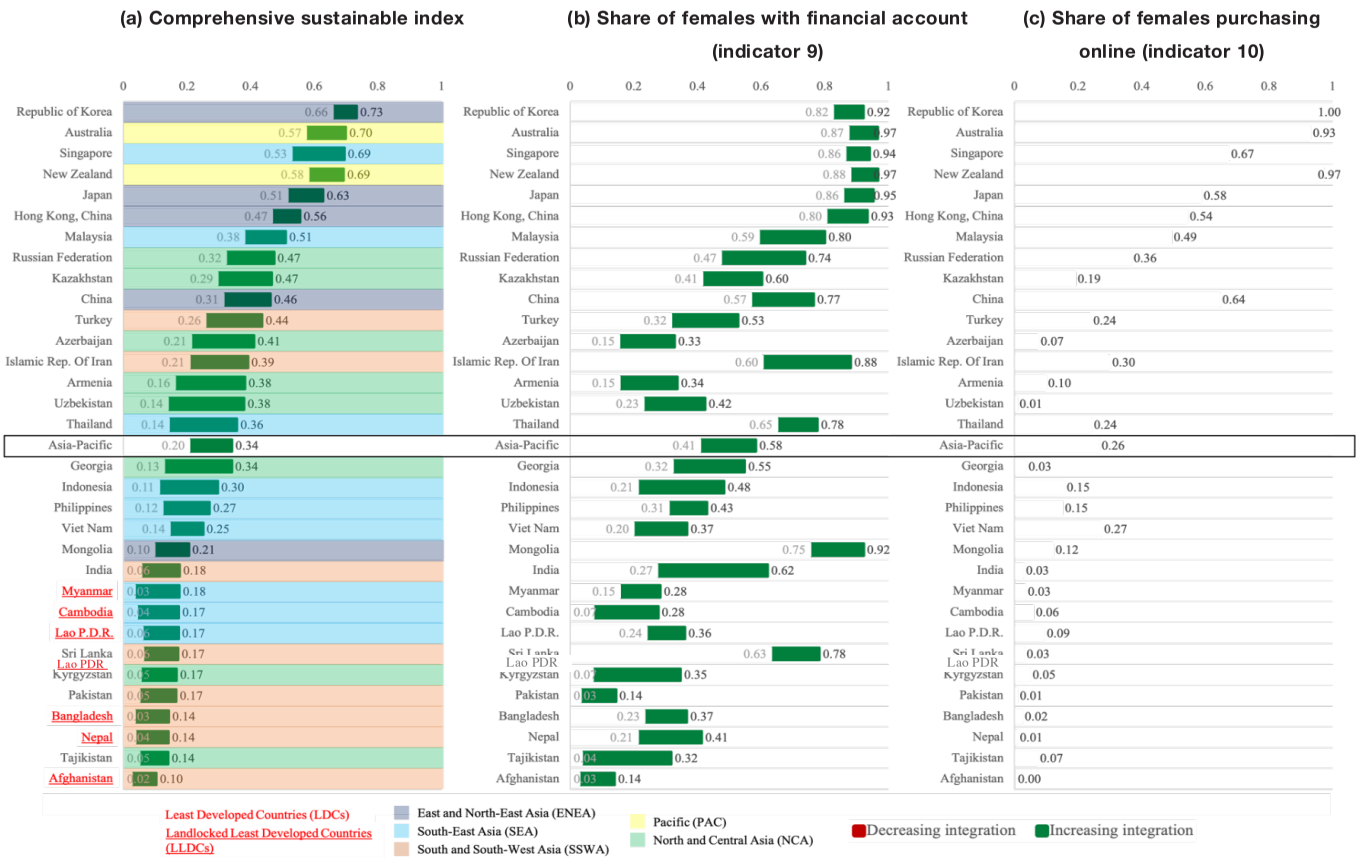
4.3.1. A summary of the performance of Asia-Pacific region based on the conventional measurement of digital integration

Based on conventional indicators, the conventional integration profile of Asia and the Pacific region for the different indicators chosen across years (from light blue in 2010 to darkest in 2017) is plotted in figure 7 for a quick and intuitive look into the state and progression of the region's digital integration. The three indicators used only in the comprehensive index are highlighted in blue, as in table 1, and the average value for the available 19 economies is reported. The three indicators used in both the comprehensive and simplified indices (not highlighted) are reported as per the simplified index's results in order to include the average of all available 46 economies.

At a first glance, in 2017, the indicators on tariffs on ICT imports and the share of the population with a financial institution account, followed by the indicator on the share of the population using the Internet for purchases performed the best. These positive integration indicators reflect a relatively well-connected Asia-Pacific region, bearing the fruits of the global rise in Internet accessibility, new technological possibilities and continued international cooperation efforts that have led to a more open and efficient trading environment.

On the contrary, the region's ICT trade intensities and the intraregional digital trade regulatory similarities indicators are trailing. On the one hand, given the region's prominence as a top producer of ICT goods globally, the average low score for both ICT trade intensities highlights a highly concentrated feature among a few economies. As all economies are weighted equally, the region's low score shows that the majority of regional economies remain under digitalized and under capacitated to produce and use digital goods. On the other hand, the fairly low regulatory similarity reveals the need to rethink international cooperation to address non-tariff measures and regulatory measures.

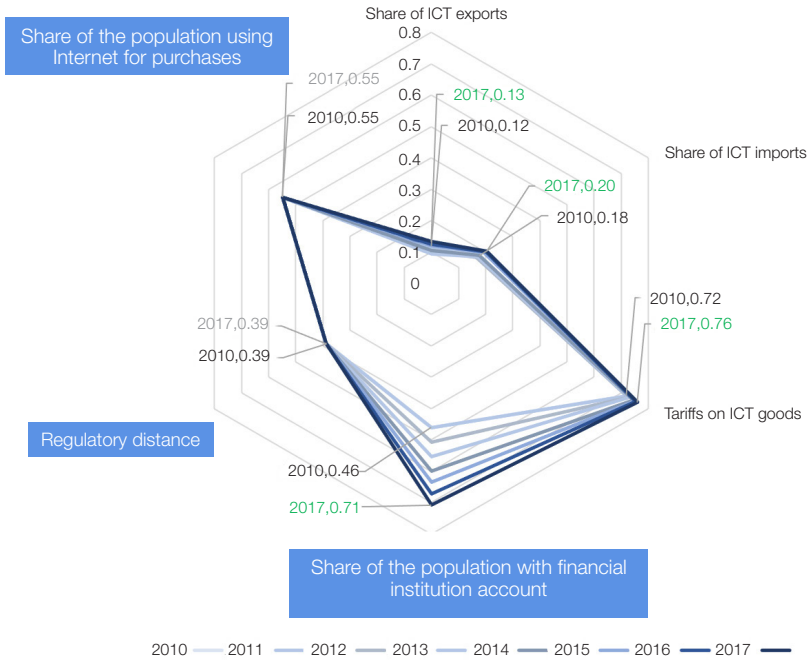
Figure 6. Sustainable comprehensive regional digital integration index and indicators per economy, 2010-2017



Source: Author's calculations based on data obtained from ESCAP DigiSRII database and methodology (ESCAP, 2020b).

Notes: Figures may diverge from the original paper as a different sample size was used. Economies are ordered according to their 2017 scores in panel (a).

Figure 7. Asia-Pacific conventional regional digital integration index indicators, 2010-2017



Source: Author's calculations based on ESCAP DigiSRII (ESCAP, 2020b).

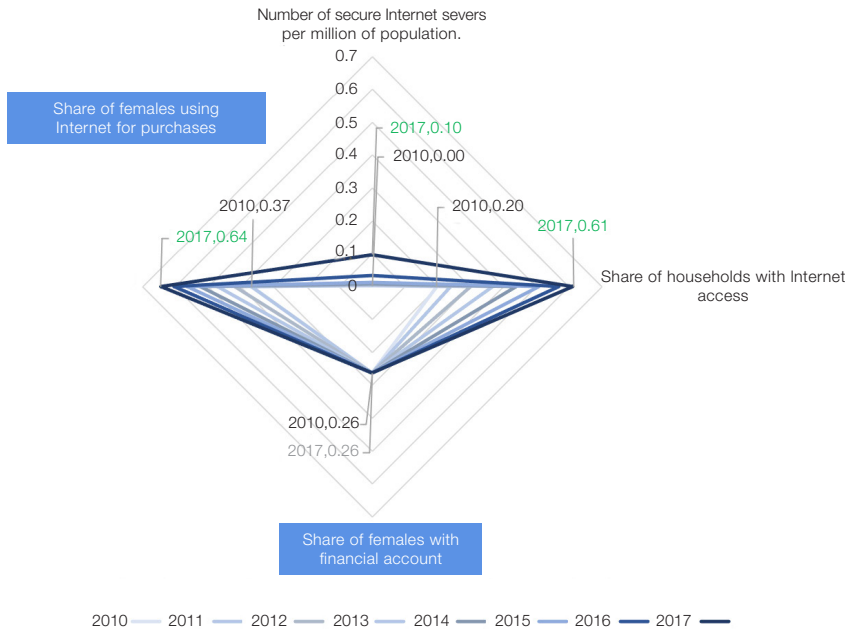
Note: Indicators highlighted in blue are only featured in the comprehensive index of regional digital integration. As such, these include only the 19 economies considered in this index. Indicators not highlighted are considered in both the comprehensive and simplified indices. Herein, the simplified index's values are reported as to include all 46 available economies.

4.3.2. A summary of the performance of the Asia-Pacific region based on the sustainable measurement of digital integration

The sustainable integration profile of Asia and the Pacific for all sustainable indicators across years (from light blue in 2010 to darkest in 2017) is plotted in figure 8 for a quick and intuitive look into the progression and state of the region's sustainable digital integration. The two indicators solely used in the comprehensive index are highlighted in blue, as in table 1, and report the average value for the available 32 economies. The two indicators used in both the comprehensive and simplified indices (not highlighted) report the average of all available 43 economies as per the simplified index's results.

The region's overall sustainable integration score has largely been driven by substantial progress made in household's access to the Internet and in female's access to online purchasing. These indicators mirror the rising ubiquity of the Internet around the world in positive movement towards an inclusive and interconnected region. However, it is important to note that little to no progress has been achieved in increasing the number of secure Internet servers per million of population regionally and in creating a more inclusive digital environment by empowering females to access financial instruments online. These are key points for advancing the region's sustainable digital integration and underpin success in achieving a long-lasting and successful Asia-Pacific wide digital transformation.

Figure 8. Asia-Pacific sustainable regional digital integration index indicators, 2010-2017



Source: Author's calculations based on ESCAP DigiSRII (ESCAP, 2020b).

Notes: Indicators highlighted in blue are only featured in the comprehensive index of regional digital integration. The value reported is therefore the average of the available 32 economies available. Indicators not highlighted are considered in both the comprehensive and simplified indices and include 43 economies as per the simplified index's results.

V. POLICY RECOMMENDATIONS

Mirroring the wide range of indicators included in the regional digital trade integration indices, in this section, key policy recommendations are provided to accelerate economies' digital regional integration from the perspective of both conventional and sustainable integration. These policy recommendations are organized according to four main policy areas linked to the indicators above: (a) facilitating cross-border digital trade; (b) providing safe and widespread digital access; (c) promoting inclusive digital participation; and (d) widening financial inclusion and the usage of digital payments. Together these policies can significantly accelerate economies' digital transformation towards becoming resilient twenty-first century digital economies.

5.1. Facilitating cross-border digital trade

Facilitating cross-border digital trade is essential to streamlining economies' digital transformation. In fact, most of the digitally integrated economies in the Asia-Pacific region have minimal ICT import tariffs (indicator 3) and are highly integrated in terms of digital trade regulatory similarity (indicator 6). This highlights the significance of a low tariff, harmonized digital trade environment for a lasting digital transformation. For underdigitalized economies, there are many reasons why this should be prioritized.

First, as indicators 1 and 2 on the ICT export and import trade intensity show, respectively, ICT global value chains in Asia and the Pacific are concentrated around a few economies, which produce and export a variety of Internet-related technology and equipment supporting digitalization. Accordingly, removing trade barriers to acquire the necessary digital technology and services is an extremely efficient way to reduce technological bottlenecks and decrease overall digital transition costs. Second, as ICT global value chains become increasingly important, developing countries can reap immense economic opportunities by attracting foreign direct investment and building digital production capabilities at home. However, these global value chains often span multiple economies, so seizing this opportunity is contingent on fostering a multilateral liberalized ICT trade environment that can accommodate efficient border crossings with multiple partners. Third, as both consumers and firms can accrue immense benefits from using the Internet, easing cross-border digital trade can further accelerate digitalization by expanding the size and availability of goods and services online. For consumers, liberalized cross-border trade means accessing a vast array of foreign products that can meet every need as efficiently as possible. For businesses, easy cross-border exports are an inexpensive way to access large foreign markets and lower production costs.

Accordingly, working multilaterally to liberalize trade and investment in ICT goods and services is an essential step to build a more resilient and efficient digital transformation. While import tariffs are a key issue that should be addressed, regulatory differences are much more prominent in the region. This calls for strengthening international cooperation in preferential trade agreements and free trade agreements around non-tariff barriers and harmonizing rules, regulations, and standard for digital products. For instance, using existing digital trade facilitation frameworks, such as the United Nations Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific[17] or raising the De Minimis value[18] are efficient ways of encouraging cross-border trade, especially in small-value products which are the most intensively traded digitally. Finally, protecting domestic and foreign firms' intellectual property rights is key to promoting innovation and encouraging entry of foreign firms. Furthermore, facilitating firms' access to capital financing for ICT-related projects and digitalization processes, upgrading workers' skills, and ensuring a diverse and competitive marketplace are other important measures that can help accelerate the digital transition of economies (EBRD, 2020).

5.2. Providing safe and widespread digital access

Many economies in the Asia-Pacific region lack adequate digital infrastructure to provide and/or access a seamless, low-cost and widespread Internet coverage, which is key to streamline economies' digital transformation. Indeed, despite the rising ubiquity of Internet-accessing devices, such as smartphones, that have helped boost Internet connectivity across the world, some of regions' landlocked developing countries, least developed countries and developing countries are still considerably behind. Regarding indicator 7 on the share of households with Internet access, Afghanistan, Bangladesh, Cambodia, Kyrgyzstan, the Lao People's Democratic Republic, Nepal, Papua New Guinea, Solomon Islands, Sri Lanka and Tajikistan, remain underconnected, despite major improvements. On the contrary, Armenia, Azerbaijan, Georgia, Thailand and Uzbekistan are extremely positive examples of economies where Internet access in households have expanded by a rate of 50 per cent higher than the overall regional average. For a digitally connected world, it is essential to improve the availability and affordability of high-speed Internet. Accordingly, governments should adopt various strategies to modernize and extend existing ICT infrastructures. For instance, encouraging public-private partnerships in highly-populated areas can be an efficient way to procure private sector investment in key infrastructural programmes. However, as the telecom sector often tends to

[17] Please refer to www.unescap.org/resources/framework-agreement-facilitation-cross-border-paperless-trade-asia-and-pacific for more information and resources on this multilateral framework agreement.

[18] The De Minimis value refers to the threshold under which goods are not subject to import duties.

turn monopolistic and hurt consumer welfare, specialized legislation focused on maintaining the long-term competitiveness of the sector and on regulating the scope of public-private partnerships is vital for a successful and lasting digital transformation. On the other hand, when market conditions could inhibit private companies from participating in the market – as what occurs in remote areas, where service costs are prohibitively high for the existing demand – national governments should resort to alternative funding mechanisms, such as universal service funds, to ensure access to digital services for rural and sparsely populated regions.

Another issue for establishing a digitally integrated region is to provide a secure Internet environment. As indicator 8 on the number of secure Internet servers per million of population highlights, Asia-Pacific economies have very few secure servers in their Internet networks, apart from a few exceptions, such as Australia, China, Japan, Singapore, and Hong Kong, China.

Establishing strong regulatory frameworks and data protection protocols can spur economic activity to be conducted online, including sensitive matters. In particular, it is essential to set effective regulatory policies in areas related to data flows, data privacy and cybersecurity. A more favourable regulatory environment may require investments in improving the security of hard infrastructure, for instance, by employing encryption technology. As much of the telecommunication equipment is privately owned, governments must engage in public-private partnerships to provide secure physical and digital infrastructure (World Bank, 2016). This could also involve setting up an institutional mechanism for promoting cooperation on e-commerce, cybersecurity matters, and digital trade rules within the ambit of preferential trade agreements, which generally leave out such considerations (Mitchell and Mishra, 2020). Over the years, some regional agreements and bilateral-dialogue mechanisms or agreements that include cybersecurity issues have been proposed or developed. For instance, the Trans-Pacific Partnership states “No party shall require a covered person to use or locate computing facilities in that Party’s territory as a condition for conducting business in that territory.” – with two sectoral exceptions (financial and government services) and two general exceptions (private and essential security) (Huang, Madnick and Johnson, 2019). Similarly, preferential trade agreements can explicitly include provisions for cybersecurity, helping economies achieve a safer environment for a digitalized tomorrow. Ensuring regulatory coherence in consumer protection and cybersecurity laws in the region are important measures to make certain the integration of the digital economy is secure. As cross-border cyberattacks are frequent, further cooperation on exchanging adequate and timely information on cyberthreats among the regional partners is also essential (World Bank, 2016).

5.3. Promoting inclusive digital participation

Several economies around the world are transforming their regional digital integration strategies to make them more inclusive and broad-based by extending digital services and technologies to women and underserved populations. As indicator 10 on the proportion of females doing online purchases and indicator 9 on female digital financial inclusion show, economies such as Australia, New Zealand and the Republic of Korea, have been extremely successful in promoting the digital inclusion of women. Meanwhile, Hong Kong, China; Japan; Mongolia and Singapore have not been very successful in encouraging women to participate more in online purchases, these economies have also done very well in creating an inclusive digital financial environment. On the contrary, females' participation in online purchases is the lowest in Afghanistan, Bangladesh, Georgia, India, Kyrgyzstan, Myanmar, Nepal, Pakistan, Sri Lanka and Uzbekistan (albeit in most of these economies overall Internet access is also extremely low). Similarly, females' participation in online financial services is the lowest in Afghanistan, Armenia, Azerbaijan, Bangladesh, Cambodia, Kyrgyzstan, the Lao People's Democratic Republic, Myanmar, Pakistan and Tajikistan.

One of the priorities for digital integration is to improve digital literacy among females. It is important to train women to develop soft digital skills, which include using smartphones, computer programmes, web applications, online communication and accessing secure networks for storing and exchanging information. Greater digital integration in the region is contingent on creating a more gender-inclusive financial environment. Reforms must also be carried out in education programmes in which more females are encouraged to learn science, technology, engineering and math skills. Moreover, addressing the issue of the widening gender-wage gap is critical to greater participation by women in digital activities. For instance, by introducing more flexible work arrangements to account for childcare, women can remain in the workforce and eventually gain greater access to the Internet and other digital services. Addressing gender stereotypes that may dissuade women from being active players in the digital economy is also particularly important. This can be done by focusing on gender inclusivity in public policy programmes and incentivizing companies to implement gender-neutral hiring policies (OECD, 2018).

5.4. Widening financial inclusion and the usage of digital payments

Financial inclusion is a key characteristic for a strong digital market, as it allows merchants and consumers to safely and efficiently conduct transactions online over an increasingly wider array of products and services. Furthermore, it is a powerful and inexpensive way of boosting growth and economic prosperity among disadvantaged communities by expanding their access to important financial instruments, such as insurances and credit lines, allowing them to receive payments instantly and securely,

and fostering better financial planning (Jack and Suri, 2014; World Bank, 2017). In this regard, indicators 4 and 9 on digital financial access and female digital financial access, respectively, show that Asia and the Pacific has progressed considerably well over the years, with most economies logging substantial gains. In particular, India, Indonesia, the Islamic Republic of Iran, Kyrgyzstan and Tajikistan have evolved the most. Cambodia, the Lao People's Democratic Republic, Myanmar and Pakistan were among the worst performers for both indicators; no relevant data from Afghanistan, Armenia, Azerbaijan, Bangladesh, Kyrgyzstan and Tajikistan are available for indicator 4, which are economies that attained low scores or indicator 9.

Subsequently, to incentivize the use of online bank accounts and increase financial inclusion, governments can begin to transfer payments to public servants, pensions, subsidies and credit lines, digitally. Moreover, encouraging businesses to pay employees and utility bills through bank accounts instead of cash would be vital in transitioning towards a widespread digitization of economic activity (World Bank, 2017). Furthermore, improving existing standards for online payment systems, creating strong legal protections for online consumers, and expanding Internet services to users in remote areas, are a few other recommendations to boost digital financial inclusion. Finally, encouraging the transaction of small value products would provide a significant stimulus to Internet purchases, as these are among the most intensively traded products digitally. Policies aimed at fostering the creation and expansion of digital platforms, such as easing domain names restrictions and online payments restrictions, enforcing a consumer protection framework and improving the speed and reliability of the postal service are effective in bringing a larger share of the population to online shopping (UNCTAD, 2017; Ferracane, Makiyama and van der Marel, 2018).

VI. FUTURE RESEARCH

While the current framework in DigiSRII aims to capture the different spheres of digital integration – especially taking into account the more comprehensive DigiSRII 1.0 methodology probes into six other dimensions, future research on this topic should complement the number and nature of the indicators used both in the conventional and sustainable perspectives. This would allow for a deeper understanding of regional digital integration in Asia and the Pacific and of countries' specific needs.

In terms of conventional integration, fine-tuning the indicators on ICT exports and imports could bring a more nuanced picture to a country's involvement in digital global values chains. For instance, adopting a digital economy measurement framework, such as the one proposed by the Asian Development Bank (ADB) (2021) and moving towards a more value-added oriented approach (instead of gross exports)

would open the door to several indicators that detail a country's value addition and consumption profile in digital goods and services. Other important dimensions that should be considered in the future are, for instance, indicators on digital skills, literacy and education of the workforce and population or on the ease of conducting business across economies for a digital company. More indicators on infrastructural availability, such as broadband speed or Internet prices, could also be considered. However, adding these indicators requires caution due to the limited availability of comparable data across countries and the potentially high correlation of the indicators.

Similarly, in terms of sustainable integration, the trajectory of expansion should naturally mimic the conventional indicators proposed above. Even though the availability of comparable data across countries remains an important challenge, it would be insightful to expand the concept of inclusion to encompass other spheres of society, such as across income groups, age groups and geographies. This wider perspective on inclusion would be important to gain a better understanding of digital penetration in a country. Moreover, understanding specific digitalization gaps is vital to formulate effective policymaking.

Finally, expanding the sample size used in each indicator – in terms of years and number of countries – could also be extremely beneficial. This would not only be useful for increasing comprehensiveness and usability of the index, but also to enhance the quality and accuracy of the index scores. Given that DigiSRII 1.0 uses a min-max transformation to normalize different indicators, results are, by nature, sensitive to the available lower and upper bounds. As more data points are included, the index scores are expected to change. However, expanding the underlying database to include as many and more varied examples of integration as possible would help stabilize scores across updates and get a better picture of the status of regional integration.

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