Latin American Economic Outlook 2020

DIGITAL TRANSFORMATION FOR BUILDING BACK BETTER

OECD DEVELOPMENT CENTRE
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Latin American Economic Outlook 2020

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Foreword

The *Latin American Economic Outlook* (LEO) analyses critical aspects related to sustainable and inclusive development in Latin America and the Caribbean (LAC). Since the LEO's launch in November 2007, the annual report has compared LAC's performance with that of other regions, analysed main development challenges and put forward policy recommendations, experiences and good practices.

The LEO benefits from the expertise and inputs of co-authors. Since 2011, the LEO has been published in conjunction with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). In 2013, the CAF – Development Bank of Latin America joined the team of authors. Since LEO 2018, the European Commission joined as a main partner.

This 13th LEO, *Digital Transformation for Building Back Better*, focuses on the role of digital transformation as a tool to foster development in the region, in particular in the context of the current coronavirus (Covid-19) crisis. It emphasises the need for a comprehensive approach, with national development plans (NDPs) aligned with digital agendas (DAs), and international partnerships, which are essential to reap the benefits of the digital transformation. It also presents macro-structural challenges in the context of the pandemic and urges implementation of further national and international actions for a response in the region. The unprecedented crisis comes at a time of high aspirations and reinforces the need to transform the region's development model.

Acknowledgements

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The report benefited from the research, drafting and fruitful collaboration between various authors across these organisations, including: Adriana Arreaza (CAF), Andrés Boeninger (ECLAC), Nathalie Basto-Aguirre (OECD), Adriana Caicedo (OECD), Cristina Cabutto (OECD), Johan Cañas (CAF), Luis Cecchi (OECD), Simone Cecchini (ECLAC), Paula Cerutti (OECD), Mathilde Closset (ECLAC), Rita Da Costa (OECD), Marin Fouéré (OECD), Valeria Jordan (ECLAC), Zebulun Kreiter (ECLAC), Nathalia Montoya (OECD), Sara Piñero Mosquera (OECD), Georgina Nuñez (ECLAC), René Orozco (OECD), Alejandro Patiño (ECLAC), Esteban Pérez Caldentey (ECLAC), Laura Poveda (ECLAC), Diane Quarless (ECLAC), Pelayo Roces Fernandez (EC), Fernando Rojas (ECLAC), Sebastián Rovira (ECLAC), Nunzia Saporito (ECLAC), Daniel Titelman (ECLAC), Juan Nicolas Velandia (OECD) and Juan Vázquez Zamora (OECD). Agustina Vierheller (OECD) provided invaluable administrative support throughout the elaboration of the report.

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Table of contents

Figures

Tables

Boxes

Acronyms and abbreviations

ADB	Asian Development Bank
AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
B2B	Business to Business
B2C	Business to Customer
BELLA	Building the Europe Link with Latin America
BEPS	Base Erosion and Profit Shifting Project
C4IR	Centre for the Fourth Industrial Revolution
CAF	Development Bank of Latin America
CARICOM	The Caribbean Community
CIAT	Inter-American Center of Tax Administrations
CITEL	Inter-American Telecommunication Commission
CTA	Environmental Technology Centre
DA	Digital Agenda
DSI	Digital Service Infrastructures
DSM	European Commission's Digital Single Market Strategy
EC	European Commission
ECLAC	Economic Commission for Latin America and the Caribbean
EGDI	E-Government Development Index
EHR	Electronic Health Record
eLAC	Regional Digital Agenda of Latin America and the Caribbean
EMBI	Emerging Markets Bond Index
ESCS	Economic, Social and Cultural Status
ETER	The European Tertiary Education Register
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GVC	Global Value Chains
HCI	Human Capital Index
ICT	Information & Communication Technology
IDB	Inter-American Development Bank
IIF	Institute of International Finance
ILO	International Labour Organization
IMF	International Monetary Fund
IMT	International Mobile Telecommunications
IO	International Organisations
IoT	Internet of Things
ISCO	International Standard Classification of Occupations
ISP	Internet Service Provider
ITU	International Telecommunication Union
IXP	Internet Exchange Point
J-PAL	The Abdul Latif Jameel Poverty Action Lab
LAC	Latin America and the Caribbean
LEO	Latin American Economic Outlook

Mbps	Megabytes per second
MFP	Multifactor Productivity
MERCOSUR	The Southern Common Market
MOOCs	Massive Open Online Courses
MP	Mesoamerica Program
MS	Milliseconds
MSMEs	Micro, Small and Medium Enterprises
NDPs	National Development Plans
NGO	Non-governmental Organisations
OAS	The Organization of American States
OECD	Organisation for Economic Co-operation and Development
OGD	Open Government Data
ORBA	Regional Broadband Observatory
PA	Pacific Alliance
PCT	Patent Co-operation Treaty
PEAs	Privacy Enforcement Authorities
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
PPP	Purchase-Power Parity
PPPs	Public-private partnerships
R&D	Research and Development
RFID	radio-frequency identification
SDGs	Sustainable Development Goals
SEGIB	Secretaría General Iberoamericana
SICA	Central American Integration System
SIDS	Small Islands Developing States
SMEs	Small and Medium Enterprises
SSC	South-South Co-operation
STEM	Science, Technology, Engineering and Mathematics
TII	Telecommunications Infrastructure Index
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
VAT	Value Added Tax
VIX	Volatility Index
WEF	World Economic Forum
WHO	World Health Organization
Wi-Fi	Wireless Fidelity

Editorial

The *Latin American Economic Outlook* (LEO) 2020 considers the digital transformation as an opportunity to overcome development traps faced by the region, which have been exacerbated during the Covid-19 pandemic. This transformation is affecting development trajectories across the globe. In Latin America and the Caribbean, it offers opportunities to speed up development.

The appropriate use of new technologies has provided innovative and efficient solutions to face the pandemic and ease the burden of lockdown and social distancing by connecting people, businesses, markets and institutions. On the other hand, during the pandemic, we have witnessed the consequences and the cost of the digital divide more profoundly. Many people have been left out of the benefits of digital technologies, and have therefore been excluded from e-learning and teleworking solutions.

The 2030 Agenda recognises that "the spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies". In LEO 2020, we argue that digitalisation is effective for development, but only if universal and inclusive.

The widespread use of these technologies can help boost productivity, promote social inclusion, as well as the decarbonisation of the economy, and support public institutions' response to citizens' increasing demands. However, the digital economy also involves significant risks, which are higher for developing countries. If not channelled properly, it could lead to increased market concentration, higher inequalities, job losses, and privacy and security issues. The LEO 2020 emphasises that the digital transformation will not boost development automatically. It entails a series of public policies that need to be co-ordinated within national development strategies, and calls upon new and reinforced international partnerships, more than ever, to reap the benefits of the digital transformation.

Urgent interventions are needed to support the socio-economic recovery

The pandemic is pushing GDP growth to historical lows across the LAC region, as well as increasing poverty and inequality. Policy interventions to preserve human, productive and financial capacities have been implemented. Nevertheless, financial and institutional capacities are limited and structural challenges, such as high informality, low productivity and socioeconomic vulnerability, accentuate the need for strong and effective actions.

The challenges created by the Covid-19 crisis are numerous, but bold policies and partnerships, at both national and international level, can turn this complicated scenario into an opportunity to redefine the social contract, putting people's well-being at the centre. This participatory process must contribute to defining and implementing stronger social protection systems, better and more accessible healthcare, more robust and inclusive public finances, and inclusive and sustainable productive strategies. More than ever, international co-operation and co-ordination are crucial in several socio-economic domains to preserve social cohesion, including the management of public and foreign debt.

A call for action to make the most of digital transformation

Digital transformation can play a major role to turn this crisis into a new development opportunity and address the region's development traps. Hence, this publication calls for a number of actions along this front.

First, the region is characterised by a predominance of micro and small firms that have low productivity, are often disconnected from their markets and do not have the capacity to absorb the shock created by the pandemic. In this respect, digital tools can help drive productivity growth and increase their competitiveness, in particular for companies that are lagging behind. Policies should therefore aim to support the uptake of technological tools with holistic digital ecosystems, adequate infrastructures, and appropriate digital skills.

Second, digital divides need to be addressed in order to bring the benefits of the digital transformation to all. A human-centric approach to digital technologies can increase the quality of life within households and therefore improve the social welfare of Latin American societies and promote environmental sustainable development. Disparities in access and use across territories, socio-economic, age or gender groups persist, and these may widen in the context of the pandemic. This can lead to the creation of gaps between winners and losers, and therefore poses additional threats to social cohesion and stability.

Third, digital technologies will bring both opportunities and challenges to the labour market. A number of jobs in the region are at high risk of automation, while others will experience substantial changes in the way they are performed. Policies to boost productivity must play a strong role in matching market needs and in ensuring a smooth transition from obsolete to new jobs.

Fourth, to ensure the benefits of the digital transformation are enjoyed at home and at the office, appropriate skills need to be developed early in life and along people's lifespan. Among those who have fewer skills, a higher proportion of women have no computer experience. Providing disadvantaged schools and students with more access to ICTs is not enough on its own, programmes that develop the right skills for both students and teachers are also needed.

Fifth, new digital technologies can transform public institutions and make them more credible, efficient, inclusive and innovative. This can help restore trust in governments by simplifying complex bureaucratic systems, providing more inclusive public services, including e-health or e-learning that reach more disadvantaged segments of society, becoming more open and transparent, and allowing the participation of citizens in decision-making processes.

There is a major condition for the above actions to be undertaken: At the national level, these policy actions need to be co-ordinated within national development strategies and with a direct link to digital agendas. This would unlock the potential of digital policies to become a decisive factor in the progress towards better social welfare.

The Covid-19 crisis makes the need for international co-operation and new partnerships in the region more important than ever. Digital transformation comes with many challenges that are cross-border in their nature, and hence calls for stronger international co-operation. These include areas like regulation and standards, investment, trade, digital security or tax challenges arising from the digitalisation of the economy. Stronger partnerships can also promote more relevant knowledge sharing and technological transfers in several dimensions, therefore contributing to closing the digital divide. The region already possesses a number of platforms on which to build upon, such as the Digital Agenda for LAC (e-LAC). In this respect, transfers of experiences from the

OECD and the European Union to the region can go a long way and should therefore be strengthened.

Digital transformation will not solve development issues by itself. We firmly believe that to reap the benefits of digital technologies we need greater co-operation on the broader issues that enable these technologies to be used in an inclusive, socially responsible and sustainable manner. Countries from Latin America and the Caribbean must not miss the opportunity of embracing a sustainable digital transformation.

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Executive summary

The *Latin American Economic Outlook 2020* focuses on the role of the digital transformation as a tool that can help foster development in the region, particularly in the context of the current Covid-19 crisis, and emphasises that international partnerships are essential to reaping the benefits of the transformation. This report also presents current macro-structural challenges and policies, in the context of the Covid-19 pandemic, and urges for further action to be taken, at both national and international levels.

Digital technologies can contribute to improving productivity, help tackle climate change, foster inclusiveness and transform public institutions. However, this can only happen if all citizens and firms are able to benefit from a digital transformation driven by a human-centric approach. The agenda is ambitious and requires the implementation of a comprehensive approach aligning national development strategies with digital agendas. More than ever international co-operation is needed to reach the full potential of digital transformation in the region.

The Covid-19 pandemic is affecting digital transformation differently across countries, with unprecedented socio-economic consequences in Latin America and the Caribbean (LAC), accentuating an already complex scenario characterised by structural development traps. The region entered the Covid-19 crisis with a majority of countries presenting low potential growth, limited fiscal space and social discontent, driven by higher demands for better public services and overall standards of well-being. The report highlights the potential of digital transformation to address these challenges in LAC, as well as to support a sustainable recovery of the region from the current crisis.

The socio-economic impacts and policy responses to face the Covid-19 crisis

The socio-economic impact of the pandemic is unprecedented in the region. Despite high heterogeneity across countries, they are all being hit by the crisis. On average, GDP growth will contract by more than 9.0% in 2020, and poverty rates may increase by 4.4 percentage points in 2020. The Covid-19 crisis is particularly difficult for close to 40% of workers who do not have access to any form of social assistance or social protection mechanism, but also for micro and small firms, that lack the capacity to absorb this shock. 2.7 million companies are likely to close, most of which are micro-enterprises, which would entail the loss of 8.5 million jobs.

Co-ordinating a global response to address the impact of the crisis in LAC remains vital. The region has adopted expansionary policies to protect the most vulnerable and to preserve human and productive capacities. Nevertheless, interventions are constrained by a narrow fiscal space, and action limited to the national level is not enough. Indeed, exceptional and well-coordinated action at the global level is necessary to rebuild the economy and promote inclusion. On the fiscal front, this concerns a series of interventions, including public debt management and improving tax transparency. Stronger policy dialogues and knowledge sharing on multiple dimensions affecting inclusive and sustainable development are more important than ever.

This sequence of policy action is fundamental for a stronger recovery and to foster well-being. In the phasing out of lockdown measures, continued income support to stimulate consumption and inclusiveness, as well as investment efforts to promote activity are fundamental. In the medium term, the aftermath of this crisis must be turned into an opportunity to redefine the social contract, putting well-being at the centre, with a focus on stronger social protection systems, more robust and inclusive public finances and the

implementation of inclusive and sustainable productive strategies. The aftermath of the economy also presents an opportunity to achieve a green recovery.

The role of digital transformation to Build Back Better

The digital transformation brings new opportunities for the region to cope with the current crisis and overcome its long-term consequences. Digital technologies have allowed part of the population and firms to keep working or studying while complying with social distancing measures. However, despite progress in the past decade, digital divides remain across households, workers and firms, leaving especially those most vulnerable behind.

Going forward, digital technologies can also play an important role in the recovery of the region, while addressing its persistent challenges. With the right policies, new technologies can contribute to improving the quality of jobs and skills, and to creating new formal jobs. In addition, new digital tools can be instrumental to improving public institutions; by properly adopting new technologies, they can become a source of productivity and increased competitiveness. Ensuring the right underlying conditions in Internet access and use, and foundational and digital skills for all, combined with a clear digital strategy aligned with national development plans (NDPs), will be fundamental.

The digital transformation to increase productivity

LAC has been characterised by a high and increasing productivity gap in comparison with developed economies. The digital revolution should be a driving force of productivity growth, particularly for micro and small companies that find themselves lagging behind. Digital tools are triggering innovation in business and production systems, the reorganisation of economic sectors, the emergence of new dynamics in the world of work, the supply of smart goods and services, and new conditions of competitiveness. Indispensable and complementary dimensions such as a holistic digital ecosystem, adequate infrastructures, including transport infrastructure, and widespread digital skills, are needed to benefit from the digital revolution.

A digital transformation that improves well-being for all families, workers and students

The digital transformation influences quality of life, labour markets and learning. Lockdowns revealed that many activities can be performed remotely but, despite considerable improvements in recent years, insufficient skills and disparities in access and use across socio-economic groups persist. In the context of the Covid-19 crisis these disparities can widen, creating winners and losers. For instance, less than half of Latin Americans had enough experience using computers and digital tools to carry out basic professional tasks, effectively excluding more than half of the region's population from performing remote activities.

New technologies bring both opportunities and challenges to the labour market. Two out of ten jobs are at high risk of automation in Latin America, while another four may undergo substantial changes in terms of tasks. On the other hand new job opportunities are appearing. Policies to support the transition of workers in declining industries towards new job opportunities are crucial.

Developing digital skills early in life and along people's lifespan is necessary for all, especially for women. Among workers with lesser skills, a higher proportion of women than men have no computer experience. Providing disadvantaged schools and students with more access to ICTs is not enough, programmes that develop the right skills for both students and teachers are also required.

Policy action must help accelerate digital transformation, making sure it supports cohesive societies and becomes a driving factor towards better social welfare.

Leveraging the new digital era to transform the State

Digital technologies can help restore trust in public institutions by making them more credible, efficient, inclusive and innovative. They can become more credible by adopting open government policies that support a culture of transparency, access to information, and public scrutiny over the use of public funds. Institutions can become more efficient by simplifying complex bureaucratic systems. The digital transformation of governments can support more inclusive public services, particularly relevant in the Covid-19 context, through e-health or e-learning and open data policies, as well as facilitate stakeholder interaction and the involvement of citizens in decision-making. The digital transformation can help reach the most disadvantaged segments of society. Finally, digital tools can help governments use new sources of data and be more innovative in the way they approach public policy, ultimately improving the policy-making process.

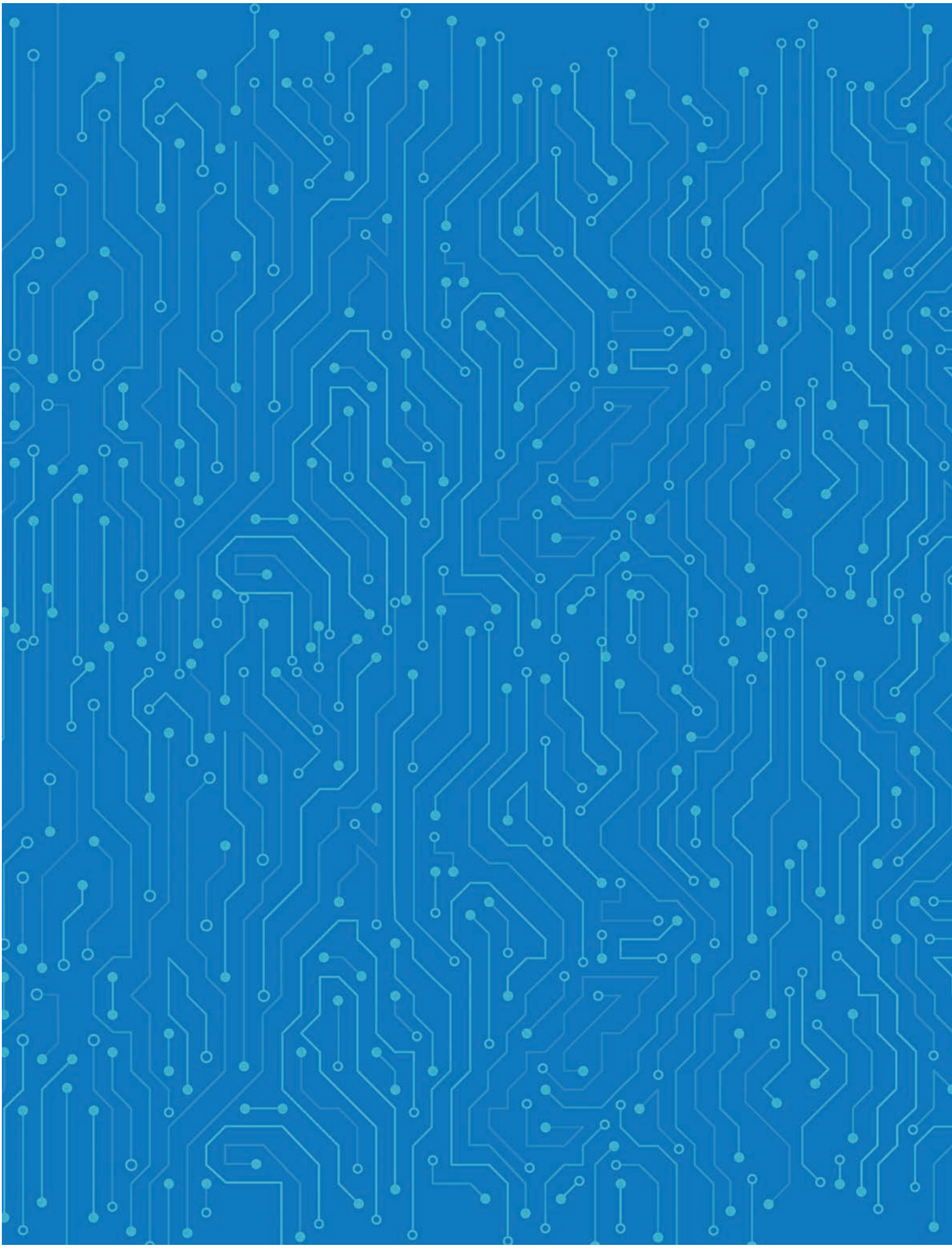
In LAC, policy areas related to access to and use of digital technologies, communication infrastructure and the future of jobs are currently more incorporated in NDPs than any other area. The digital transformation englobes a series of public policies that need to be included in NDPs through a coordinated approach, with a direct link to Digital Agendas. Finally, new digital tools can contribute to optimising the design, adoption and monitoring of these development strategies.

International co-operation to make the most of the digital transformation

As the digital transformation generates both challenges and opportunities that transcend national borders, even more so since the Covid-19 crisis, it is essential for LAC to coordinate digital policies at the international level. International and innovative partnerships can serve the region, by promoting and facilitating nationally driven processes and aligning countries on an equal footing to share knowledge on digital inclusion policies that ensure better digital skills for all. They should also aim to build on existing capacities and to create new ones to spur national and global reforms.

Building a regional digital market could help LAC tap into its digital potential. LAC countries need to further integrate regional co-operation initiatives such as eLAC, and exchange experiences with other regions. LAC stands to learn from other regions' experiences, particularly the EU's Digital Single Market, aimed at including citizens and their rights in the digital age, and at strengthening businesses.

Multilateral co-operation is more crucial than ever. For instance, tax challenges of the the digitalisation of the economy demand international co-ordination across countries and LAC can largely benefit from further co-operation within the region and with other jurisdictions on these issues. On an equal-footing basis, the region should play an active role in the international debate to reach consensus and solutions, through effective multilateral co-operation, to the issues related to the taxation of the digitalisation of the economy.



Overview

Digital transformation for an inclusive and sustainable recovery post Covid-19

The *Latin American Economic Outlook 2020* analyses and provides policy messages to capitalise the digital transformation to foster inclusive and sustainable development in the region, in particular in the context of the current coronavirus (Covid-19) crisis. This overview summarises the main results and messages of the report. First, it examines the socio-economic impacts of the Covid-19 crisis in the region and how it exacerbates existing vulnerabilities. It also highlights the relevance of the digital transformation to overcome LAC's development traps. It then analyses the digital transformation's potential to: 1) improve productivity growth and diversification; 2) foster inclusiveness and well-being; and 3) strengthen public institutions and improve governance. Last, it explores how new international partnerships play an important role in reaping the benefits of the digital transformation.

Introduction

The *Latin American Economic Outlook 2020: Digital Transformation for Building Back Better* analyses and provides policy messages to capitalise the digital transformation to foster inclusive and sustainable development in the region, in particular in the context of the current coronavirus (Covid-19) crisis. Latin America and the Caribbean (LAC) are navigating challenging and unprecedented times. The coronavirus (Covid-19) pandemic is profoundly affecting socio-economic conditions in the region, accentuating an already complex scenario of significant structural weaknesses: low productivity, high inequality and informality, and deficient public services and institutions. The crisis comes at a time of high social aspirations and reinforces the need to transform the foundations of the region's development model, putting citizens' well-being at the centre.

The digital transformation brings new tools and opportunities for the region to cope with the current crisis and to overcome longer-term development challenges. It entails disruptions that are triggering innovations in business and consumption models, transforming production systems and value chains, reorganising economic sectors, generating new dynamics in the world of work, creating smart goods and services, and introducing new conditions of competitiveness (ECLAC, 2016, 2018; OECD, 2017a, 2017b). Digital tools can also support access to better services, including health and education. Finally, they can be instrumental in improving the functioning of states, by facilitating more credible, effective, inclusive and innovative institutions, which may address citizens' demands and rising social discontent.

LAC countries must undertake significant investments and implement ambitious policies to make the most of the digital transformation for all. The digital transformation relies on the degree of adoption of previous information and communications technology (ICT), such as broadband access or Internet use. Ensuring that all people can access, use and benefit from new technologies requires a comprehensive, innovative and co-ordinated policy effort. Related public policy co-ordination demands strategic planning: comprehensive frameworks provided by strong national development plans (NDPs) that are closely aligned with the more specific digital agendas (DAs).

The coronavirus (Covid-19) crisis may have boosted momentum to undertake the reforms necessary to ensure the benefits of the digital transformation for all. Technologies have been instrumental in mitigating some impacts, for instance, by supporting telework and e-commerce activities. However, the importance of bridging digital divides has become even more evident across families, students, workers and firms.

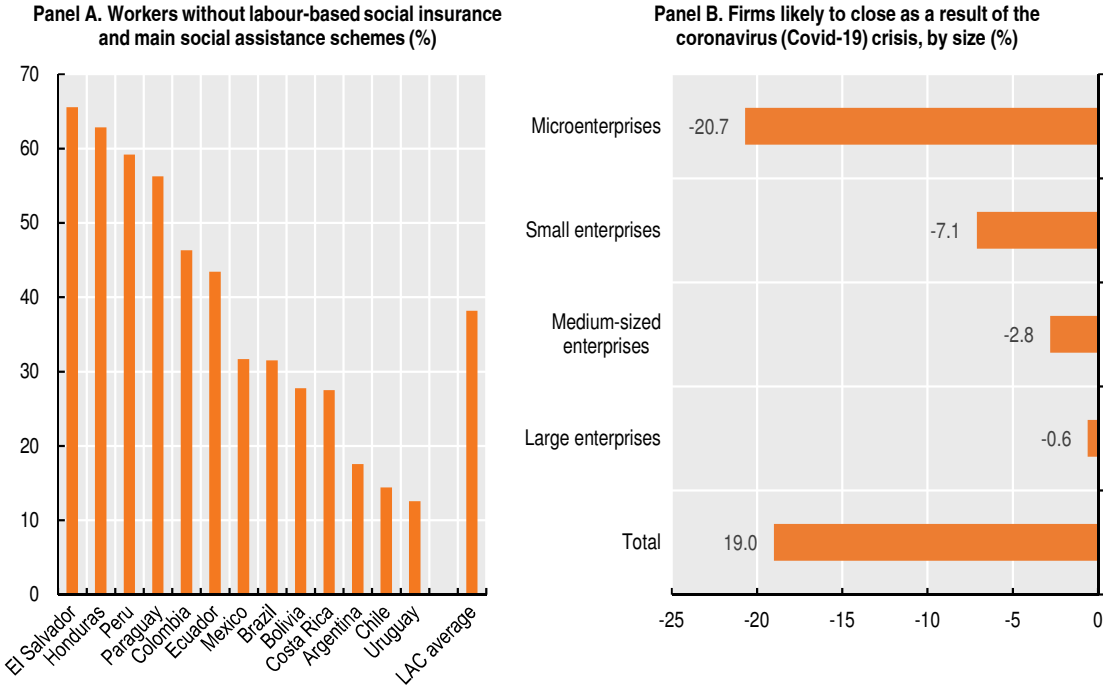
The *Latin American Economic Outlook 2020* (LEO 2020) explores how the digital transformation can foster development and promote greater well-being for all in LAC. The report first examines the socio-economic impacts of the Covid-19 crisis in the region and how it exacerbates existing vulnerabilities, and highlights the relevance of the digital transformation to overcome LAC's development traps (Chapter 1). It then analyses the digital transformation's potential to: 1) improve productivity growth and diversification (Chapter 2); 2) foster inclusiveness and well-being (Chapter 3); and 3) strengthen public institutions and improve governance (Chapter 4). Last, it explores how new international partnerships play an important role in reaping the benefits of the digital transformation by building multilateral platforms for knowledge exchange on an equal footing, strengthening national institutions' capacities, and promoting co-operation under whole-of-government partnership frameworks (Chapter 5). A specific analysis on Caribbean countries (Chapter 6) and country notes for 14 LAC economies are covered in the report.

The coronavirus (Covid-19) crisis hits the region at a time of deep structural weaknesses

The economic impact of the coronavirus (Covid-19) crisis is deep and will complicate the macroeconomic outlook for LAC in the next years. Since 2014, the region has experienced the weakest period of growth since 1950 and exhibited lower growth than the OECD average, with almost no expansion of the economy in 2019. This suggests that its potential growth was already low. The crisis is bringing internal and external shocks. National health measures are having a major impact on economic activity and, consequently, on social conditions, while a sharp decline in global demand, considerable reduction in commodity prices, financial volatility and additional impacts associated with lower investment, contraction of tourism and potential decrease in remittances compound a complex scenario. Overall, economic growth will decline by more than 9% in 2020 (ECLAC, 2020a; CAF, 2020a).

The contraction of activity caused by the pandemic is having a dramatic socio-economic impact, affecting the most vulnerable groups. Close to 60% of workers in LAC are informal. Many are self-employed in a subsistence, daily living economy and at risk of slipping back into poverty. Before the crisis, close to 40% of total workers were not protected by any safety net (i.e. without labour-based social insurance and main social assistance schemes) (Figure 1, Panel A). This risks increasing poverty and inequality levels, already on hold since 2014. Within firms, the crisis will be particularly difficult for micro and small firms, which do not have the capacity to absorb the shock: 2.7 million mostly microenterprises are likely to close, entailing the loss of 8.5 million jobs (Figure 1, Panel B).

Figure 1. **Workers without a safety net and firms likely to close owing to the coronavirus (Covid-19) crisis in selected Latin American countries**



Sources: Basto-Aguirre, Nieto-Parra and Vázquez (2020), "Informality in Latin America in the post COVID-19 era: Towards a more formal 'new normal'?", www.lacea.org/vox/?q=blog/informality_latam_postcovid19; and ECLAC (2020b), "Sectors and businesses facing COVID-19: Emergency and reactivation", https://repositorio.cepal.org/bitstream/handle/11362/45736/5/S2000437_en.pdf.

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Governments have made significant and rapid efforts since the beginning of lockdown measures to respond to the most vulnerable populations and firms. To reach informal workers and households, most countries have expanded unconditional cash transfers. Actions to support firms include direct transfers, credit guarantees, and moratoria on payment of taxes, utilities or social security contributions.

However, interventions are constrained by limited fiscal space, and national-level actions are not enough. Co-ordinated global-level actions are needed to rebuild economies and promote inclusion. Fiscally, such interventions include public debt management and increased tax transparency. Regarding public debt, there is no unique solution to managing it due to country differences in initial fiscal conditions, type of foreign creditors and financial capacity to tap into capital markets. These heterogeneities across countries demand several policy actions in response to the coronavirus (Covid-19) crisis at both national and international level.

Beyond the immediate impacts of the coronavirus (Covid-19) crisis, the region must orient policy efforts towards overcoming structural challenges. Development traps, which involve circular, self-reinforcing dynamics that limit countries' capacity to advance, are the result of longstanding weaknesses and new challenges arising from progress towards higher income status. The *Latin American Economic Outlook 2019: Development in Transition* identified four development traps: low productivity, social vulnerability, institutional weakness and environmental sustainability (OECD et al., 2019). Regarding the latter, the digital transformation should contribute to achieving a "fair" transition to sustainable low carbon growth that goes hand-in-hand with social justice.

The digital transformation has emerged as a profound global trend that offers challenges and opportunities which, if accompanied by effective policies, can contribute to overcoming LAC's development traps. While efforts are underway, seizing the opportunities requires new policy approaches and complementary investments.

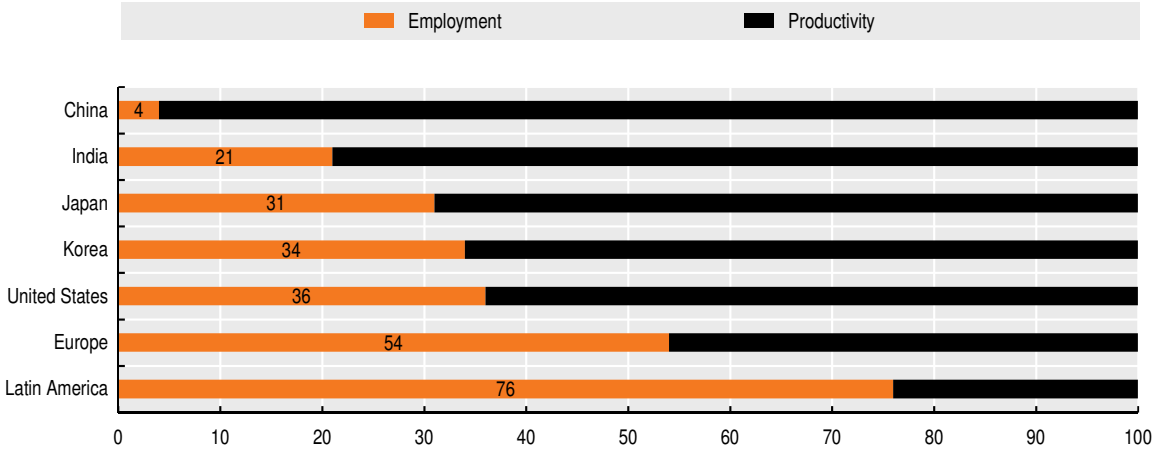
The OECD's Going Digital project identifies seven key policy dimensions to make the digital transformation benefit growth and well-being: 1) enhance access to digital technologies; 2) strengthen their effective use; 3) enable digital innovation; 4) ensure quality jobs for all; 5) promote social prosperity; 6) strengthen trust; and 7) foster open markets (OECD, 2019a). Action in these areas will help overcome LAC's development traps (OECD, 2019b).

Policy efforts for going digital must move beyond a sectoral approach, as it is a multi-dimensional process with implications in various areas. The cross-border nature of some of its challenges and opportunities demands greater international co-ordination. Setting up mechanisms for political dialogue at the regional level, fostering agreements in areas that demand international regulatory coherence and encouraging co-operation are essential. The Regional Digital Agenda of Latin America and the Caribbean (eLAC), co-ordinated by ECLAC since 2000, has gained relevance.

The digital transformation can boost productivity growth

The region has experienced a high and increasing productivity gap with respect to developed economies in the last decades. Aggregate labour productivity shows reduced and persistently low productivity growth from 1950 onwards. Productivity growth is the core engine of sustained economic progress, but LAC's gross domestic product (GDP) growth is mainly explained by labour force expansion, with little contribution from productivity growth (Figure 2).

Figure 2. **Contribution of employment and productivity to GDP growth in selected countries and regions, 2000-19 (percentages)**



Note: Simple average of the 17 LAC countries covered by the Conference Board.
Source: Own calculations based on Conference Board (2020), *Total Economy Database* (database), www.conference-board.org/data/economydatabase.
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Most Latin American countries' competitiveness is largely based on abundant natural resources or low-skilled labour. The result is a poorly diversified production structure, entailing low value added and an export specialisation concentrated in goods with low technological content. As with the commodity boom, this type of structure can provide periods of rapid growth but not sustained productivity growth. Achieving the latter requires the incorporation of technology and production diversification towards dynamic sectors, both in technology and in terms of international demand (ECLAC, 2012; OECD et al., 2019).

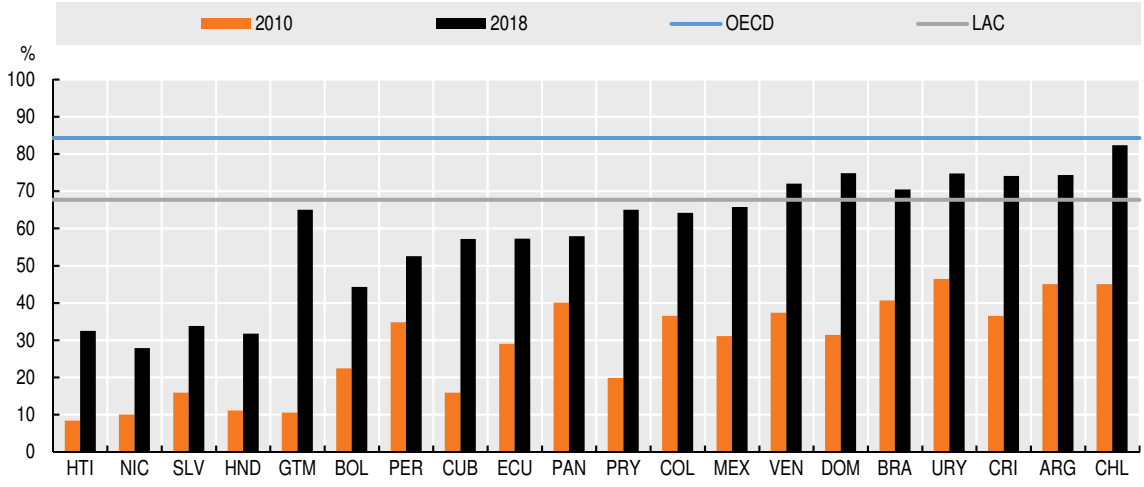
Promoting the digital transformation of production

LAC must take advantage of the digital transformation and promote production transformation to escape the productivity trap. Some countries are incorporating policies to boost the development of emerging technologies, such as advanced robotics and artificial intelligence (AI), to improve productivity. Such efforts include Brazil's National Internet of Things Plan, Colombia's Fourth Industrial Revolution Centre, operated by the Ruta N Corporation in Medellin, and Uruguay's digital manufacturing laboratory. Challenges remain, especially in productive application of digital technologies, development of digital entrepreneurship and business heterogeneity. A large share of smaller businesses have difficulties adopting new technologies. Furthermore, despite the rapid pace of technological change and its potential to improve efficiency, aggregate productivity growth, including in LAC, has slowed over the past decade, giving rise to a productivity paradox (OECD, 2017a, 2017b).

The diffusion and impact of digital technologies on productivity in LAC are not automatic and depend on indispensable elements, including proper access to and diffusion of digital technologies, healthy business dynamism, small and medium-sized enterprise engagement in digital transformation, and adequate competition in the digital economy. Developing a holistic digital ecosystem is essential to facilitate adoption by firms (CAF, 2017). LAC has seen an important expansion of the Internet. In 2018, 68% of the population used the Internet regularly – almost twice the share in 2010, although

lagging behind the OECD average of 84% (Figure 3). Access, connectivity and connection quality vary among and within countries. Moreover, despite sustained improvement in connection speeds, the region remains well below the world average, limiting the digital services and apps available.

Figure 3. **Percentage of Internet users in selected Latin American and Caribbean countries, 2010 and 2018 (or latest available year)**



Notes: The indicator can include estimates and proportion of Internet users based on national household survey results. Figures reflect total population or individuals aged 5 or older. If neither were available (i.e. target population reflects a more limited age group), an estimation for the entire population was produced.

Source: Own calculations based on data from ITU (2020), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

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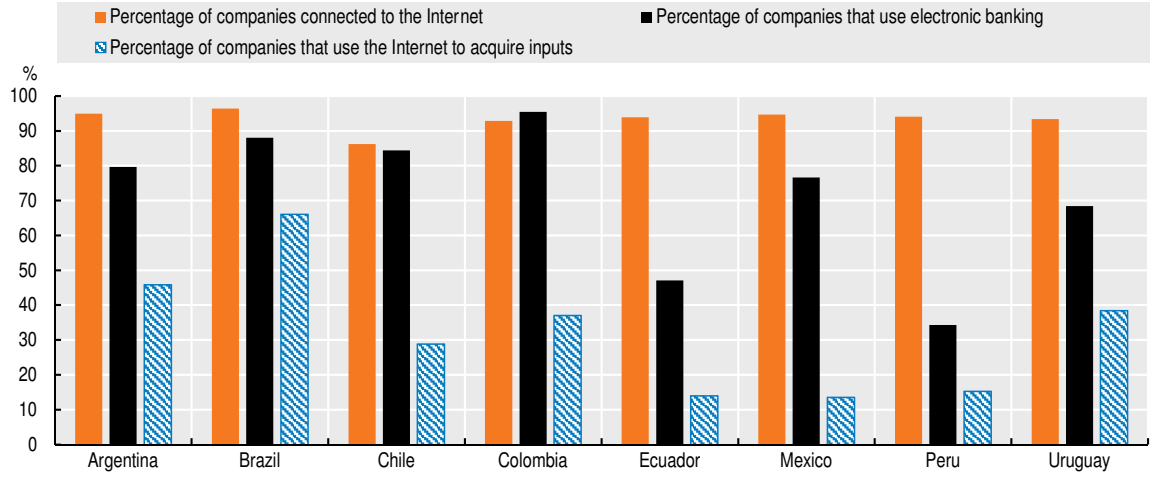
Successful digital transformation strategies for productivity rely on a broader range of interventions and sectors than ICT alone. Transport connectivity and skills are critical enabling elements in the digital era in which LAC lags behind the OECD. Digital skills development policies should be aligned with broader industrial and technological policies to ensure that workforce abilities match those required by priority sectors. Adoption and adaptation of digital technologies involve an array of functions and professions, each with distinct education and skills requirements. Despite ample degree and postgraduate programmes, LAC lags in high-level training programmes (mainly PhDs), which has an impact on research and development (R&D). Investing in appropriate skills and narrowing the gap relative to countries at the technological frontier will be essential for LAC to leverage digital technologies. Furthermore, transport connectivity is fundamental to make the most of digital transformation. Thanks to digital platforms, e-commerce can expand markets and improve efficiency. Improving transport infrastructure and logistics should promote further competitiveness, including in the expansion of e-commerce.

Digital technologies are not independent from the sector, organisation structure and other context-specific aspects in which they operate. Technological solutions and policies must be adapted to individual sectors and types of production units, in particular small and medium-sized enterprises (SMEs), to address the unique characteristics that influence their functionality. In particular, as the Covid-19 recalls, in a region where productivity disparities are considerable according to the size of the firm, the digital transformation brings an opportunity but also a risk of reinforcing disparities. With appropriate policies, digital technologies could help close the productivity gap with bigger firms. Despite

advances in recent years, low adoption of even basic technologies, especially among small firms, shows that space remains for further policy intervention. For instance, in some countries of the region, the productivity gap between small and large companies that own their own website is higher than 30 percentage points.

The region entered into the Covid-19 crisis with relatively few companies using digitalisation in their everyday operations (Figure 4). Therefore, greater digitalisation should be a feature of the post-pandemic economy (CAF, 2020b; ECLAC, 2020b). Digital technologies will be key to new operating models: companies will have to adopt technologies to process large amounts of information to improve decision processes, which may redefine business models. Industry should incorporate greater use of robotics to improve efficiency and increase the use of artificial intelligence (AI) tools (CAF et al., 2020). Digital transformation may also affect business model operations through changes in the sale and delivery of goods and services or interactions with suppliers (ECLAC, 2020b).

Figure 4. **Latin America: Digitalisation of the supply chain, 2018**



Source: CAF (2020b), "El estado de la digitalización de América Latina frente a la pandemia del COVID-19", https://scioteca.caf.com/bitstream/handle/123456789/1540/El_estado_de_la_digitalizacion_de_America_Latina_frente_a_la_pandemia_del_COVID-19.pdf?sequence=1.

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The region is in a better place to take advantage of the digital transformation, mainly because of increased access to networks and devices. However, it is necessary to ensure the key enabling elements of a virtuous digital ecosystem, such as quality infrastructure, digital skills for all and consistent legal frameworks that promote investment and innovation. There is significant space to promote R&D, new business models and adjustments of productive value chains through digitalisation. Past experiences show that such policies' impact depends on a strategic vision, e.g. including them in NDPs, ensuring interinstitutional co-ordination and building public-private co-operation.

The digital transformation can improve well-being through social inclusion of families, workers and students

The digital transformation influences households' quality of life, jobs and learning. New technologies offer many opportunities for accessing better public services, improving health and education, creating jobs, and bringing previously under-represented groups into the labour market and closer to public policies. The digital transformation can also

help improve the quality of jobs and skills: dangerous or repetitive tasks in particular can be automated. The coronavirus (Covid-19) crisis evidenced that technologies allow some segments of the population to choose where and when to work more freely, which can improve work-life balance, and for work environments to be made safer and healthier.

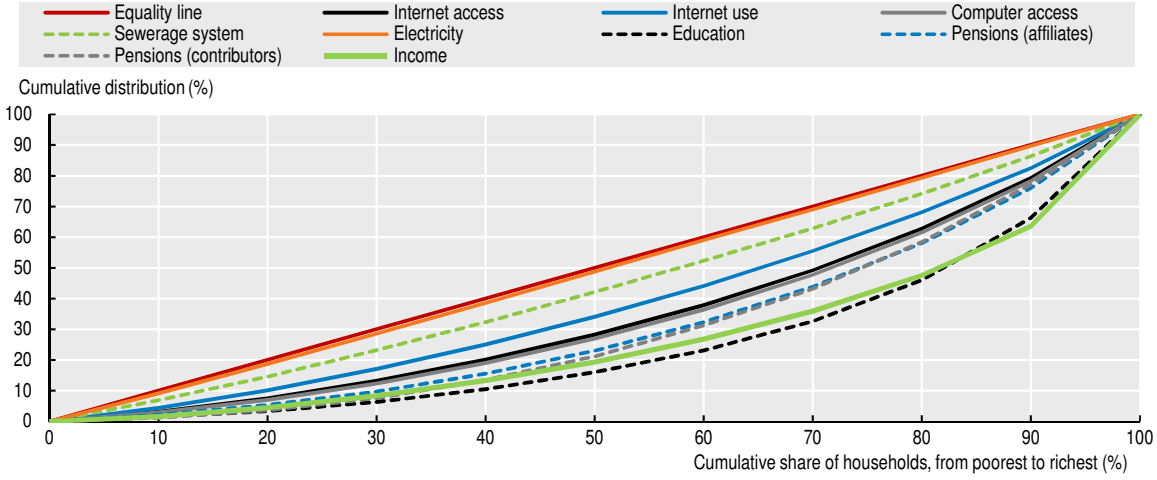
The Covid-19 crisis also highlights the digital divide in the region as an urgent concern, as poor and vulnerable workers without the access and skills to benefit from digital tools are being left behind. Those unable to exploit the new digital tools are likely to be more affected by the health, economic and social consequences of the crisis, potentially widening socio-economic inequalities. In particular, workers with no access to new technologies or skills are more prone to short- and long-term economic and other losses, for instance, because they have no opportunity to telework or sell goods on line, while their children may be unable to continue their education remotely.

Ensuring households benefit from the digital transformation

Despite strong improvements in Internet access and use, digital gaps among households by income, age and territory remain. Internet access in LAC is still strongly linked to household income. On average, there is almost a 40-percentage point gap between the percentage of the total population that uses Internet in the richest quintile (75%) and the poorest (37%). This gap in OECD countries is on average below 25 percentage points. Internet use in LAC is significantly higher among individuals aged 15-34 (over 60%) than those aged 65-74 (18%) and those over age 74 (8%). The number and share of urban users exceed figures for rural areas – by up to four times in some countries.

While the digital divide remains, in most countries Internet access and use are better distributed across income groups than income, pensions and some public services. (Figure 5).

Figure 5. **Distribution of Internet access, Internet use and other services by income decile in selected Latin American countries, 2017 or last available year**



Note: Simple average by decile for selected LAC countries. See Figure 3.1 for detailed methodology.

Source: Own calculations based on ORBA/ECLAC (2019), *Household Survey Data Bank* (database), www.cepal.org/es/observatorio-regional-de-banda-ancha.

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Getting ready for the future of work and skills

Few people, particularly women, have the skills to profit from ICT for everyday life. The Survey of Adult Skills, a product of the OECD Programme for the International

Assessment of Adult Competencies (PIAAC), provides information on how often individuals perform ICT-related tasks. Chile participated in PIAAC Round 2 (2015) and Ecuador, Mexico and Peru in PIAAC Round 3 (2017-18). Less than half of Latin Americans aged 15-65 covered by the survey had used a computer or had sufficient experience to use one for basic professional tasks. The most common Internet use tasks, performed at least once per week, were gathering information (73%) and email (69%). Fewer than 10% of workers used ICT for more advanced tasks, such as computer programming. Individuals with tertiary education used these tools more frequently than those with less education. Finally, men were more likely than women to use ICT to conduct transactions or work with spreadsheets.

Based on occupational estimates, 16% of LAC jobs are at high risk of automation, from 5% in Bolivia to 29% in Uruguay (ECLAC, 2019). Furthermore, by taking into consideration the replacement of tasks within occupations, on average, 25% of jobs in Chile, Ecuador, Mexico and Peru are at high risk of automation, and 35% may experience substantial changes in tasks and how they are carried out (OECD, 2019c). Jobs are at high risk of automation if at least 70% of their tasks are likely to be automated. Jobs are at risk of significant change if 50% to 70% of their tasks are likely to be automated (Nedelkoska and Quintini, 2018).

While some jobs will disappear, change or be created with the digital transformation, very few LAC employees have proficiency with or use digital tools at work: only one-third of LAC workers used ICT at work on a weekly basis, compared with more than half in Europe (OECD, 2018a).

Managing the transition of workers in declining industries and regions into new job opportunities, and moving towards wider, more inclusive social protection systems, remain key challenges. The future of work will depend on policy decisions (OECD, 2019c). Social protection provision should be reshaped to ensure better coverage, including for workers in non-standard employment, such as the gig economy, where temporary or free-lance contracts are the norm, and zero-hour contracts.

The coronavirus (Covid-19) crisis highlights that policies and institutions must ensure that the digital transformation does not harm certain type of workers. Some workers face multiple barriers to training. Those with low skills, in jobs at high risk of automation or who lose their jobs are often reluctant to retrain or unable to identify relevant learning activities. Even well-informed, motivated workers face barriers, such as lack of time, money or skills to start specific training. This is particularly the case for informal workers in the region. Employers are also more likely to invest in training higher skilled workers, expecting a higher return on investment.

New forms of work in the platform economy may offer opportunities for formalisation in LAC. The digitalisation of transactions could reduce costs and improve monitoring of economic activity. To capitalise on the opportunities, labour and tax policies must ensure adequate tax and social protection mechanisms.

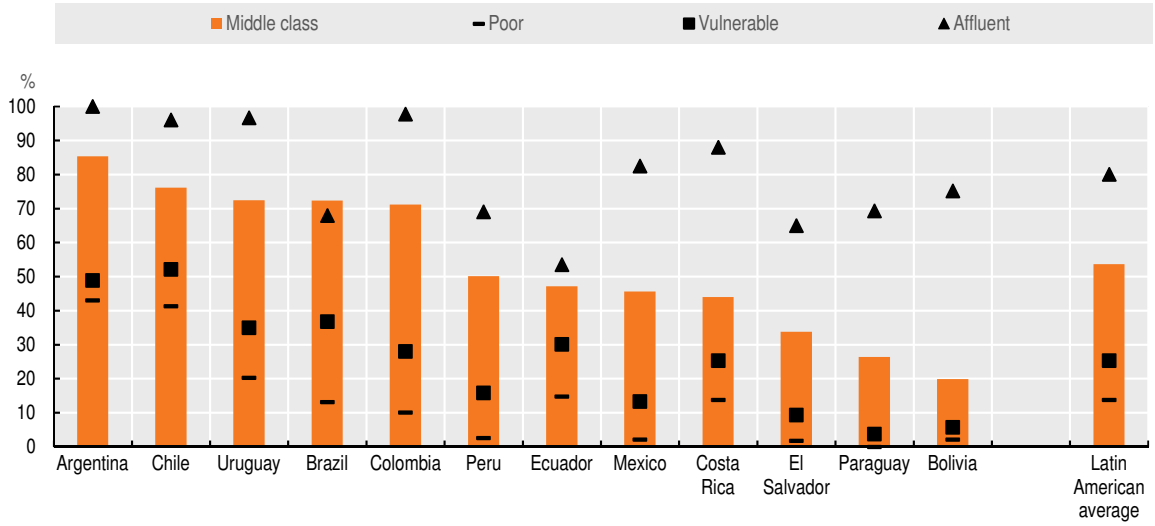
Closing the digital divide for a better and more inclusive education

Using digital tools is linked to better school performance. Students with higher proficiency in the OECD Programme for International Student Assessment (PISA) 2018 had started using digital devices at a younger age. Starting to use ICT before age 9 was significantly associated with higher scores than starting after age 12. Digitalisation over the last decade has influenced how students learn, do homework, interact with peers and spend leisure time. Internet use at school among students aged 15 in LAC more than doubled between 2012 and 2018 to over one hour on a typical school day.

ICT use inequalities also relate to gender and geography. Urban students in LAC are almost 25% more likely to engage in social media and more than 20% more likely to chat than their rural counterparts. The difference in OECD countries is marginal. Gender differences start early in schools and affect future professional development. While a similar share of boys (34%) and girls (35%) reported that they expected to work in a science-related occupation, they tended to select different fields, with girls more prone to select health-related professions, and boys more prone to select ICT, and science and engineer professions.

Schools in LAC promote equity in access to and use of ICT in countries where household connectivity is not universal. Access is especially low for students from poor households. For instance, in 2018 less than 14% of poor students in primary education had a computer connected to Internet at home, compared to more than 80% of affluent students with the same education level (Figure 6). Moreover, more than 5% of students had access to the Internet and other digital technology exclusively through school. Finally, higher connection to Internet is also needed in schools in LAC. For instance, in 2018 some 95% of school computers in the OECD area were Internet connected, compared with 74% in LAC.

Figure 6. **Share of students enrolled in primary education with an Internet connected computer at home by income group, 2018 or last available year**



Note: The regional average is a simple average. Poor are those living with less than USD 5.5 per capita per day (purchasing power parity [PPP] 2011). Vulnerable, those living with USD 5.5 to USD 13 per capita per day (PPP 2011). Middle-class,those living with USD 13 to USD 70 per capita per day (PPP 2011). And affluent, those living with more than USD 70 per capita per day (PPP 2011).

Source: Basto-Aguirre, Cerutti and Nieto-Parra (2020).

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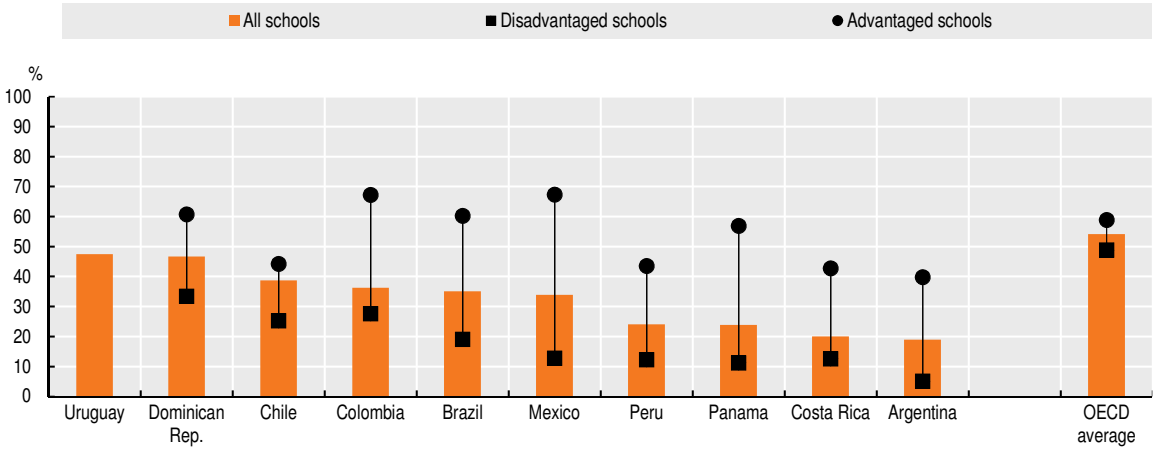
Only a few schools in Latin America were sufficiently prepared for digital learning before the coronavirus (Covid-19) pandemic. Students aged 15 attending advantaged schools in the region were more likely to have access to an effective online learning support platform, compared with those attending disadvantaged schools (Figure 7). Unpreparedness may amplify socio-economic gaps in education. On average, 58% of 15-year-olds in the region attended schools whose principals considered that teachers had the necessary technical and pedagogical skills to integrate digital devices into the curricula. This highlights the vast training needs that lie ahead for education systems, and the significant discrepancy in digital teaching capacity between socio-economically advantaged and disadvantaged schools.

Figure 7. **Availability of an effective online learning support platform by school socio-economic status in selected Latin American countries**

Percentage of students in schools whose principals agreed or strongly agreed that an effective online learning support platform was available, PISA 2018



Note: Socio-economically disadvantaged (advantaged) schools are those in which the average socio-economic status of students is in the bottom (top) quarter of the PISA ESCS among all schools in the country/economy. Countries/economies are ranked in descending order of percentage of schools with an effective online learning support platform. The difference between disadvantaged and advantaged schools in Uruguay is not statistically significant.

Source: OECD (2018b), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

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The coronavirus (Covid-19) crisis made inclusive digital transformation a top priority, to temper negative effects and accelerate inclusive economic recovery. The need to embrace digital transformation beneficial to all is a main lesson of the crisis and may be an opportunity for countries to prioritise it in DAs. To avoid amplifying existing inequalities and ensure that technology benefits all, countries should extend both access and skills among schools, students, households and workers. Policy actions should quickly and effectively articulate digital transformation processes as key enablers of social welfare.

The digital transformation of public institutions can improve governance and rebuild trust

The expansion of LAC's middle class since the beginning of the century brought rising social aspirations, and the coronavirus (Covid-19) pandemic is likely to increase demands for stronger public institutions and better quality public services. Despite improvements in public governance in past years, institutions are failing to respond adequately. Across most LAC countries, distrust and low satisfaction have been deepening, and social discontent is growing, creating an institutional development trap (OECD et al., 2019). The extent to which the pandemic deepens social discontent and changes citizen aspirations is yet to be seen, but public institutions have been under unprecedented pressure and will need to respond to evolving social demands and extraordinary policy challenges.

The digital transformation presents new challenges but also significant opportunities to strengthen the social contract and better respond to rapidly changing public demands. It can help improve governance and the functioning of public institutions and move towards digital governments in three respects. First, there is a need for new rules and institutions to govern the digital transformation, including in areas such as digital security, data protection and governance, and new ethical considerations. Second, digital technologies can profoundly transform public institutions and make them more credible, effective, inclusive and innovative. Third, efforts to transform into digital economies

and societies must be co-ordinated; a strategic approach to the digital transformation involves developing DAs closely linked with broader NDPs.

Adapting the rules of the game to govern the digital transformation

Governing the digital transformation is a crucial public policy issue. Changes to institutions, regulations and markets are needed to ensure the fair and equitable advancement of the digital transformation. Governments face new regulatory challenges, not only in managing issues arising from the digital transformation but also in ensuring that it benefits all (OECD, 2019b).

Regulatory frameworks must be adapted to address competition challenges from the increasing convergence of networks and services in the digital economy. A stable, predictable framework fosters long-term investment in broadband infrastructure and digital innovation. At the same time, innovation-friendly regulation is needed to facilitate new industries and digitally intensive firms. Frameworks must also help protect consumers. In designing regulations, responsibilities must be clear, avoiding overlap and giving institutions specific tools to enforce decisions.

Sufficient safeguards to protect sensitive sectors and citizens from digital security incidents and strengthen trust in the digital ecosystem are key. As individuals, governments and firms become more digitally open, security incidents are increasingly frequent and risk causing social and economic harm. Security risks can cause: disruption of operations and essential services, such as water, energy, public health and safety; direct financial loss; lawsuits; reputational damage; loss of competitiveness, e.g. through disclosure of trade secrets; loss of personal data; and consumer distrust (OECD, 2015). Private and public organisations should take digital security into account in their risk management and not treat it as a specific, technical risk that merits a separate response. LAC countries are moving towards strategic, long-term plans for digital security: in 2019, 13 Latin American countries had a national digital security strategy (IDB/OEA, 2020).

Data have emerged not only as key economic assets but also critical inputs for effective frontline responses to the spread of the coronavirus (Covid-19). There is a need for stronger regulation of data governance, privacy, value and exchange across borders. During the pandemic, privacy enforcement authorities have played a key role in applying new or existing privacy and data protection frameworks to ensure trustworthy, fast and secure data management. Data protection frameworks have evolved significantly in recent times and have influenced regulatory frameworks in LAC. Most LAC countries have data protection frameworks with shared characteristics. Most differences are explained by date of adoption and, to some extent, the influence of various international models. International harmonisation should be supported to promote a framework that encourages information exchange while safeguarding citizens' rights.

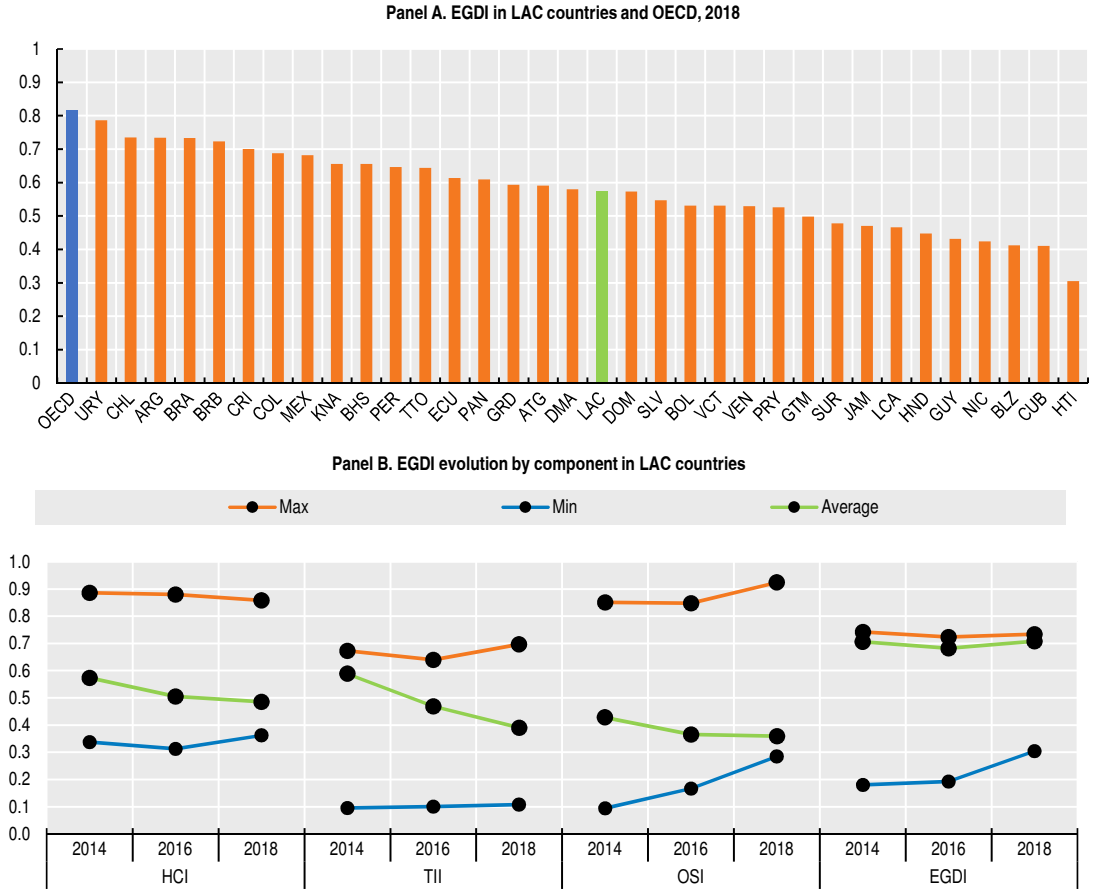
Governance of the digital transformation must incorporate ethical dimensions and react to new challenges. The growing use of AI apps raises concerns related to human values, fairness, human determination, privacy, safety and accountability, among others. Data on which algorithms train can be erroneous, biased, insufficient or not updated (Buenadicha Sánchez et al., 2019), underlining the need for more robust, safe, secure and transparent AI systems with clear accountability mechanisms (OECD, 2019d).

Social media platforms have enhanced the facility and rapidity with which mass disinformation (fake news) spreads. Exposure to disinformation is negatively correlated with trust in government (OECD, 2019e). Disinformation has other negative social effects: the spread of fake news about the coronavirus (Covid-19) risks encouraging behaviours that negatively affect public health.

Transforming governments: Towards more credible, efficient, inclusive and innovative public institutions

LAC countries are at different stages of the digital transformation of governments. The United Nations (UN) E-Government Development Index (EGDI) is the most comprehensive measure of e-government development world wide. Latin American countries fall into two groups. Argentina, Brazil, Chile and Uruguay are among the top 50 performers of the 193 countries surveyed in the 2018 edition, performing slightly below the OECD average (Figure 8, Panel A). Nicaragua (129), Belize (132), Cuba (134) and Haiti (263) appear among the worst performers (UN, 2019). The greatest challenges for LAC countries are in the dimensions of communications infrastructure and human capital, according to the evolution of the EGDI sub-indices in 2014-18 (Figure 8, Panel B).

Figure 8. **United Nations E-Government Development Index (EGDI) and its evolution**



Notes: The UN E-government Development Index (EGDI) is a composite index of the Online Service Index (OSI), Communications Infrastructure Index (TII) and Human Capital Index (HCI). It ranges from 0 (least developed) to 1 (most developed). Simple averages for the OECD area and LAC.

Source: Own calculations based on UN (2019), *UN e-Government Knowledge Database* (database), https://publicadministration.un.org/egovkb/en-us/Data-Center.

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To improve public governance, governments can use digital tools to become more credible, efficient, inclusive and innovative. Governments are evolving from e-governments to digital governments. E-government uses ICT, particularly the Internet, as a tool to achieve better government (OECD, 2014). It allows for little interaction with citizens, and management practices remain hierarchical. Digital government relies

on a digital government ecosystem comprised of government actors, non-government organisations, businesses, associations and individuals who support the production of and access to data, services and content through interactions with government. The shift towards digital government is expected to bring greater transparency and openness on the part of governments, and a more collaborative, user-driven and proactive approach that recognises data as strategic assets.

Digital technologies can improve the trustworthiness of public institutions and therefore increase their credibility. In 2018, 26% of the population reported having confidence in the national government, down from 45% in 2008 (Gallup, 2019). The perception of corruption is a main driver of mistrust in public institutions: in 2018, 79% of the population believed corruption was widespread in their governments (Latinobarómetro, 2018); 53% believed corruption had increased in the previous 12 months (Pring and Vrushi, 2019). Trust is a cornerstone of public governance and critical for the success of public policy. Without it, citizens disengage from civic duties and find few incentives to participate in politics and pay taxes. If well managed, the digital transformation can help governments regain trust by harnessing the opportunities of open government data, creating a culture of transparency, integrity and social accountability.

Digital technologies have the potential to curb corruption in the misuse of public funds. Colombia's *MapaRegalías* platform shows the origin and destination of financial resources obtained from the exploitation of natural resources, and has helped identify numerous irregularities (Santiso, 2018). The creation of central purchasing bodies as centres of procurement expertise, and the development of e-procurement solutions (e.g. *Chilecompra* and *Colombia Compra Eficiente*), are transforming traditional practices in LAC. Brazil's Observatory for Public Expenditure tracks procurement expenditure data, cross-checking it with other government databases to identify atypical situations that, while not *a priori* evidence of irregularities, warrant examination.

Social media can be a powerful tool to support citizen trust. Particularly in the context of a crisis, such as the coronavirus (Covid-19) pandemic, governments must ensure that clear and trustworthy communication reaches the greatest number. Social media can provide an important platform to inform citizens about the risks and evolution of the crisis and the measures adopted to counter it. It can be especially effective in LAC, given the high use of social media.

By making public services more efficient with new technologies, governments can improve citizens' experience and cut transaction times and in-person costs. LAC's bureaucratic system is complex, illustrated by the average time it takes to carry out a government transaction, such as getting a birth certificate, paying a fine or obtaining a licence. It takes around 5.4 hours to complete a transaction in LAC, although variation among countries is high, ranging from more than 11 hours, on average, in Bolivia to less than 3 hours in Chile for an equivalent transaction (Latinobarómetro, 2017; Roseth, Reyes and Santiso, 2018). Digital channels for processing transactions could eliminate in-person time and costs.

The digital transformation of governments can also support more inclusive public services through open data policies, more interactions with stakeholders (e-consultation) and citizen involvement in decision-making processes (e-decision making). It can help governments provide more inclusive public services by reaching the more disadvantaged segments or remote areas with access challenges. Education is one area in which digital technologies can expand the reach of services. E-learning has undergone an extraordinary transformation in recent years. E-health also has strong potential. E-consultations during

the coronavirus (Covid-19) pandemic have played a crucial role in stemming the spread of the virus and reducing the burden on emergency rooms.

The digital transformation can help governments be more innovative in public policy design, delivery and evaluation, improving the policy-making process, for instance thanks to the use of Big Data or GovTechs. Technology and the digitalisation of societies and governments are generating massive amounts of data, which can be important assets to spur innovation and develop better informed and targeted public policies and services. Many countries are using smartphone-generated geolocated and proximity data to map the geographical distribution and evolution of the coronavirus (Covid-19) or monitor compliance with lockdown measures. Making the most of the digital transformation requires a change within public administration from an information-centred to a data-driven, innovative approach that includes digital technologies and data in public policy design from the outset.

Strategies for digital transformation in national development plans and digital agendas

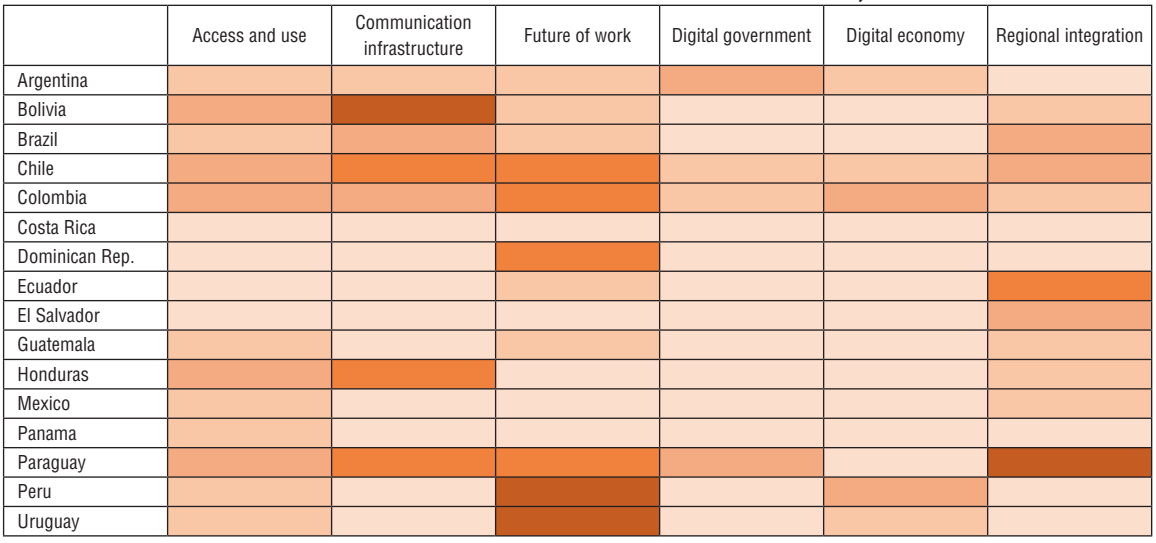
The digital transformation englobes a series of public policies that need to be included under a co-ordinated approach, as the National Development Plans (NDPs), with a direct link with digital agendas. A text-mining exercise of the relative frequency of six digitalisation topics in LAC NDPs was carried out to determine their main focuses: 1) access to and use of the Internet and digital technologies; 2) communication infrastructure; 3) future of work (i.e. policy concerning changes in the labour market due to new technologies); 4) digital government; 5) digital economy; and 6) regional integration. A mix of quantitative and qualitative results emerges (Figure 9).

Access and use, communication infrastructure and future of work are most represented in LAC NDPs. A growing number of plans recognise Internet access as a basic household service, alongside water, electricity and telephone. Regarding the future of work, NDPs focus on skills upgrading over encouraging new and more flexible working arrangements. Attention to developing the digital economy remains low, with few proposals to foster online commerce, open banking or financial technology companies. Regional integration is important for the majority of countries, but most focus on energy, border and commercial integration. Few countries advocate for digital integration in their NDPs as part of their broader objective to develop an innovative, competitive economy.

DAs are another key public policy tool to navigate and co-ordinate the digital transformation in the long term. Most LAC countries have developed DAs, with varying characteristics (Figure 10), which propose cross-sectoral programmes to achieve policy objectives involved in the digitalisation of the economy and society. DAs encompass a range of policies, involving not only ICT ministries but also institutions in charge of finance, education, industry and public administration.

The Regional Digital Agenda of Latin America and the Caribbean (eLAC) has served as a space for co-operation among regional DAs, where governments share experiences and best practices and discuss a common vision for use of digital technologies as development tools. The forum set out a series of regional goals that serve as a guide for the development of national policies. The DAs of Argentina, Brazil, Colombia, Costa Rica, the Dominican Republic, Honduras, Mexico, Panama and Peru explicitly indicate the articulation of national policy objectives in line with those set at eLAC2020.

Figure 9. **Intensity of digitalisation topics in national development plans (NDPs), selected Latin American and Caribbean countries, 2019**



Note: This figure was obtained by compiling a list of keywords for each topic; intensity of topic was calculated based on relative frequency. See Annex 4.A1 of Chapter 4 for detailed methodology.

Source: Own elaboration based on latest NDPs (end of 2019).

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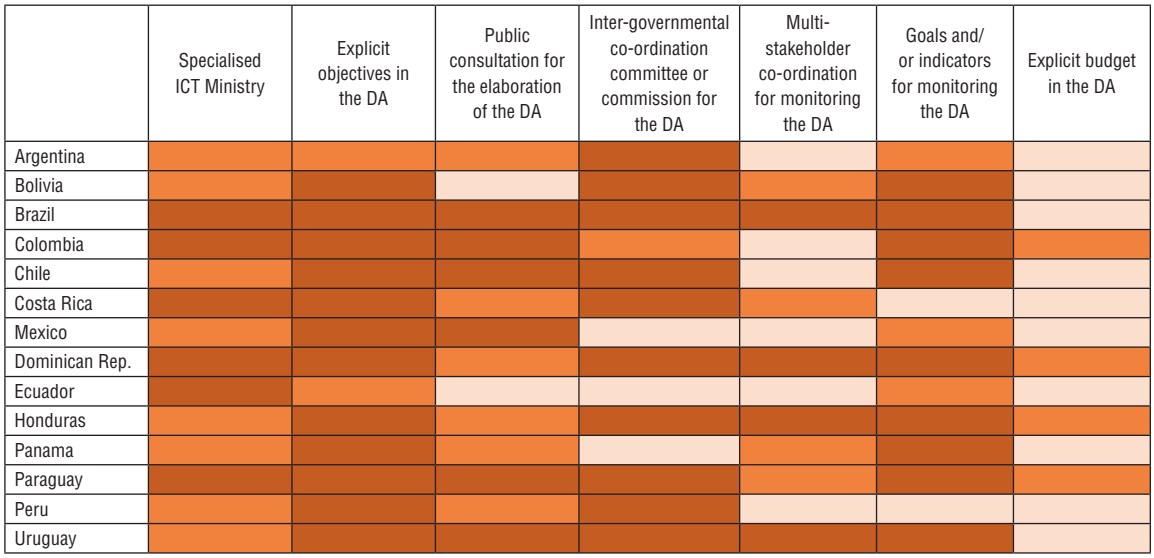
Figure 10. **Institutional characteristics of national digital agendas (DAs), selected Latin American and Caribbean countries, 2020**



Note: Colour intensity indicates the intensity with which the DA includes the characteristic in its institutional design.

Source: Own elaboration based on latest national DAs (January 2020).

StatLink *https://doi.org/10.1787/888934172768*

New international partnerships can facilitate development in the digital age

As digitalisation creates both opportunities and challenges that transcend borders, international co-operation, co-ordination and new partnerships are a key dimension to make the most of digital transformation at local, national and international levels.

LEO 2019 called for a shift towards renewed international co-operation to facilitate sustainable development. Co-operation in LAC's digital transformation, particularly in light of the highly transversal impact of digital tools, could help support countries to overcome development traps and advance their development.

The coronavirus (Covid-19) crisis has accentuated the importance of international co-operation and digital tools. Co-ordinating policies at the international level to promote digitalisation for all is essential. Traditional models of international co-operation have not met expectations. A renewed model could facilitate LAC countries' development strategies. Examples in the digital sector already show the way.

International co-operation can help LAC countries build domestic digital capacities to face their often interrelated development traps. The most effective initiatives follow a multi-dimensional approach to development, tackling several challenges at once. The BELLA Programme and the European Union-Brazil Partnership for Scientific and Technological Cooperation not only build LAC's productive or social inclusiveness capacities through digital tools but also allow countries to close the gap between their priorities and international matters (BELLA, 2019). Triangular co-operation initiatives, such as the Environmental Technology Centre in Peru, illustrate how new tools can help build capacities to face development challenges (GIZ, 2014).

Regional integration can also help realise LAC's digital potential. A regional digital market could advance development by helping countries enhance communication infrastructure and expand trade, severely affected by the coronavirus (Covid-19) crisis. LAC's digital regulatory frameworks and regional and sub-regional co-operation efforts are often not harmonised. Regional co-operation initiatives, such as the ECLAC Digital Agenda for Latin America and the Caribbean 2020 (eLAC2020), could prove useful for multiple stakeholders and countries to articulate frameworks and levels of digital development, exchange experiences and set up policy dialogues (ECLAC, 2018). In addition to boosting LAC's digital development, it could help align national strategies with international standards and promote the region's voice on international platforms, allowing LAC countries to participate on an equal footing. There are good examples from other regions and interregional partnerships. The European Union's digital strategy provides a useful, concrete example of how to build an integrated regional platform and create common regulation for technological innovations while positioning itself as a key partner for co-operation, reinforcing its position in the multilateral system (European Commission, 2019).

International co-operation is essential to overcome challenges that transcend borders, as the taxation issues brought on by the digitalisation of the economy. On an equal footing basis, LAC countries should greatly benefit from further co-operation with other economies, and the LAC region has also an important role to play in reaching consensus solutions through effective multilateral co-operation.

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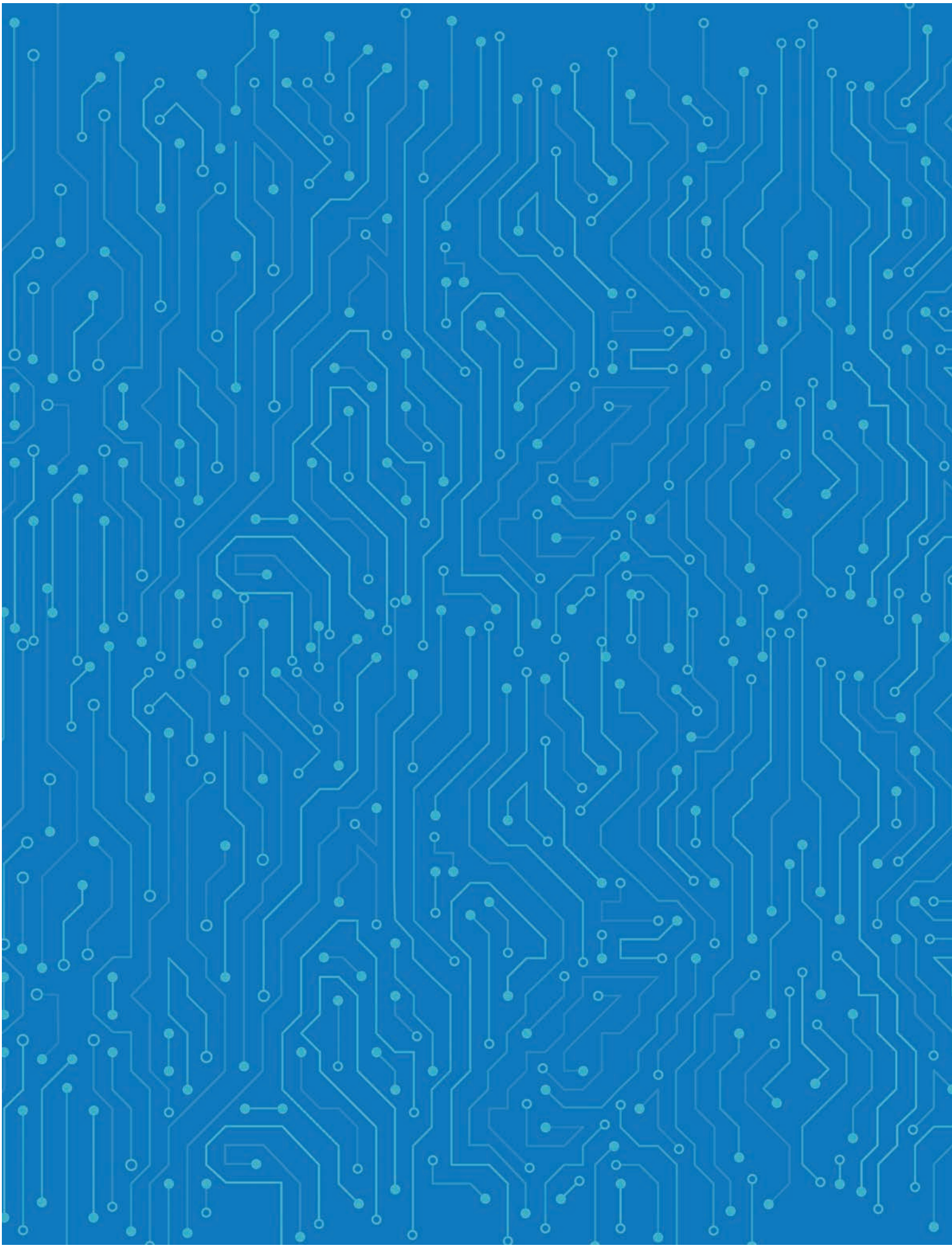


Chapter 1

Structural macro perspective and the role of the digital transformation to overcome development challenges

The coronavirus (Covid-19) crisis has been an exceptional, unexpected and exogenous shock to Latin America and the Caribbean, where most of the countries were already suffering from anaemic or zero growth. The region confronts the crisis with structural challenges, including a vulnerable middle class, persistent inequalities, laggard productivity and constrained fiscal space. The persistence of structural bottlenecks caps the space for rapid recovery. In some countries, inequality reduction has stalled in the most unequal region in the world, and increases in poverty and indigence are expected in the context of the coronavirus (Covid-19) crisis. Against this scenario, innovative and effective actions have been implemented to contain the damage, but further efforts will be needed at the national and international level for a sustainable recovery. Digital transformation proved to be a useful tool during the pandemic, but only for some firms and citizens. If gaps in coverage, access and use are properly addressed, digital transformation will play an essential role in the economic recovery and holds the potential to help overcome the persistent challenges and spur more sustainable and inclusive development.

LAC faces the Covid-19 crisis with low productivity growth, a vulnerable middle class, an increase in poverty and persistent inequalities

The social consequences of the crisis are uneven, and affect mainly the most vulnerable groups

In 2020, extreme poverty is likely to increase by 4.5 percentage points, which means

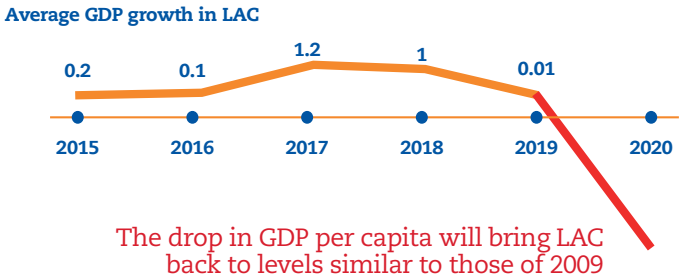
28.5 million additional people

and a total of

96.2 million people living in extreme poverty

Slow growth in recent years and the sharp decline in GDP growth projections limit the space for a rapid recovery

LAC is facing an unprecedented economic crisis



The drop in GDP per capita will bring LAC back to levels similar to those of 2009

2.7 million companies are likely to close, causing the loss of

8.5 million jobs

The Covid-19 crisis is reinforcing the structural development traps that prevent a more inclusive and sustainable growth

Digital transformation is a key global trend

Digital transformation comes with various challenges and opportunities, and can help overcoming Latin America's development traps

Digital transformation can help overcome these traps: enhance productivity, promote inclusiveness, strengthen institutions and chart a sustainable development path

Introduction

Latin America and the Caribbean (LAC) is navigating challenging and historic times, as the world confronts the worst peace-time recession in a century (OECD, 2020a; IMF, 2020). The pandemic has not only cost the lives of countless Latin-Americans, but it has considerably affected socio-economic conditions, with domestic lockdown measures to contain the spread of the virus causing an immediate drop in economic activity, coupled with an unfavourable external context, including strong declines in global demand, global trade, tourism, commodity prices and a surge in financial volatility. With output projected to fall by more than 9% in 2020 (ECLAC, 2020a; CAF, 2020a), LAC is the region experiencing the biggest contraction in the emerging markets and developing economies (IMF, 2020). LAC entered the crisis following a wave of mass protests in some countries driven by deep social discontent. This was partly due to a poor economic performance, which hindered advances in social progress. Between 2014 and 2019, LAC experienced the weakest period of growth since 1950 and exhibited lower growth than the Organisation for Economic Co-operation and Development (OECD) average, with almost no expansion of the economy in 2019. This suggests that potential growth in most LAC countries was already low.

Most LAC countries responded to address the socio-economic consequences of the coronavirus (Covid-19) crisis with supportive monetary and fiscal measures from the beginning of lockdown measures. Fiscal policy is playing an essential role in mitigating negative economic and social effects and will continue to be pivotal in the subsequent recovery. Countries' ability to react to the pandemic with fiscal policy depends on their fiscal space and their access to international financial markets. Efforts to mitigate the effects of the pandemic have mainly focused on counter-cyclical measures to support vulnerable firms and households. Some central banks have eased monetary conditions by lowering interest rates and adopting liquidity measures, including non-conventional monetary measures, to promote domestic demand and facilitate business activity. Supervisory authorities also eased prudential regulations to prevent credit bottlenecks that might be caused by binding regulatory requirements amid the crisis.

Owing to the sharp reduction in economic growth, prospects for socio-economic progress have dimmed, with reduction of poverty and inequality on hold and possibly reversing in 2020. Under a scenario of a 9% contraction in GDP in 2020, poverty in LAC may rise by 6.9 percentage points (45.4 million more people), compared with the prior year, affecting a total of 230.9 million people (37.3% of the LAC population). Extreme poverty is likely to increase by 4.5 percentage points (28.5 million more people), affecting a total of 96.2 million people (ECLAC, 2020a). Similarly, after strong decreases in inequality during the commodity boom, inequality has stagnated since 2014 in the most unequal region in the world (OECD et al., 2019). Inequality is a historical and structural characteristic of LAC societies and has been maintained and reproduced over years. It is an obstacle to the eradication of poverty, to sustainable development and to the protection of people's rights and a more sustainable development model. The present crisis risks making high and persistent inequality worse. Urgent policy action, on several fronts, is needed to address its root causes and drivers (ECLAC, 2018a; OECD et al., 2019).

Socio-economic progress after the crisis will also be feeble due to the regions structural challenges that are being aggravated by the coronavirus (Covid-19) crisis. Low potential growth, low and stagnant productivity growth, a vulnerable middle class and persistent inequality are just a few symptoms of structural challenges that stand in the way of further inclusive and sustainable development and of convergence with advanced economies. The 2019 *Latin American Economic Outlook* (*LEO*) identified four development traps: low productivity, social vulnerability, institutional weaknesses and environmental risks (OECD et al., 2019). The mass protests of 2019 in some countries revealed the

urgency to regain citizens' trust and rebuild the social contract. The current crisis may present an opportunity to create consensus among citizens around major pending reforms. These reforms need to take into account how the pandemic is exacerbating existing development traps (OECD et al., 2019): elements to consider include the need to improve the quality and universality of health care, social protection, strengthen *ex ante* crisis response mechanisms (e.g. automatic stabilisers) and implement fiscal reforms of both income and expenditures, and clear development strategies to boost productivity, promote job formalisation and reduce dependence on fossil fuels and transition to a low-carbon development model.

The digital transformation can play an important role in tackling the health crisis, mitigating its socio-economic consequences and promoting a recovery that delivers more sustainable and inclusive development. The digital transformation refers to the economic and societal effects of digitisation and digitalisation. The digital revolution entails disruptions that are triggering innovations in business and consumption models, transforming production systems and value chains, reorganising economic sectors, generating new dynamics in the world of work, creating smart goods and services and introducing new conditions of competitiveness. It has consequences on citizens' lives, in the manner they learn, work, consume, interact with each other and with their institutions. This revolution is a result of the combined adoption of technologies, such as broadband high-speed networks, smart devices, cloud computing, the Internet of Things (IoT), Blockchain, Big Data analytics, artificial intelligence (AI), robotics, additive manufacturing (3D printing) and virtual and augmented reality. The availability of such technologies facilitates the emergence and provision of new solutions in the economic, social, institutional and environmental fields. These new tools are already helping mitigate the effects of the pandemic, either by allowing, to some extent, business continuity, teleworking and home schooling or by tracking quarantined citizens. The realisation of these opportunities is not automatic. In many LAC countries, poverty, inequalities, and precarious and informal labour markets hamper access to and use of these digital solutions.

The speed of change due to the exponential nature of technological advances, the great utility of digital technologies in all sectors and industries, and their profound capacity to transform entire systems of production, management and governance bring opportunities but also complexity and uncertainties to the dynamics of development (ECLAC, 2018b; OECD, 2019a, 2019b).

To ensure that policies harness the benefits of the digital transformation while mitigating the challenges, LAC policy makers need to be more proactive in "going digital" and step up their engagement with citizens, businesses, unions and academics to adapt policies to the new context. Policy makers must provide the conducive environment for innovation and digital technology adoption (Andrews, Nicoletti and Timiliotis, 2018). The adoption of new technologies can create polarisation between productive and less productive firms, concentrate market power and stymie competition and firms' entry, change the structure of the labour market and potentially increase existing inequalities, aggravating the digital divide at home, school and work. These and the employment precariousness associated and the gaps in social protection coverage can worsen social vulnerability. These challenges existed before Covid-19. The pandemic – and the measures implemented to contain its spread – have made them even more urgent.

This chapter first presents the external context LAC faces in this coronavirus (Covid-19) crisis. Second, it shows the economic impact on the region and the policy responses needed at the national and international level. Third, it shows that the crisis asymmetrically affects citizens and firms, insisting in particular that the greatest impact is on the most vulnerable groups. The last section identifies how the digital transformation can help overcome the region's structural challenges.

External and domestic impacts of the coronavirus (Covid-19) crisis on economic performance

A challenging international context

As a result of coronavirus (Covid-19) and the associated containment measures, global activity is contracting dramatically in 2020. The pandemic forced governments to focus on health measures as the primary concern. Confinement and isolation led to the temporary and sometimes permanent shutdown of businesses, widespread mobility and travel restrictions, financial market turmoil, erosion of confidence and heightened uncertainty; these, together with depressed incomes due to rising unemployment, strongly lowered demand (OECD, 2020a). In a rapidly changing environment, it is difficult to quantify the magnitude of the measures' impact on gross domestic product (GDP) growth, but it is clear that they imply sharp historical contractions in output, household spending, corporate investment and international trade. The latest estimates suggest that annual GDP growth of the world economy for 2020 will range between -4.5% and -5.0% (IMF 2020; OECD, 2020a). Without the prompt and effective policy support introduced in all economies, the contraction in output would have been substantially larger (OECD, 2020a).

The outbreak of the coronavirus (Covid-19) has added to the complicated economic, financial, commercial and technological scenario experienced in the last years. In 2019, advanced and emerging economies lost momentum. Weaker demand and escalating trade tensions debilitated global trade, increasing uncertainty about the economic outlook and dampening business confidence and thus investment.

The slowdown in trade flows is intensifying in 2020. Global trade collapsed, declining by over 15% in the first half of 2020 (OECD, 2020a). Confinement measures caused a collapse in demand and a disruption of global value chains. Disruption of production in countries that participate in global value chains (GVCs) will be a crucial factor in the deterioration of trade in intermediate goods, compounded by a widespread weakening of demand for consumer and investment goods as a result of confinement and the economic crisis (ECLAC, 2020b).

Despite heterogeneity across countries, growth in the United States, Europe and the People's Republic of China (hereafter "China"), key partners of LAC, are being hit before a rebound in 2021. The coronavirus (Covid-19) outbreak will bring the US economic expansion to a halt, with strong negative economic growth in 2020. The US GDP contracted by 32.9% in the first quarter at an annualised rate (BEA, 2020). There is uncertainty about the evolution of the pandemic. GDP is projected to decline by -3.8% this year, with a 4.0% rebound in 2021. Massive monetary and fiscal responses sustained US households and businesses, but continued policy support will be needed to boost the economic recovery and avoid protracted high unemployment (OECD, 2020a). Lockdowns in European economies will also lead to a major recession. The fall is estimated to be around -7.9% in 2020, with double-digit unemployment and strong increases in public debt. Fiscal and monetary policies will remain supportive, to boost the subsequent economic recovery, which is estimated at around 5.1% in 2021. In China, GDP will slow down to 1.8% in 2020. The pandemic triggered an increase in precautionary saving and eroded consumer confidence. In 2021, the economy is expected to grow by 8.0% annually (OECD, 2020a).

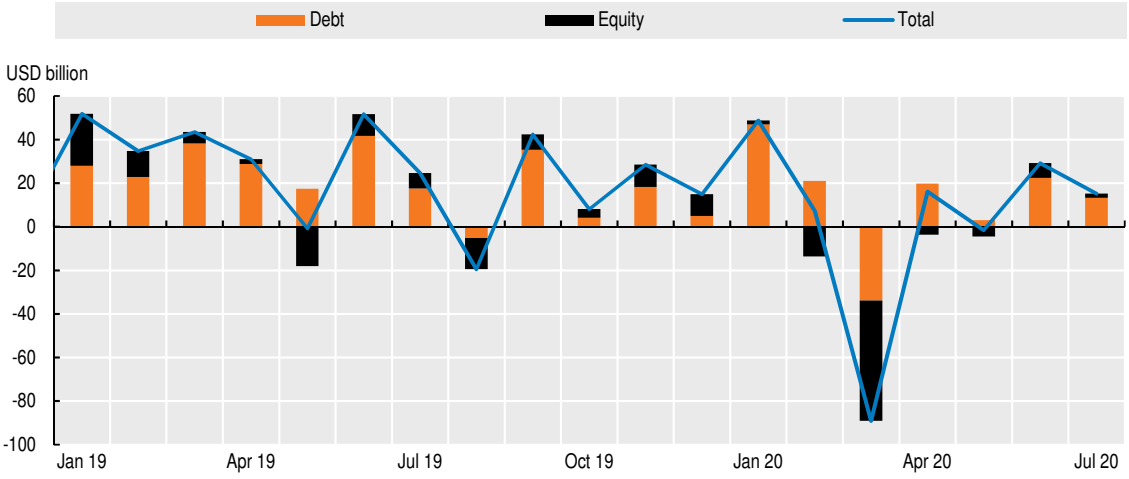
Financial volatility in emerging markets

While the coronavirus (Covid-19) crisis has been an exceptional, unexpected and exogenous shock to the world economy, abundant liquidity remains in international capital markets, making this crisis different from past global crises. Following the sudden

stop in March 2020, and the largest ever capital outflows from emerging markets (IIF, 2020), global liquidity and the appetite for emerging markets have increased, thanks to the Federal Reserve expansive monetary policy. Net capital inflows have returned to emerging markets, particularly debt flows have returned to emerging markets in April 2020, although they have not yet fully recovered. As of August 2020, emerging economies as a whole accumulated net capital outflows close to USD 25 billion. China represented the bulk of these movements, while the rest of emerging economies registered net inflows, although below the levels accumulated in the same period of the previous year (Figure 1.1).

Despite large international liquidity and expansionary policies in the OECD area to respond to the crisis, uncertainty arising from the trade collapse and deteriorating economic outlook has increased volatility in financial markets, with greater risk aversion and worsening global financial conditions. These led to higher demand for safe assets (rates of return on US securities have reached historically low levels, for instance), lower demand for LAC financial assets and significant currency depreciations in some countries (ECLAC, 2020c; OECD, 2020b).

Figure 1.1. **Financial conditions, net capital flows to emerging markets (3 months rolling sum)**



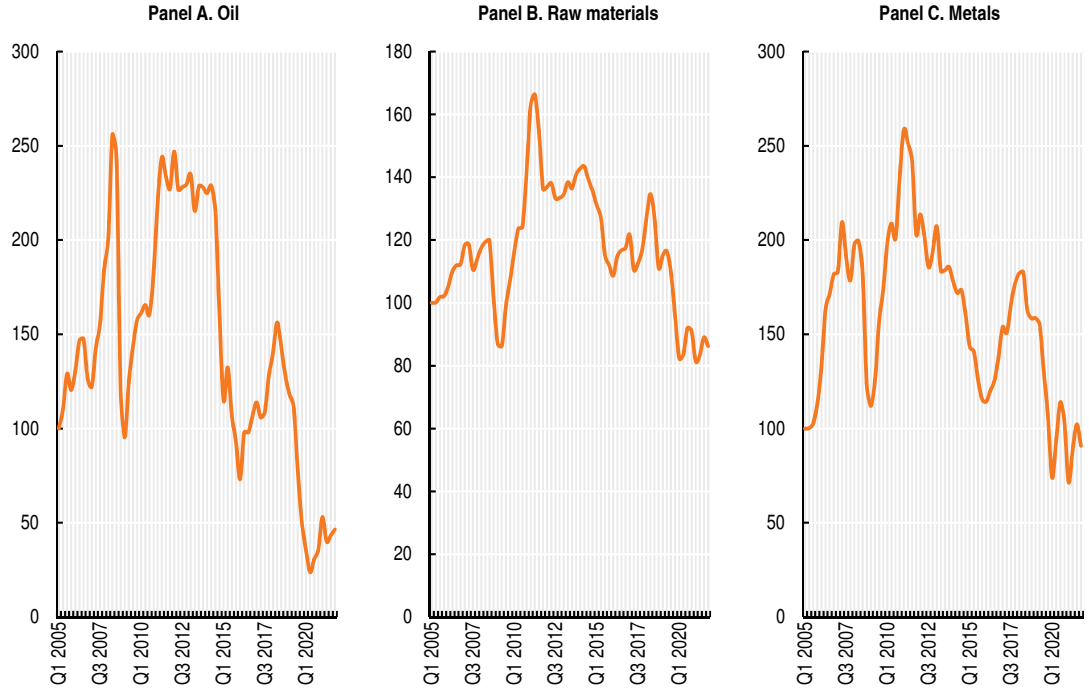
Sources: Based on Capital flows tracker, IIF (August 2020) and Bloomberg.
StatLink https://doi.org/10.1787/888934171343

Sharp decline in commodity prices

The coronavirus (Covid-19) crisis caused a sharp fall in commodity prices (Figure 1.2) that is having a strong negative impact on the income levels of several LAC economies. The contraction in global demand, particularly from China, Europe and the United States, is playing a major role in commodity price dynamics. A geopolitical crisis in the oil market led to a 24% reduction in prices in less than a week in early March 2020 (ECLAC, 2020c), aggravated by physical constraints to inventory accumulation, particularly in the United States.

The price of base metals decreased dramatically in 2020 because of the contraction of industrial production. In the case of agricultural commodities, soybeans, sugar and coffee prices have also sharply declined (OECD, 2020a). Prices are expected to remain relatively low over the next two years.

Figure 1.2. **Commodity prices, 2005-2020 (2005 = 100)**



Source: Bloomberg data. Own calculations based on GVAR model.
StatLink https://doi.org/10.1787/888934171362

Disappointing performance in Latin America and the Caribbean

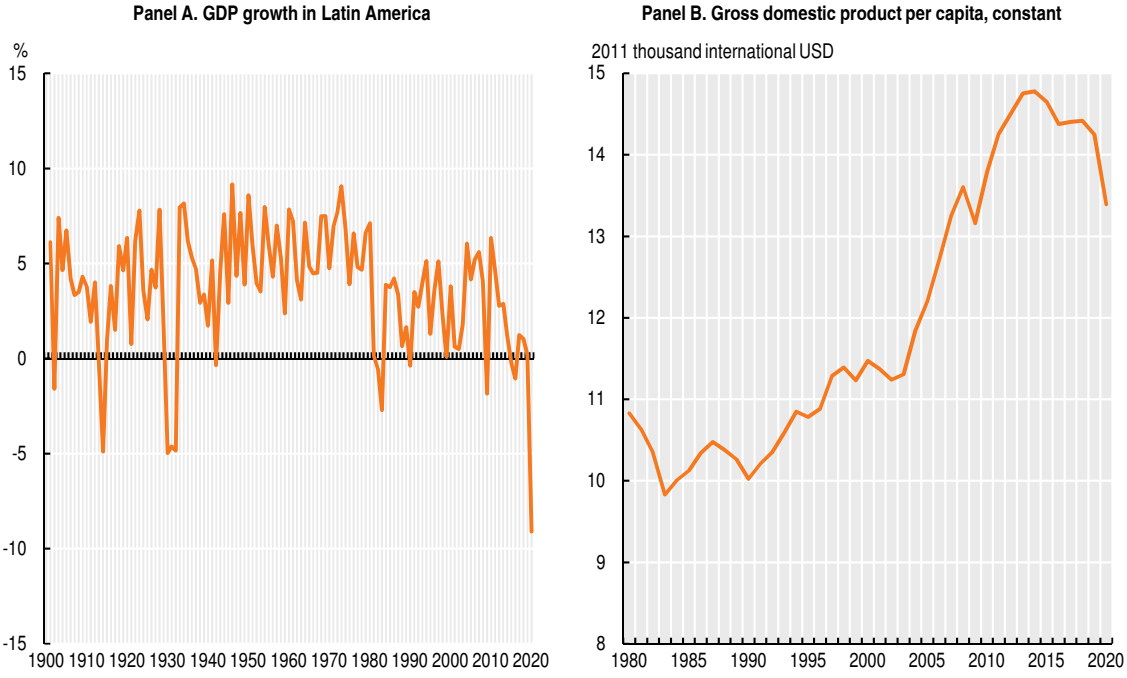
The coronavirus (Covid-19) pandemic will have large and lasting socio-economic consequences in LAC, aggravating the region's already complex situation. The recovery of Latin American economies following the recession of 2015-16 proved fragile. Between 2014 and 2019, the region experienced the weakest period of growth since the 1950s, consistently recording lower growth rates than the OECD average. Activity growth lost momentum in 2018 and subsided even more in 2019. In 2019, with heterogeneity in the region, the combination of a less favourable external environment and idiosyncratic negative shocks in several countries pushed average growth in the region close to 0%. The pandemic is bringing both external and internal shocks that accentuate the region's vulnerability and unsolved structural challenges.

The impact of this crisis on economic activity and social conditions is particularly severe for the region in the absence of appropriate automatic stabilisers, such as unemployment insurance, in most countries of the region (OECD, 2020b). Since the majority of firms finance investment mainly with retained earnings, gross capital formation is bound to be negatively affected. The downside multiplier effects felt at sector and economy levels will be significant and compounded by uncertainty regarding the duration of the pandemic. Several international organisations estimate annual GDP growth in 2020 at below -9% for LAC (CAF, 2020a; ECLAC, 2020a; IMF, 2020). This supposes a historical decrease in economic growth for the region (Figure 1.3, Panel A). The majority of LAC countries will exhibit negative growth in 2020 (CAF, 2020a; ECLAC, 2020a; OECD, 2020a). The magnitude of the economic contraction will vary across countries and depend on several factors, including: the depth and length of confinements, size and effectiveness of additional measures adopted both within and outside the region during and after the lockdown,

sectoral composition of the economy, openness to the world economy and the global economy in the aftermath of the crisis (OECD, 2020b).

In 2020 the average GDP per capita for the region is estimated to go back to its 2009 level (Figure 1.3, Panel B). Consumer and investor confidence will remain subdued as long as the pandemic is not under control. This will not only weigh on investment and aggregate demand in the short term, but further cap potential growth in the medium term by reducing capital accumulation. In addition, a slow recovery of employment may increase informality and poverty and compromise human capital accumulation (see the section below on the social effects of the coronavirus [Covid-19] crisis). Finally, in the absence of reforms to boost formalisation, competition and facilitate resource reallocation, productivity gains will stall. Output losses could be permanent, risking another lost decade in terms of per capita income advances.

Figure 1.3. **Annual GDP growth rate and GDP per capita in Latin America and the Caribbean**



Source: Own calculations based on ECLAC (2020a), "Addressing the growing impact of COVID-19 with a view to reactivation with equality: New projections", *Special Report COVID-19 No.* 5; CAF (2020a), "Economic Perspective for the Second Quarter"; and IMF (2020), "A crisis like no other, an uncertain recovery", *World Economic Outlook Update*, June.

StatLink https://doi.org/10.1787/888934171381

Coronavirus (Covid-19) and its economic transmission channels

Beyond the direct health impact of the coronavirus (Covid-19), the socio-economic impact in LAC occurs – and will continue to occur – through a variety of transmission channels.

First, confinement measures induce a large immediate drop in economic activity. The health measures imply the significant slowdown and, in some cases, outright stoppage of production and distribution of goods and services. As workers are prevented from going to work, the consequent rise in unemployment and decline in working hours, accompanied by the fall in the wage bill and incomes, trigger a reduction in aggregate demand for

goods and services, and business profits. The prevailing structure of production, large informality, limited infrastructure and insufficient digital skills limit the share of workers who could potentially work from home. A significant fraction of GDP and employment in LAC is therefore affected by the confinement measures.[1] Faced with a contraction in consumption, uncertainty and mounting debt, firms are also cutting back on investment.

Second, containment measures, restrictions on border crossing and social anxiety affect key sectors, such as tourism and international travel. Incidence is particularly strong in countries where tourism is a major driver of economic activity, such as Caribbean economies. In these countries, tourism services accounted for 13.9% of GDP and 15.2% of total employment in 2019 (see Chapter 6), and could fall by around 25% (ECLAC, 2020c). In the first four months of 2020, international tourist arrivals declined by 39% in the Caribbean, 35% in Central America and 35% in South America, compared with the previous year (ECLAC, 2020c). Other sectors, such as retail trade, wholesale trade and manufacturing, are also being heavily affected.

Third, the global slowdown (OECD, 2020a) and the disruption of global and regional value chains generate a sharp decline in LAC exports and potentially disrupt domestic production in sectors highly vulnerable to disruptions in global value chains.

Fourth, the decline in commodity prices, the economic slowdown and the fiscal response affects both the trade and fiscal balances of several LAC countries.

Fifth, higher volatility in financial markets brings high uncertainty in LAC debt, equity and currency markets, affecting the solvency of large companies exposed to commodity markets or that have no other form of insurance against currency fluctuations. Part of this has reversed since April, following expansionary policies in developed markets and the sharp reduction of interest rates. However, the cost of credit remains high for some countries and companies owing to risk premiums.

In contrast to these negative effects, the adoption of digital technologies and the spread of the Internet have been critical to sustain a certain continuity in business, jobs and study from home, although the digital divide, notably lack of high-speed broadband Internet and lack of appropriate digital skills, has prevented benefit to all. Digital technologies play an important role with respect to the pandemic.

A strong setback in external accounts

The sharp decline in global and regional economic activity in 2020 will have an impact on LAC's external accounts. Deficits in current account balances reduced slightly in 2019, following the slowdown in international trade and the correction in commodity prices. With few exceptions, current account deficits were financed by foreign direct investment (FDI) (Figure 1.5, Panel A).

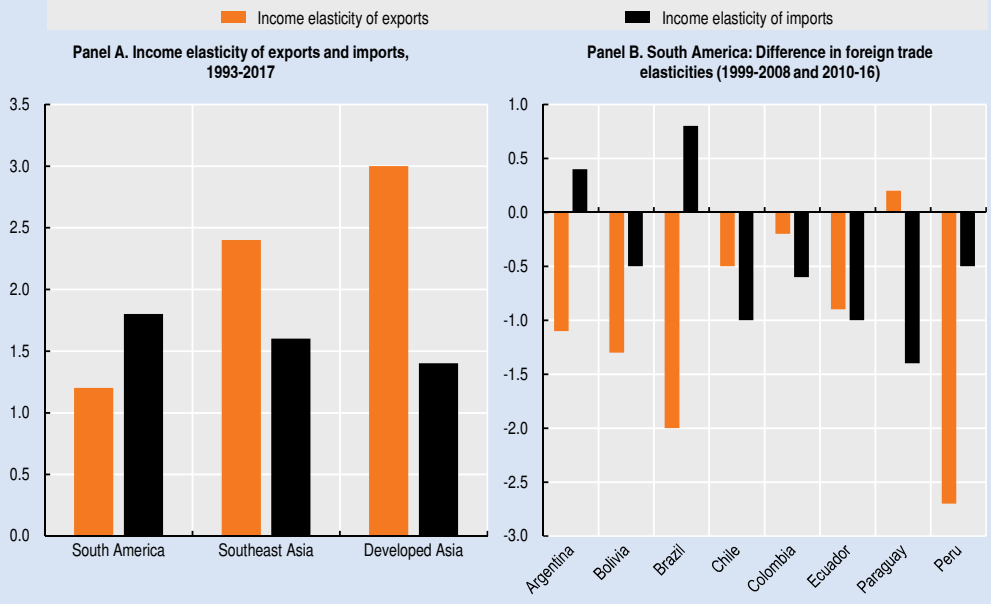
The overall impact of the crisis on the external account will depend on the combined behaviour of its various components and on the income elasticity of exports and imports (Box 1.1). While the sharp reduction in imports should alleviate the trade balance, the contraction in global demand and commodity prices should have a negative impact on the more outward-oriented LAC economies dependent on commodity revenue. Similarly, countries dependent on tourism, such as Caribbean countries, should have a negative impact on the services component of the trade balance. First estimates suggest that, for 2020, the fall in imports will be more significant than in the region's exports, producing a small improvement in the current account balance (ECLAC, 2020b). While the transfer balance in the current account will deteriorate owing to lower remittances, the income account will likely improve because of lower profit repatriations.

Box 1.1. **Income elasticity of exports and imports in Latin America and the Caribbean**

LAC countries need to change their patterns of insertion into the global economy to achieve higher GDP growth rates without suffering external imbalances. The relationship between export and import income elasticities allows estimating the growth ceiling with external equilibrium. For instance, in the case of South America, the relationship between the income elasticity of exports and imports is approximately 0.8, which implies that, if the world's GDP grew to 2% in the next few years, South America could grow to 1.4% without suffering from increasing external indebtedness (Figure 1.4, Panel A) (Abeles and Cherkasky, 2020). The ratio for Mexico is 1.2, which establishes an external restriction ceiling of 2.2%. These values are much lower than those estimated for Asian economies, which reach close to 4.0%, accounting for the much greater space to grow without colliding with the external restriction. Import elasticities are similar among various regions, so it is the low export elasticities that define the reduced ceiling for growth with external equilibrium in LAC, with a tendency to the fall of the income elasticity of exports (Figure 1.4, Panel B).

Exports in the region show low diversification and thus are much less sensitive to global demand growth than in other regions, which have recorded much higher and sustained GDP growth rates for several decades. Countries with a higher content of industrial exports, and especially those of high technological content tend to have greater export elasticities, in contrast to countries that exports raw materials. Export elasticities tended to worsen in recent years more than the pace of world product growth. With the exception of Paraguay, export elasticities fell in the last decade, amid the boom in international commodity prices, compared with the previous decade.

Figure 1.4. **Income elasticity of exports and imports, selected regions**



Source: Abeles and Cherkasky, (2020), "Revisiting Balance of Payments Constrained Growth 70 years after ECALC's Manifesto, the Case of South America", *Revista de Economia Contemporânea, 24(1)*, and CEPALSTAT (database), https://data.worldbank.org/products/ids

StatLink https://doi.org/10.1787/888934171400

The sharp decline in global demand is affecting export volumes and prices, with a deterioration of terms of trade of several countries in the region due to decreases in commodity prices. The value of the region's exports could fall by as much as 23%, with an 11% drop in prices and a 12% decline in volume, essentially owing to a sharper contraction in global demand (ECLAC, 2020b). In particular, as of early April 2020, oil prices had fallen by 60% since the beginning of the year; copper, iron, sugar and coffee prices had also sharply declined. While the collapse in oil prices can be a relief to the oil-importing Caribbean and Central American economies, it affects the fiscal and external accounts of several South American countries and other economies of the region, including Mexico and Trinidad and Tobago. The drop in metal prices is also negatively affecting countries; Chile and Peru, for instance, are suffering from the decline in copper prices.

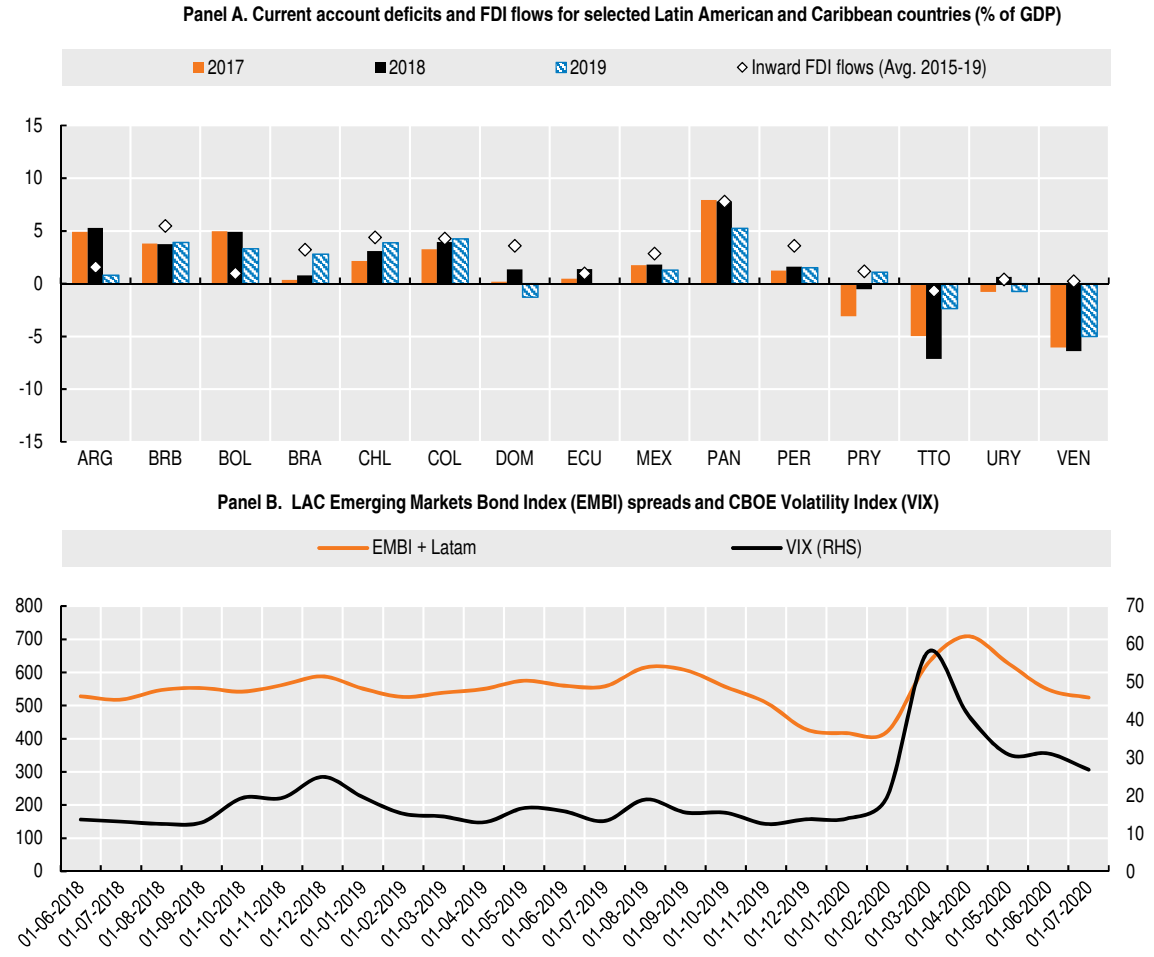
FDI will deteriorate dramatically, reducing the financing quality of the current account deficit and curbing improvements in productivity. On a global scale, FDI is expected to fall between 30% to 40%, decreasing the most in economies most severely hit by the pandemic (UNCTAD, 2020). The sharp fall in remittances (World Bank, 2020a) will further weaken current account balances, with a likely stronger impact on Central America and Mexico. Conservative estimates show that remittances originating from the United States will fall by at least 3% in 2020 (Inter-American Dialogue, 2020); this could decrease further owing to border-crossing restrictions that will sharply cut migration flows, such as seasonal workers moving to the United States.

The slowdown in LAC main trading partners, notably China and the United States, is a significant factor affecting the outlook of the region. China has become the main trading partner for many South American economies (OECD/CAF/UN ECLAC, 2015). China is not only a major importer of raw materials but also a direct investor and credit provider to LAC economies, mainly Argentina, Brazil, Ecuador and Venezuela (Inter-American Dialogue, 2020). Contraction in the United States mainly affects Mexico, Central America, Colombia and the Caribbean.

Between February and May 2020, LAC experienced substantial capital outflows (especially portfolio investment), surpassing levels reached in the aftermath of the 2008 financial crisis (IDB, 2020; IIF, 2020). Although LAC Emerging Markets Bond Index (EMBI) spreads remain lower than in the 2008 financial crisis, they are above levels observed in the past five years (Nieto-Parra and Orozco, 2020). The evolution of sovereign bond spreads in some countries of the region, in particular those without solvency difficulties, has been highly correlated with the volatility conditions of international markets. For instance, similar to international markets' expectation of volatility, measured by the Chicago Board Options Exchange's Volatility Index (VIX), LAC EMBI considerably increased in March 2020 and then relatively receded (Figure 1.5, Panel B).

Since April 2020, governments and companies in the region (e.g. Chile, Colombia, Guatemala, Mexico, Paraguay, Peru, Uruguay) have been able to issue bonds in international markets at relatively low costs, although variations across countries remain, even among investment-grade countries. Similarly, concerning exchange rate markets, currencies have depreciated differently, even among these countries. Compared with the 2015-19 year averages, between January and May 2020, the average exchange rate in Peru depreciated by 4%, in Colombia and Mexico by around 15% and in Brazil by around 33%. Strong currency depreciations will pose an additional concern to governments and companies highly indebted in foreign currency and that have not hedged their foreign currency exposure (OECD, 2020b).

Figure 1.5. **External accounts and financial conditions in selected LAC countries**



Sources: Based on official data, IMF and Bloomberg.
StatLink https://doi.org/10.1787/888934171419

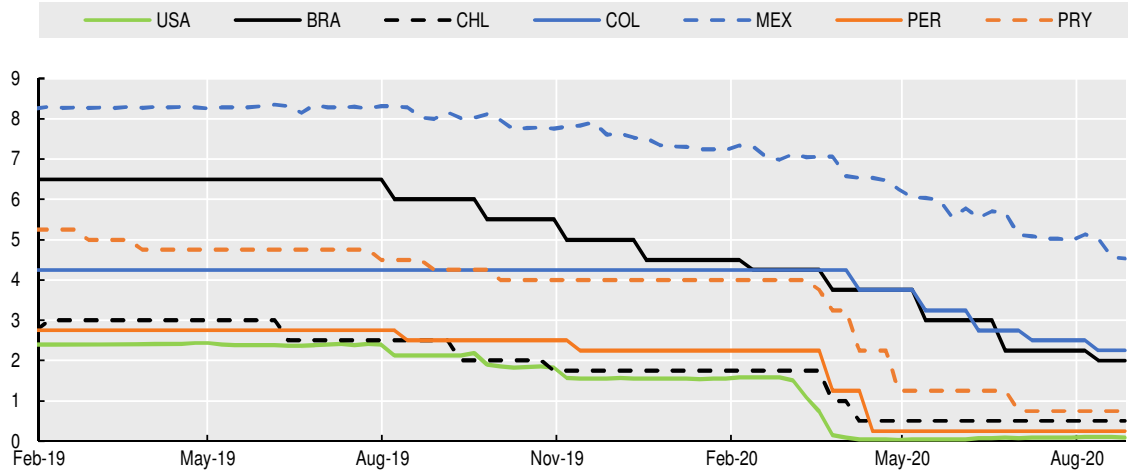
Monetary policy and financial conditions to respond to the crisis

Central banks have played an active role in the response to the coronavirus (Covid-19) crisis. Most central banks in the region started to ease monetary conditions at the beginning of lockdown measures (Figure 1.6). Monetary actions were timely, and more than ten countries decreased the policy interest rate and intervened in the foreign exchange market. Some countries provided liquidity in dollars through swap lines and purchased public or private securities. In particular, the central banks of Brazil, Chile, Colombia and, to some extent, Peru have purchased private and government securities in domestic financial markets. Credit regulations have also been eased to allow commercial banks to renegotiate loans with households and firms without affecting their credit ratings.

With the considerable decrease in domestic demand, inflation remains contained in most Latin American countries. Despite heterogeneity across countries, moderate increases in prices may be expected in the short term because of currency depreciation and supply shocks. However, given the absence of significant pressures on prices and a considerable slack in some economies, central banks in Latin America have continued to lower interest rates to shore up activity. Economic uncertainty about the duration of the coronavirus

(Covid-19) crisis and, therefore, lockdown measures in the region will affect monetary conditions.

Figure 1.6. **Monetary policy interest rates for selected countries (%)**



Source: Based on official data and Bloomberg.
StatLink https://doi.org/10.1787/888934171438

Local financial systems were relatively well prepared to face the economic shock, with high solvency and liquidity ratios before the crisis. Even so, demand for liquidity is projected to increase as firms and households may seek additional credit or use existing lines to mitigate the negative effects of lockdown measures on economic activity. Prompt actions by central banks have largely reduced the risks of liquidity shortfalls in financial systems. Non-performing loans may also grow, particularly once renegotiated loans mature. Evidence suggests that banks behave pro-cyclically during crises and may restrict credit to preserve their balance sheets, but countries in the region have already adopted measures to prevent the situation spiralling down. More than 15 countries have imposed a moratorium on loan repayment, opened preferential lines to provide credit or liquidity to small and medium-sized enterprises (SMEs) and reduced liquidity and reserve requirements to support credit (Nuguer and Powell, 2020).

Fiscal policy to mitigate the crisis and ignite the recovery

Fiscal policy is playing an essential role in mitigating the negative economic and social effects of the pandemic and will continue to be pivotal in the recovery. With fragile or non-existent unemployment insurance, high informality and low tax revenues in the region, weak automatic stabilisers (Espino and González Rozada, 2012) make discretionary fiscal responses to the crisis even more urgent.

Most LAC economies have implemented fiscal measures (OECD, 2020c). Over 20 countries have put in place transfers to households and opened credit lines to firms. More than 15 countries have also introduced reductions or deferrals of labour taxes and social security contributions, and debt service deferrals and salary compensation for workers. Measures aiming to mitigate the effects of the coronavirus (Covid-19) crisis should be designed as temporary so as not to compromise future fiscal stability (ECLAC, 2020c; Izquierdo and Ardanaz, 2020).

On average, fiscal support in some countries of the region has been modest compared with the size of the shock and with advanced and other emerging economies. Fiscal support varies considerably across countries and it has been relatively large in some economies,

including Brazil, Chile and Peru. However, the final value of these measures remains uncertain given the final execution of these announcements as well as the possibility to expand the duration or coverage of these temporary actions or the announcement of new policy actions in the upcoming months. Moreover, informality and limited access to bank accounts complicate the logistics, focalisation and effectiveness of transfers to firms and vulnerable households. However, some countries have implemented innovative policies in that respect (see the section below on the social effects of the coronavirus [Covid-19] crisis).

Macroeconomic policies in response to the coronavirus (Covid-19) crisis, including fiscal, should distinguish short- and medium-term objectives and instruments. The short term refers to policies aimed at confronting immediate effects. The medium term refers to a context of a flattening contagion curve and progressive lifting of lockdown measures. Co-ordination among monetary, fiscal and capital account regulation policies is essential in the short, medium and long term.

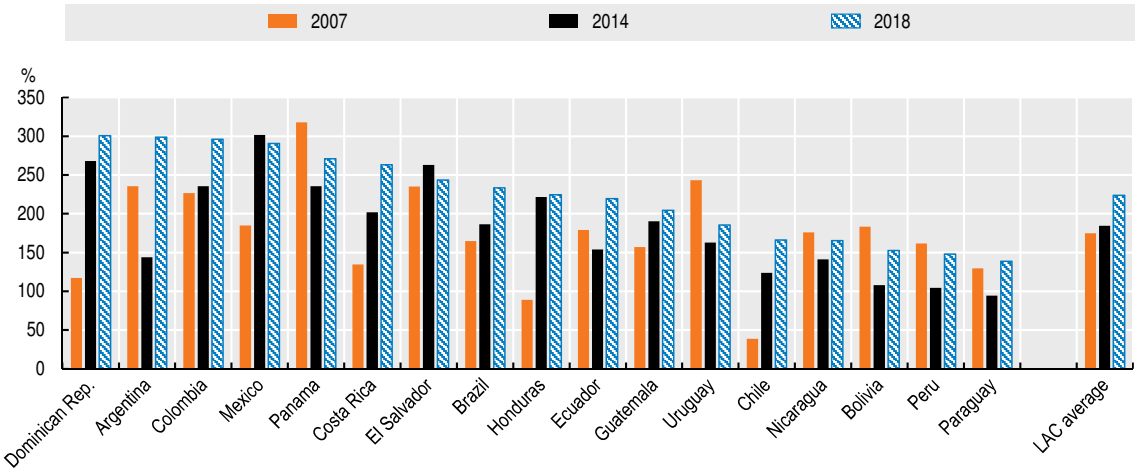
Short-term fiscal policy should strengthen health systems, provide liquidity to firms to preserve employment and help them survive, and buffer household income losses, particularly those more vulnerable. Some countries with high informality or underdeveloped social safety nets have resorted to implementing or expanding existing social transfer programmes and guaranteed to facilitate loans to SMEs.

In the medium term, transfers and guarantees must give way to increased capital expenditures and investment in education and skills as key to ignite and sustain recovery efforts. After the health emergency, fiscal policy should increase demand, while focusing on investing in infrastructure and human capital to increase medium-term productivity. Public capital expenditures are set to have high multiplier effects in the economy and provide the expectation of profitability for crowding in private-sector investment, especially if pursued in close co-ordination with policies that allow formalisation and reallocation to more productive firms. Not all fiscal measures are alike and governments should strive to design stimulus packages that deliver large economic multipliers reasonably quickly and also set the economy on a path towards low-carbon development (Hepburn et al., 2020).[2]

LAC countries' ability to react to the pandemic with fiscal policy will depend on their starting fiscal position and their access to international markets. Before the crisis, with strong heterogeneity among countries, fiscal space in the majority of countries was limited, as many economies were undergoing fiscal adjustments. Fiscal deficits are the norm in most countries in the region. Despite high heterogeneity, tax revenues remain scarce at close to 23.1% of GDP, more than ten percentage points lower than the OECD average (OECD et al., 2020). Moreover, fiscal policy has not been sufficiently effective in reducing inequalities, informality and promoting entrepreneurship. The relatively low tax revenue also implies the need for improving the design, targeting and execution of public expenditures (Izquierdo, Pessino and Vuletin, 2018; OECD et al., 2019).

Debt levels have increased in almost all countries since 2014. Public debt-to-tax ratios, a proxy indicator of countries' financial capacity to pay the public debt, increased in most countries, leaving them in a weaker position to face the coronavirus (Covid-19) crisis than they were in 2007, before the 2008 financial crisis (Figure 1.7). Going forward, fiscal measures to address the crisis and the consecutive economic slowdown are likely to take a toll on tax revenues. Given the increasingly limited fiscal space and the increasing revenues needed to address the heterogeneous challenges, global co-ordination of public debt management should be the priority.

Figure 1.7. **Debt-to-tax ratio (gross public debt) in selected Latin American countries, 2007, 2014 and 2018**



Sources: Based on official data (2019) and OECD et al. (2020), *Revenue Statistics in Latin America and the Caribbean 2020*.
StatLink https://doi.org/10.1787/888934171457

Global co-ordination of public debt management

Coronavirus (Covid-19) fiscal needs call for globally co-ordinated debt management. Issuer or creditor inaction can lead to debt defaults and, therefore, debt crises, adding to an already complicated scenario. There is no unique solution to managing public debt in the region owing to country differences in initial fiscal conditions, type of foreign creditors and financial capacity to tap into capital markets.

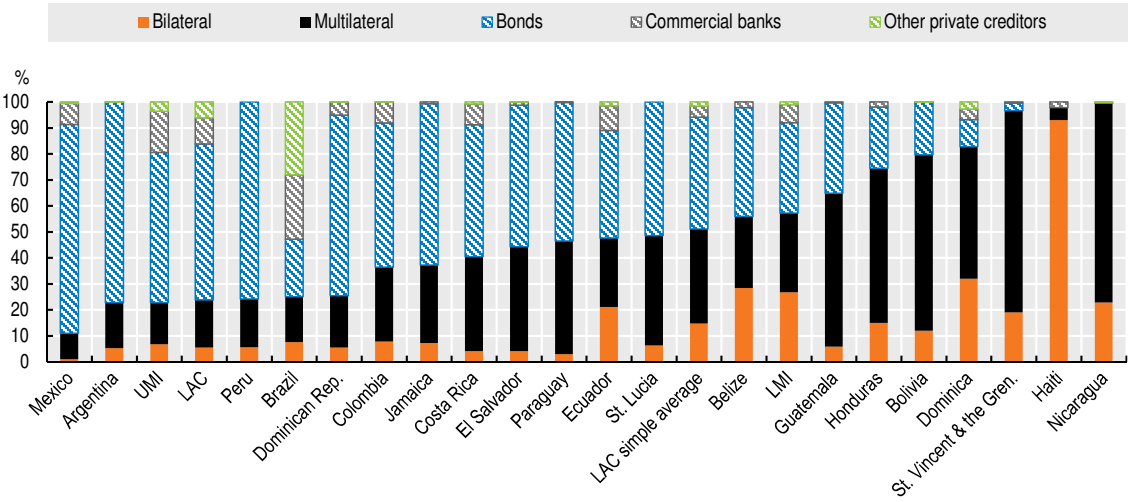
Some countries had challenging financial situations before the pandemic. In countries including Argentina and Ecuador, international discussions on outstanding public debt obligations started before the crisis; Ecuador reached the majority needed to restructure bonds with private creditors in August 2020. Capital markets actors had already put a price on the cost of restructuring before the crisis (Nieto-Parra and Orozco, 2020). Similarly, Argentina reached an agreement to restructure almost 100% of its external public debt on 31 August 2020. Caribbean countries are highly indebted and may face borrowing constraints. In 2018, 3 of the 25 most indebted countries in the world (measured by gross general government debt levels relative to GDP) were in the Caribbean: Antigua and Barbuda, Barbados and Jamaica (IMF, 2019; OECD et al., 2019).

How countries raise resources varies across the region. Some Central American countries (e.g. Guatemala, Honduras, Nicaragua), Caribbean economies (e.g. Haiti, Saint Vincent and the Grenadines, Dominica) and a few South American economies (e.g. Bolivia, Ecuador) have traditionally issued debt through bilateral creditors or multilateral banks. On the other hand, Mexico and most South American economies have traditionally had access to capital markets to raise funds (Figure 1.8), and about half their debt is in domestic currency. Brazil issues debt mostly in domestic currency. High local currency debt issuance reduces the debt sustainability risks in the face of large exchange rate depreciations.

Debt ratios are expected to increase in the next two years. As long as interest rates would be below growth rates, debt ratios should stabilise in the medium term, but at higher levels. Debt should eventually be brought back to more sustainable levels and fiscal space regained, but the process must be gradual to prevent stalling growth and social progress. With abundant liquidity, international capital markets seem more willing

to admit larger debt ratios at this point, and there is still access to capital flows. However, financial conditions to tap into capital markets vary across countries, and pricing varies considerably according to countries' debt sustainability. Conditions may also change rapidly in the medium term if monetary policy normalises in advanced economies.

Figure 1.8. **External public debt stock by creditor (public and private) in selected Latin American and Caribbean countries, 2018**



Notes: LAC simple average gives equal weight to all countries on their distribution of credit holders; LAC takes into consideration the amount issued by each LAC country. LMI and UMI are all lower middle-income and upper middle-income countries in the world.

Source: OECD Development Centre calculations based on World Bank (2020b), *International Debt Statistics* (database), https://data.worldbank.org/products/ids (accessed May 2020).

StatLink https://doi.org/10.1787/888934171476

High heterogeneity in public debt levels and financial conditions across LAC countries highlights several policy actions that can be crucial in response to the coronavirus (Covid-19) crisis, depending on the case:

- There needs to be co-ordinated action among bond holders and capital markets actors in restructuring debt issued by countries already facing financial difficulties. This is crucial to minimise reputational risk (i.e. future access to capital markets) and provide countries with some fiscal space to respond. Collective Action Clauses can help facilitate renegotiation with bond holders.

  Previous debt relief or restructuring mechanisms provide useful lessons learned. In particular, creditors and debtors should share the burden. Debt relief or restructuring initiatives should be led by official creditors, then crowd in private creditors (Bolton et al., 2020). Governments should focus on an effective economic policy communication strategy and the objectives regarding expected achievements from debt relief or restructuring. Effective data and information sharing with creditors is key. Last, governments should include appropriate contingency clauses in the agreement.
- Official support should prioritise economies that have little or no access to capital markets.
- Countries that already enjoyed ample fiscal sustainability must retain access to capital markets with low risk premiums that allow them to raise funds needed to respond to the crisis.
- Another group of countries might have access to capital markets but face high debt cost due to the deterioration in perceptions of debt sustainability among markets

participants. The deterioration includes current and potential downgrades in credit ratings or expectations of low future growth and public revenues. There are several policy options, including debt standstill or moratorium, debt relief, creation of a special vehicle to finance the crisis or pay the debt, and greater use of Special Drawing Rights. All require international co-operation, involving multilateral banks, developed countries or private creditors (Nieto-Parra and Orozco, 2020; Bolton et al., 2020).

Historical examples provide lessons for facing today's public finance challenges, for instance, the outcome of the long 1980 debt crisis resolution process in the region. Policy support and co-operation among countries in the early 1990s (e.g. by converting bank loans to bonds [Brady Plan]) were vital in reducing socio-economic costs. Involving private creditors helped lower uncertainty surrounding access to capital markets and allowed economies to access financial markets and borrow additional resources (Eichengreen, 2020). Rapid policy response is essential to avoid high socio-economic costs (Flores Zendejas, 2020).

Increased productivity to promote growth

Low productivity growth has long been a drag on potential growth. One of the most relevant challenges for LAC countries is related to their low levels of productivity (see Chapter 2). LAC countries base their competitiveness, to a large extent, on the advantages of natural resources or the abundance of low-skilled labour. This type of comparative advantage can sustain periods of rapid growth, such as during the commodity boom, but not long-term convergence with advanced countries.

The type of competitiveness necessary to achieve sustained economic growth is based on incorporation of technology and productive diversification towards dynamic sectors, both in technology and in terms of international demand (ECLAC, 2012) (see Chapter 2). The importance of technology is visible in the ability to respond to the crisis. Countries with a more developed communications infrastructure and that are more advanced in their adoption of digital technologies are better placed to preserve certain economic activities and save jobs in the region. However, significant gaps remain in many countries in terms of digital and technology assimilation (CAF, 2020b).

In the medium term, public capital expenditure can play a role to ignite recovery efforts and boost productivity growth. Under the expected circumstances, capital expenditures are bound to have a high multiplier effect on employment and promote productivity. They can act as a vehicle for crowding in private-sector investment, especially if pursued in close co-ordination with production transformation policies, and with improvements in private-sector policies and the business climate. Indeed, close co-ordination between public investment and production transformation (e.g. via public procurement policies) may maximise the multiplier effects of the former.

The outcomes of a lengthy wave of contagions, mobility restrictions and moderate policy support in most LAC countries may well be destruction of some capital (i.e. firm bankruptcies) and high unemployment and informality. Policy efforts should be directed to facilitate mobility and efficient reallocation of resources to more productive firms and sectors. There is space to promote competition, innovation and entrepreneurship; simplify tax systems to encourage firm expansion and formalisation, and to make fiscal policy more progressive; and improve state capacities to provide better goods and services to citizens to rebuild trust in governments (OECD et al., 2019). More efficient and better-funded governments will be better equipped to meet the challenges of promoting sustainable growth and developing adequate systems of social protection and safety nets.

Social effects of the coronavirus (Covid-19) crisis

The fight against poverty and inequality, and the realisation of more just and inclusive societies with higher levels of well-being for all, as stipulated in the UN 2030 Agenda for Sustainable Development, is an objective at the highest level in LAC political agendas. Although countries have made significant progress in reducing poverty and inequality over the last decades, there are still significant challenges and structural gaps to act upon, which the present crisis is magnifying.

Inequality in LAC is the result of a complex matrix of determinants and has its roots in the economic structure and institutional settings. Income group or class is one of the structural axes of social inequality, along with gender, age (life cycle), ethnicity, race and territory. Individual socio-economic status reflects and explains many of the dimensions in which inequality is expressed: employment and work, access to productive resources and income, education, health, basic services, housing, food, security, social protection, opportunities to live free of violence, technology and participation, among others (ECLAC, 2018a, 2016).

LAC societies are characterised by structural inequality, which has been maintained and reproduced even in periods of economic growth and prosperity. This inequality constitutes an insurmountable obstacle to the eradication of poverty, to sustainable development and to the guarantee of people's rights. High levels of income inequality can have negative effects on economic growth and create political instability (Milanovic, 2020). Inequality is based on an economic structure that is concentrated in a few sectors. It is characterised by a complex framework, in which socio-economic inequalities intersect with gender, territorial, ethnic, racial and generational inequalities (ECLAC, 2016).

The social consequences of the coronavirus (Covid-19) crisis are asymmetrical and mainly affect the most vulnerable groups, aggravating the region's already complicated social scenario (see Chapter 3 for the role of the digital transformation for these groups).

Regarding the production structure, the economic downturn will mostly affect workers from sectors like tourism, commerce and transport, particularly micro, small and medium-sized enterprises and own-account workers, most of whom are informal. The crisis will be particularly difficult for micro and small firms, which have no capacity to absorb the shock. Around 2.7 million – or 19% of all firms – mostly micro companies are likely to close (Figure 1.9, Panel A), entailing the loss of 8.5 million jobs and affecting the livelihoods of many more households that depend on those jobs for their household income (ECLAC, 2020d).

Extending support to firms is difficult, as many are informal and often fall outside the scope of programmes aimed at the productive sector. Direct transfers, credit guarantees and moratoria on the payment of taxes, utilities or social security contributions usually require formal status. As support to informal activities is mainly targeting the self-employed, informal SMEs are falling through the cracks. Some countries are encouraging firms to formalise, at least to some degree: in exchange for signing up on registries, they become eligible for support (Basto-Aguirre, Nieto-Parra and Vázquez-Zamora, 2020).

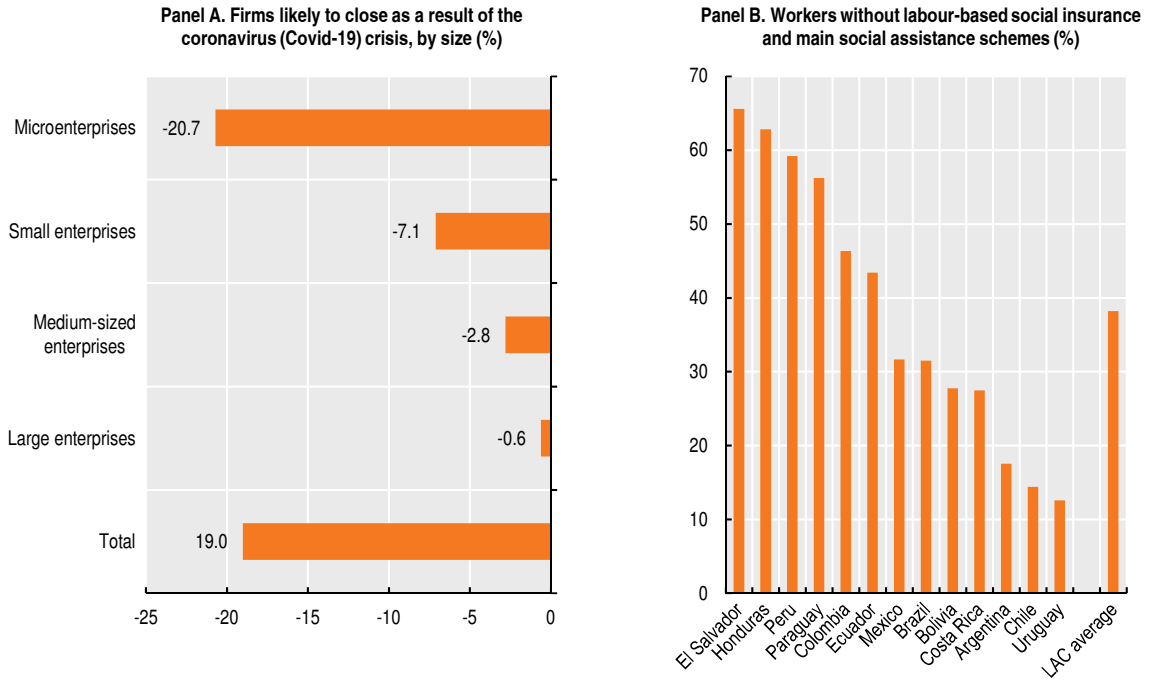
The income shock generated by the coronavirus (Covid-19) crisis is having a negative effect on social conditions in LAC, especially for the most vulnerable. The shock hurts disproportionately the poorest and most economically vulnerable households in a region where 25% of the population is poor and 37% is vulnerable to falling into poverty. Most workers in these income groups are caught in the social vulnerability trap: in informal jobs that limit their access to social protection (including health services), unemployment insurance, income stability and savings as a safety net.

On average, close to 60% of workers in the region are considered informal, with particular incidence across the most disadvantaged socio-economic groups (OECD,

2020b). Some 58% of informal workers live either in economic vulnerability (USD 5.5-13.0 per day) or in poverty (less than USD 5.5 per day).

Social assistance programmes in the region cover a significant portion of poor households, but many remain exposed. Close to 40% of workers are not protected by any safety net (Figure 1.9, Panel B); this reaches a level of 65% across informal workers (Basto-Aguirre, Nieto-Parra and Vázquez-Zamora, 2020). These workers can hardly face any increases in health expenditures or income loss due to quarantine measures. Containing the increase in poverty requires new forms of social protection that reach vulnerable groups during this crisis or the provision of emergency basic income so that no citizen lives under the national poverty line (ECLAC, 2019).

Figure 1.9. **Workers without a safety net and firms likely to close owing to the coronavirus (Covid-19) crisis in selected Latin American countries**



Source: ECLAC (2020d), "Sectors and businesses facing COVID-19: Emergency and reactivation", *Special Report COVID-19 No.4* and Basto-Aguirre, Nieto-Parra and Vázquez-Zamora (2020), *Informality in Latin America in the post COVID-19 era: Towards a more formal "new normal"?*, Vox Lacea.

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Governments have made significant efforts to reach informal workers and households by expanding non-conditional cash transfers. Argentina's *Ingreso Familiar de Emergencia* explicitly aims to reach households that subsist from informal activities, self-employment or domestic work. In Brazil, informal workers and the unemployed earning less than half the minimum wage and not covered by social benefits except *Bolsa Família* received a temporary new benefit. In Chile, Ingreso Familiar de Emergencia reaches informal workers and vulnerable households. In Colombia, *Ingreso Solidario* aims to reach 3 million vulnerable informal or self-employed households not covered by social benefits. Dominican Republic put in place the *Quédate en Casa* and *Pa' Ti* programmes. Ecuador's *Bono de Protección Familiar* was expanded to reach informal households not receiving other social transfers. Peru also expanded *Bono Familiar Universal* during the crisis to reach 2.3 million households without a formal dependence labour relationship (OECD, 2020b). While the coronavirus (Covid-19) crisis is a major challenge for the region, it is also an opportunity

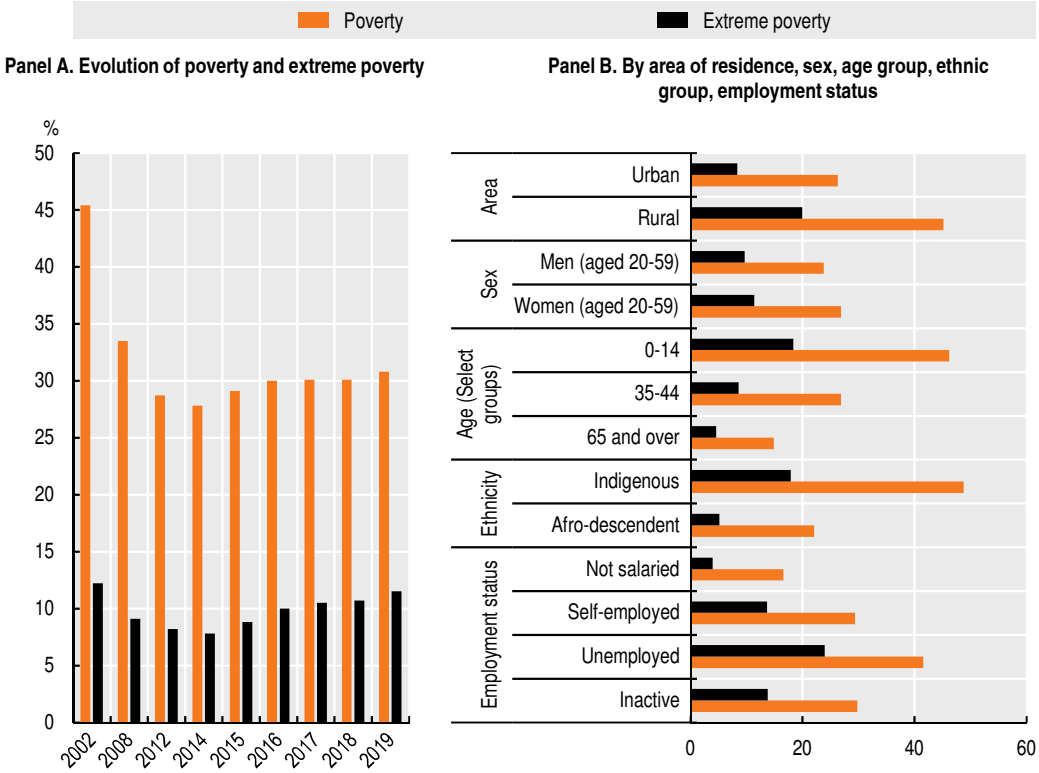
to rethink social protection and move towards more inclusive systems (Basto-Aguirre, Nieto-Parra and Vázquez-Zamora, 2020).

The poverty dimension

Between 2002 and 2014, the region made great strides in reducing the poverty rate (from 45.4% to 27.2%) and extreme poverty rate (from 12.2% to 7.8%). The end of the commodity export boom and the consequent economic slowdown reversed the trend from 2015 onwards and the number and rate of poor people started to increase again. In 2019, the number of people living in poverty and extreme poverty reached 191 million and 72 million, or 30.8% and 11.5% of the LAC population, respectively (Figure 1.10, Panel A) (ECLAC, 2019). The commodity price fall was intensified by the reduction in fiscal space and adjustment policies that affected coverage and continuity of anti-poverty and social and labour inclusion policies (Abramo, Cecchini and Morales, 2019). Labour market indicators deteriorated: unemployment rose and the trend towards greater formalisation was curbed. The increase in poverty varies across LAC countries, and the impact is greater among those in rural areas, women, children (and Afro-descendants and indigenous people (Figure 1.10, Panel B).

In the absence of a strong response, the coronavirus (Covid-19) pandemic could increase poverty and extreme poverty. An additional 45.4 million people could become poor, reaching a total of 230.9 million people (37.3% of the LAC population). Extreme poverty is likely to increase by 4.5%, 28.5 million more people, affecting a total of 96.2 million people (ECLAC, 2020a).

Figure 1.10. **Evolution of poverty and extreme poverty in Latin American and Caribbean, by socio-economic characteristics, 2002-19**



Source: Own elaboration based on ECLAC (2019), *Panorama Social de América Latina*.
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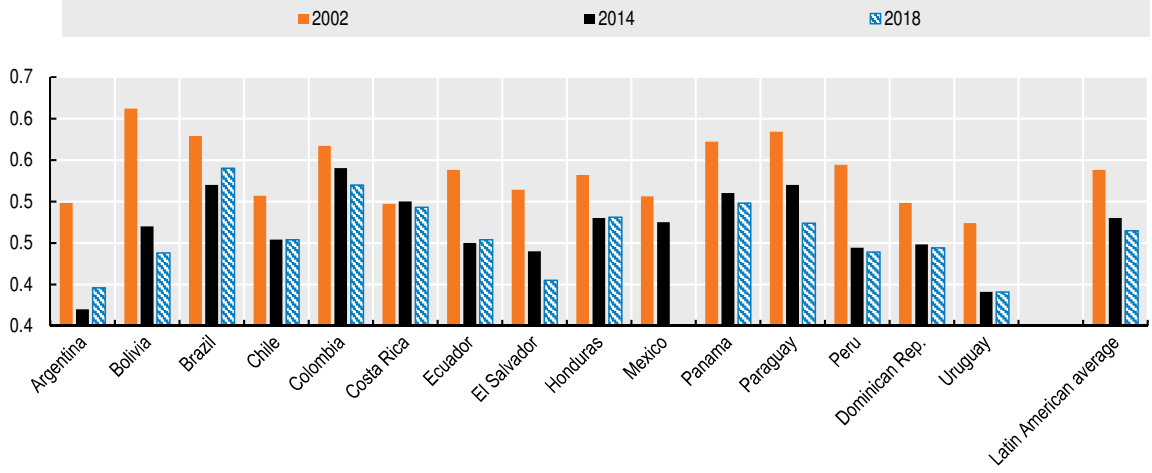
The inequality dimension

Despite significant progress in the last 15 years, inequality remains high in LAC. It is the most unequal region in the world, with an average Gini Index almost one-third higher than Europe. The average LAC Gini Index fell from 0.54 in 2002 to 0.47 in 2014 and 0.46 in 2018 – a decrease of 13.6% in 16 years or 0.9% per year, on average. The pace of decrease slowed over the period: the average between 2014 and 2018 was 0.6% per year, compared with 1.0% per year between 2002 and 2014. However, these averages mask very uneven patterns across LAC countries in relation both to inequality and to the intensity and direction of changes over the periods. In 2018, Argentina, El Salvador and Uruguay recorded the lowest levels (below 0.40); Brazil and Colombia recorded levels higher than 0.52 (ECLAC, 2019) (Figure 1.11).

The coronavirus (Covid-19) crisis will exacerbate already existing inequalities because of the higher incidence in most vulnerable segments of the population. In this respect, the digital divide in the region has become an even greater concern as it can further enhance inequalities. Digital solutions have been developed to mitigate the consequences of the lockdowns. Still, 32% of the LAC population has no Internet access, which has proven essential to confront the impacts of the pandemic (CAF, 2020b). Education is a case in point: not all students, nor all schools are equally equipped or have access to the necessary equipment and pedagogical tools for remote schooling. Students from more disadvantaged backgrounds or from schools in disadvantaged areas suffer the most from school closures in terms of learning outcomes, with possible lasting consequences (OECD, 2020b) (Chapter 3). In fact, the impact on inequality can well go beyond this crisis. Education is case in point. Not all students, nor all schools are equally equipped or have access to the necessary communication infrastructure or pedagogical tools to deliver remote schooling successfully. Students from more disadvantaged backgrounds or from schools in disadvantaged areas suffer the most from school closures. Higher dropouts from school and lower learning outcomes will likely have lasting consequences on their human capital formation, job opportunities and future earnings (OECD, 2020b) (Chapter 3). Moreover, girls are at a greater risk of not returning once schools reopen, deepening gender gaps and reducing girl empowerment.[3]

Figure 1.11. **Inequality in selected Latin American countries (Gini Index), 2002, 2014 and 2018**



Source: ECLAC (2019), *Panorama Social de América Latina*.
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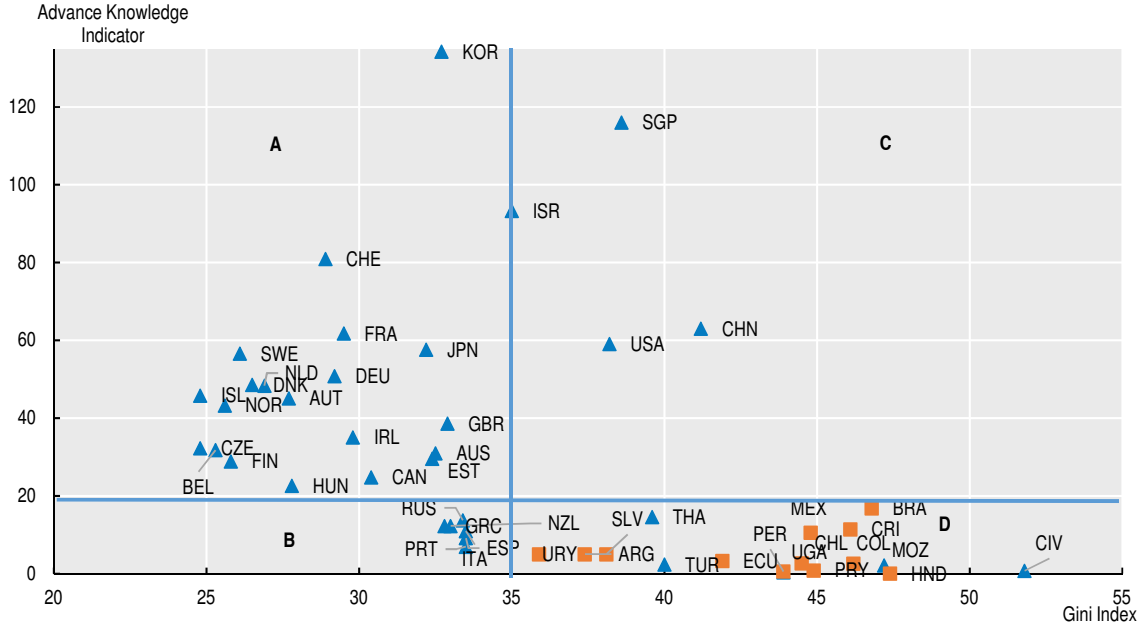
Socio-economic challenges and the productive structure

Poverty, inequalities and social vulnerabilities are strongly related to the productive structure and how countries are inserted in the knowledge economy. This can be illustrated by analysing the relationship between inequality and the Advanced knowledge indicator, a proxy of the productive structure. The indicator combines a country's specialisation in the production and export of high-tech goods with research and development (R&D) efforts, considering the productive and technological capabilities and generation and dissemination of knowledge (Rovira, forthcoming). By relating this indicator to an income inequality index (Gini Index), four possible groups are identified, with respect to the world average.

Latin America is in the group with high inequalities and low technology adoption, although with variation across countries. Countries in the first group (quadrant A, Figure 1.12) have a high advanced knowledge indicator value (economies that export high-tech goods and incorporate R&D as a main element in their development strategies) and low income inequality. Those in the second group (quadrant B) do not have a very high degree of sophistication but have low income inequality, thanks to social welfare. Those in the third group (quadrant C) have diversified productive structures and a knowledge-based economy but high income inequality. Those in the fourth group (quadrant D) have high income inequality and poor capacity to generate and incorporate technologies into their productive structure. Some African countries, Turkey, Thailand and all Latin American countries are part of this quadrant, although with very strong heterogeneity among them. Countries with lower relative levels of income inequality, such as Argentina and Uruguay, contrast with countries like Brazil, Colombia and Honduras.

Figure 1.12. **Advance knowledge indicator and the Gini Index**



Note: The Gini coefficient uses income after taxes and transfers. The "Advance Knowledge" indicator is calculated as the multiplication between the averages (2014-17) of the variables i) high technology exports as a percentage of manufacturing exports and ii) R&D expenditure as a percentage of GDP. Due to the availability of information, for the average of the R&D expenditure variable as a percentage of GDP, in the case of India, Mozambique, New Zealand and Senegal, only the year 2015 was taken; In the case of Mexico, the years 2014, 2015 and 2016 were taken and, in the case of Ivory Coast, the year 2016. For the average of the variable of high technology exports as a percentage of exports in manufacturing, in the In the case of Mozambique, only the years 2014, 2016 and 2017 were taken.

Source: Rovira, forthcoming, *Deconstruyendo el proceso de desarrollo de ALC: entre la heterogeneidad productiva, la escasa complejidad tecnológica y la concentración del ingreso.*

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The coronavirus (Covid-19) crisis is an opportunity to implement pending structural reforms in the region and lay the foundations of a new social contract. The crisis comes at a time of growing discontent between citizens and states – as highlighted by the protests in late-2019 – and unmet aspirations for better-quality public services and well-being (OECD et al., 2020). While the crisis may deepen social discontent, it could also create momentum to rethink the social contract, address structural vulnerabilities – the region's productivity, social vulnerability, institutional and environmental development traps – and thereby respond to rising aspirations. In evolving a new social contract, dialogue among all actors, including civil society, policy makers, academics, unions and the private sector, is essential to build consensus, address existing issues and guarantee a sustainable pact.

Such a process should take several dimensions into consideration. First, stronger social protection systems could play a central role in future public policies. Second, more resources will be necessary to build resilience and finance inclusive development, including through reformed progressive tax systems and more efficient public expenditure. Third, successful sustainable development strategies should support effective co-ordination to boost formal employment, productivity growth and the transition to more inclusive and low-carbon development models. The participation of a broad range of actors throughout the policy-making process is necessary to draw upon a variety of knowledge and viewpoints. For this reason, international and regional co-operation will also be important sources of knowledge, financing and co-ordinated action both in the immediate response to the crisis and to sustain the future reforms and a sustainable recovery in the region (OECD et al., 2020).

Digital transformation in the time of coronavirus (Covid-19)

The coronavirus (Covid-19) and its containment have corroborated the increasing role of new technologies and a transition towards a digital economy and society. The exponential increase in Internet traffic, the growing importance of teleworking and tele-conferencing, and the maintenance of distribution and supply value chains are just a few indicators of this acceleration (CAF, 2020b). Technology has become particularly useful to help contain the pandemic, with some economies using digital tools to communicate test results and track quarantined citizens (Kim, 2020) (see Chapter 4). Digital technologies have allowed parts of the population to keep working or studying from home while in quarantine, allowing access to updated information, public services and education programmes while complying with social distancing measures (see Chapter 3).

The Internet, digital platforms and e-commerce contributed to a few sectors maintaining partial activities. They facilitated commercial transactions (e.g. Amazon, Mercado Libre, Rappi), financial services (e.g. Ant Financial, Avant, Mercado Pago, Nubank), communication services and social networks (e.g. Facebook, Skype, WhatsApp, Zoom), tourism and hosting services (e.g. Takeoff, Booking, Airbnb), app development (e.g. Apple iOS, Google Android) and job matching (e.g. Laborum, LinkedIn, Workana, Freelancer). Digital technologies can play an important role in the region's recovery as well, while addressing the persistent challenge of low productivity. They can spur new connections between supply and demand, facilitate commercial transactions and job matching, and create or modernise industries, for instance, into agriculture (Aggrotech), banking and finance (Fintech) or automotive (Autotech) (see Chapter 2). Analysis of Big Data captured by digital payments is allowing governments to track the recovery and facilitating research on policy effectiveness more promptly.

The different impacts of containment measures across sectors and socio-economic groups is a stark reminder of why addressing digital gaps, promoting inclusiveness and

making technologies work for all should be a main policy goal. Only workers, students, citizens and consumers with adequate infrastructure and skills can benefit from the advantages of technological tools to continue working, studying and accessing goods and services. Urgent additional efforts are necessary in the region to deploy communication infrastructure (CAF, 2020b), improve regulatory frameworks and enhance access to the internet and digital services. In parallel, education and training systems must be better equipped to deliver digital skills (OECD, 2020d) and transversal skills (IDB, 2019). These skills are necessary for people to benefit from the digital transformation and adapt to changing circumstances through their life. For instance, gender disparities start early in school and affect future professional development. In both LAC and the OECD, boys are four percentage points more likely to start using digital devices before age 4 and five percentage points more likely to start between ages 4 and 6 (see Chapter 3). An increasing role for international co-operation is needed to co-ordinate and intensify such efforts (see Chapter 5).

Digital transformation as a catalyst for inclusive and sustainable development

Low economic growth, a vulnerable middle class and persistent inequalities are symptoms of the region's four development traps. Their circular, self-reinforcing dynamics limit countries' capacities for further inclusive and sustainable growth. These traps are the result of longstanding weaknesses and new challenges arising from progress towards higher income status (OECD et al., 2019). The digital transformation brings new tools and opportunities, but also challenges. If properly adapted, digital tools can help the region to cope with the current crisis and existing structural challenges. Technological progress has accelerated, and major shifts are radically transforming economies and societies.

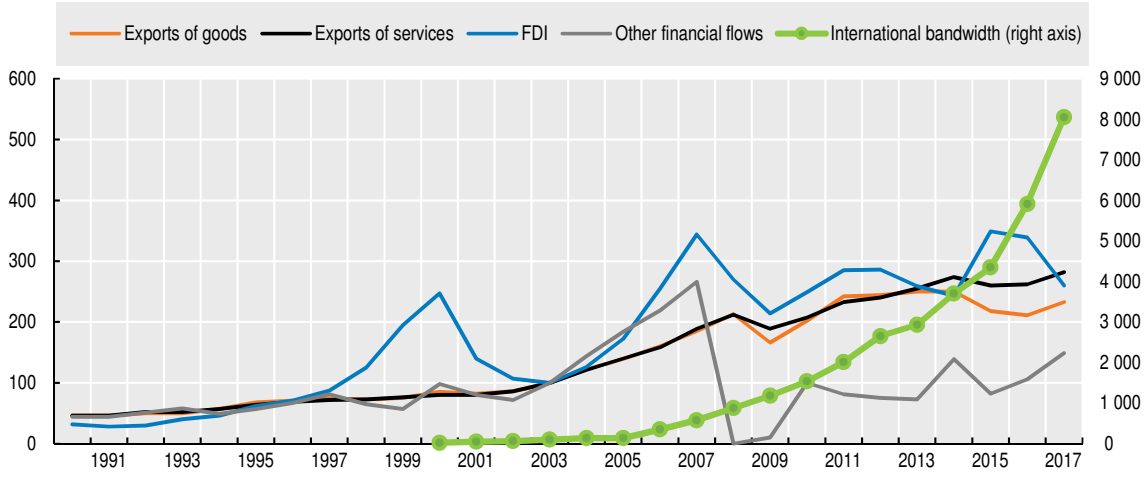
The digital transformation is still at an early stage in LAC, and the major transformational impact of changes is yet to been seen. AI, Big Data, Blockchain, the IoT, drones, 3D printing, computing power, cloud computing and 5G networks are prominent examples making up the so-called fourth industrial revolution or next production revolution (OECD, 2017a, 2017b). The dynamism of digitalisation is evidenced by the fast growth of international bandwidth capacity[4] since 2007, despite volatility in international markets and a global financial crisis. Worldwide data flows increased about 130-fold between 2002 and 2017, while commercial and financial flows only tripled. Three phases can be singled out. The first phase of growth, from 2000 to 2010, shows the beginning of the digital transformation and associated data flows. The second, between 2010 and 2015, shows an acceleration of these flows, mainly driven by the development of broadband networks. The third, from 2015 onwards, shows greater acceleration in data flows, driven by greater combined adoption of digital technologies (Figure 1.13).

The digital transformation can help address the region's development traps. It can support a more inclusive and productive society (see Chapters 2 and 3), help diversify the LAC economies (OECD, forthcoming), help improve governance, enhance access to public services (see Chapter 4), expand the way people collaborate and create content, and enable them to benefit from access to global markets and greater product diversity and choice. The United Nations (UN) Sustainable Development Goals (SDGs) identify access to information and communications technologies (ICT) and universal and affordable access to the Internet as a key target (target 9c). Digital tools can promote the achievement of many SDGs (OECD et al., 2019).

Policy makers in the LAC region need to be more pro-active in "going digital" and step up their engagement with citizens, businesses and unions to adapt policies to the new context. Efforts are underway but there are still strong lags (OECD, 2020e), and seizing the opportunities will also require new policy approaches that take into account how the transformation affects all aspects of the economy and society in complex and interrelated

ways, challenging existing policies in many areas and cutting across sectoral policy silos. Stronger domestic (including across levels of government) and international co-operation and collaboration, and rethinking how policies are developed and implemented, will be critical. The OECD Going Digital project identifies seven key areas of action to make the digital transformation benefit growth and well-being: 1) enhance access to digital technologies; 2) strengthen their effective use; 3) enable digital innovation; 4) ensure quality jobs for all; 5) promote an inclusive digital society; 6) strengthen trust; and 7) foster open markets (OECD, 2019a). Action in these areas can provide Latin American governments with a useful framework to overcome LAC's development traps.

Figure 1.13. **Commercial flows of goods and services, foreign direct investment, other financial flows and international Internet traffic capacity, 1990-2017 (Index 2003 = 100)**



Source: ECLAC (2018b), *State of Broadband in Latin America and the Caribbean 2017.*
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If digitalisation is to be a driver of sustainable development, the design and implementation of digital transformation strategies should be coherent and aligned with a country's sustainable development strategy. In this respect, it is important to highlight how digital transformation can help address spatial disparities and move towards a low-carbon development model. The regional (sub-national) dimension should not be overlooked. The considerable heterogeneity in digital transformation across regions within countries must be addressed to boost productivity, competitiveness and inclusion in co-ordination with national policies (Box 1.2).

Box 1.2. **Regional gaps in digital transformation: the case of Colombia**

For the past seven years, the Private Competitiveness Council and the Universidad del Rosario have produced and published the Departmental Competitiveness Index (IDC), a multi-dimensional diagnosis of the economic development of Colombia's regions based on the methodology of the World Economic Forum (WEF) Global Index of Competitiveness.

The IDC is constructed from 104 hard indicators – which do not correspond to results of perception surveys – grouped into 13 pillars and 4 competitiveness factors. The final result is a normalised score from 0 to 10 for Colombia's 32 departments and Bogotá.

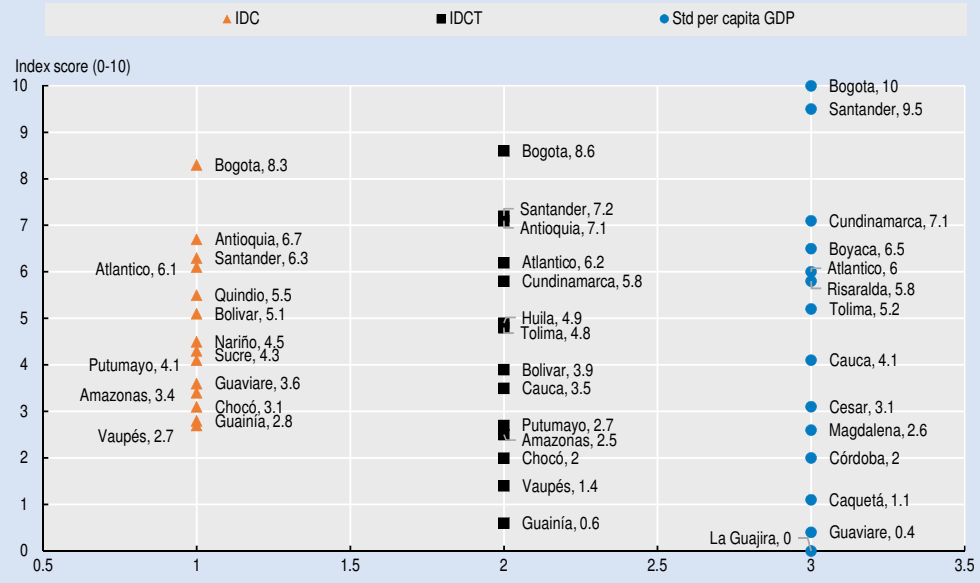
The indicator has been used as a diagnostic and follow-up tool for local development plans. It was recognised by the WEF in 2017 for its ability to measure regional competitive

performance and has generated numerous discussion spaces throughout the country as a key input into public policy analysis for the regions (Consejo Privado de Competitividad/ Universidad del Rosario, 2016; WEF, 2017).

In 2019, the IDC highlighted the importance of digital transformation by including an ICT adoption pillar. This served as the basis for the Departmental Technology Connectivity Index (IDCT), which was inspired by the Global Competitiveness Index ICT adoption pillar and the OECD Going Digital conceptual framework. The IDCT evaluates the departments' performance in five areas: 1) public appropriation of ICT; 2) ICT infrastructure in the territories; 3) household access; 4) ICT entrepreneurship; and 5) human capital formation.

The IDCT reveals large gaps in the area of insertion and mass adoption of ICT at the regional level: a gap between departments of 5.6 points in the IDC ranking and 8.0 points in the IDCT. Classification in the IDCT coincides, in part, with per capita income of the departments (Figure 1.14).

Figure 1.14. **Dispersion of scores in the Departmental Competitiveness Index, Departmental Index of Technological Connectivity and GDP per capita in Colombia, 2019**



Notes: GDP per capita excludes mining-energy activities. To perform normalisation, a maximum-minimum transformation was used that assigns a value between 0 and 10.

Source: Consejo Privado de Competitividad (2019).

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Illuminating Colombia's enormous digital transformation disparities is the first step. These indexes should be used to inform public policy actions. For instance, given that the greatest gaps in digital transformation are found in departments with high rurality rates, public-private partnerships could provide the necessary communication infrastructure for regional connectivity, so that it does not fall completely to the public sector (Consejo Privado de Competitividad, 2019).

As a result of the dematerialisation of the economy, the digital transformation can help achieve a "fair" transition to sustainable low carbon growth by producing clean energy (e.g. electrifying industry, transport and household consumption; regenerating natural

carbon sinks) and improving resource use efficiency (e.g. reducing waste, minimising the carbon intensity of construction) (IDB /DDPLAC, 2019). In all cases, supply of digital goods and provision of digitally deliverable services reduces the need for physical movement, reducing emissions. Similarly, both can increase efficiency in energy production and consumption. The digital transformation and the transition to a low-carbon economy can have strong social and civic inclusion spillover effects. It can help bring health benefits and quality jobs. Transition to a low carbon economy must be fair in the sense that efforts to preserve the planet must go hand-in-hand with social justice. There are risks associated with high levels of digital energy consumption: polluting production processes and, in the case of hardware devices, significant e-waste. In 2017, digital technology and storage of generated data accounted for almost 7% of worldwide electricity consumption. With more citizens and devices connecting to the Internet, the figure is expected to rise, putting further pressure on the environment (Greenpeace, 2017).

Measurement plays a key role in the design and evaluation of policies and to ensure the effectiveness and accountability that are needed to rebuild trust between citizens and states, but existing tools and metrics struggle to keep up with the digital transformation and its possible impacts (Box 1.3) (OECD, 2019c). In the short term, priority should be given to improving the international comparability of current indicators and making statistical systems more flexible to the introduction of new concepts related to the digital transformation. In the longer term, the statistical community will have to design new and interdisciplinary approaches to data collection and exploit the information captured by digital technologies. Partnerships with the private sector will be especially important in bringing new data and insights into the policy-making process to achieve these objectives (OECD, 2019c).

Box 1.3. **Measuring the digital transformation: A roadmap for the future**

The OECD articulated nine actions that would improve countries' capacity to monitor and measure the digital transformation and its impacts. The first four aim to equip governments with better data and indicators for dealing with the challenges. The remaining five target areas for priority attention. The goal is to advance the measurement agenda and elaborate key indicators for dimensions of the OECD Going Digital integrated policy framework, along with additional indicators providing more detail and nuance (OECD, 2019c).

Action 1. Make the digital economy visible in economic statistics.

Action 2. Understand the economic impacts of digital transformation.

Action 3. Encourage measurement of the digital transformation's impacts on social goals and people's well-being.

Action 4. Design new and interdisciplinary approaches to data collection.

Action 5. Monitor technologies underpinning the digital transformation, notably the Internet of Things, AI and Blockchain.

Action 6. Improve the measurement of data and data flows.

Action 7. Define and measure skills needs for the digital transformation.

Action 8. Measure trust in online environments.

Action 9. Establish an impact assessment framework for digital governments.

The ambitious transformation envisioned by the UN 2030 Agenda for Sustainable Development implies a change in the development paradigm that must be conceived in consideration of the new industrial era driven by the digital revolution. The digital transformation results in changes in consumption and production models that can offer both opportunities and risks to the environment. The response to the coronavirus (Covid-19) crisis affords an opportunity to tackle both issues at once: recovery policies should direct economic stimulus towards building a development model grounded in environmental sustainability (OECD, 2020b).

Conclusion

LAC entered the coronavirus (Covid-19) crisis with existing development traps and a deep social discontent, illustrated by a wave of mass protests in late 2019. It was also undergoing its weakest period of growth since 1950. The crisis has exacerbated deep, structural challenges in LAC countries.

Containment measures brought an immediate and sharp drop in economic activity, while global lockdowns created an unfavourable external context, with a strong decline in global demand, trade, tourism and commodity prices and increased financial volatility, as witnessed by record-high capital outflows in the first quarter of 2020 and exchange rate depreciations.

Sharply reduced economic growth has dimmed prospects for socio-economic progress in LAC. The social consequences of the crisis have been asymmetrical, mainly affecting the most vulnerable. A large number of mostly micro firms will likely close, entailing considerable job losses and affecting household income. The income shock will most hurt the poorest and economically vulnerable households, and significant increases in poverty and extreme poverty are expected. Most workers in these more exposed income groups are caught in a social vulnerability trap: they are in informal jobs that limit their access to social protection, unemployment insurance, income stability and savings as a safety net. Informal sector workers are also particularly vulnerable to sanitary challenges brought by the pandemic and lack necessary working conditions that would reduce health risks.

Most countries have responded with timely monetary and fiscal measures to mitigate the socio-economic impacts of the crisis. Some central banks have eased monetary conditions by lowering interest rates and adopting liquidity measures, to promote expansion of domestic demand and facilitate business activity. Fiscal policy has played a strong role in the short term and will be pivotal for the recovery and addressing structural challenges, such as sluggish productivity growth, in the medium term. Countries' ability to deploy fiscal policy depends on their starting fiscal space and their access to international markets. Given the limited space and heterogeneous challenges, global co-ordination of macroeconomic policies and of public debt management is a priority.

Digital technologies have been essential in confronting the pandemic and its socio-economic consequences. They helped maintain some business continuity and allowed part of the population to telework and continue education remotely. However, few in LAC have the infrastructure and skills to benefit fully from these technologies; the pandemic confirms the high potential of the digital transformation but highlights the urgent need to close the digital divide.

The usefulness of digital technologies during the pandemic illustrates the importance of the digital transformation in overcoming the LAC region's structural challenges and development traps identified in LEO 2019. The traps themselves result from longstanding structural gaps reinforcing development challenges. In this sense, as countries advance in their respective development pathways, structural gaps in key development dimensions,

such as productivity, social inclusion and poverty, have generated vicious dynamics leading to development lock-in. The pandemic has revealed that the structural problems that the region faces limit the development and adoption of digital technologies and solutions. The scarce percentage of the population that has been able to access digital solutions, for example teleworking, and the small number of companies that were digitally prepared to face the coronavirus crisis should be a wake-up call.

The digital revolution presents multiple opportunities that can allow to overcome the structural gaps that the region is facing. Properly adopting new technologies can ignite new engines of growth and support productivity growth and diversification (see Chapter 2). Digital tools can improve well-being by creating new jobs, improving human capital and fostering better work-life balance (see Chapter 3). They can strengthen public governance by facilitating more credible, effective, inclusive and innovative institutions, and better equip them to address citizens' demands and rising social discontent (see Chapter 4). They can also help achieve a fair transition to sustainable green growth and a low-carbon development model, with the dematerialisation of the economy. Many challenges of the digital transformation transcend borders, requiring international efforts and development partnerships. LAC can draw on lessons from abroad to make better use of technologies to ensure that the digital transformation benefits all (see Chapter 5).

Notes

1. The International Labour Organization estimates that 23% of workers in Latin America are in occupations that allow home-based work, as opposed to 30% in North America and Europe, 12% in Asia-Pacific and 7% in Africa (ILO, 2020).
2. Hepburn et al. (2020) survey of several senior officials and other economic experts from G20 countries on the relative performance of 25 major fiscal recovery "archetype" fiscal packages across four dimensions: speed of implementation, economic multiplier, climate impact potential, and overall desirability. They identify five policies with high potential on both economic multiplier and climate impact metrics: clean physical infrastructure, building efficiency retrofits, investment in education and training, natural capital investment, and clean R&D.
3. Burzynskaa and Contrerasa (2020) highlight two main reasons girls have a higher risk of not returning to schools: a higher risk of sexual exploitation, pregnancy, and (forced) marriage during lockdowns; and a disproportionate increase in unpaid household work, resulting in girls spending more time helping out at home instead of studying.
4. International bandwidth is the maximum amount of data transmission from one country to the rest of the world.

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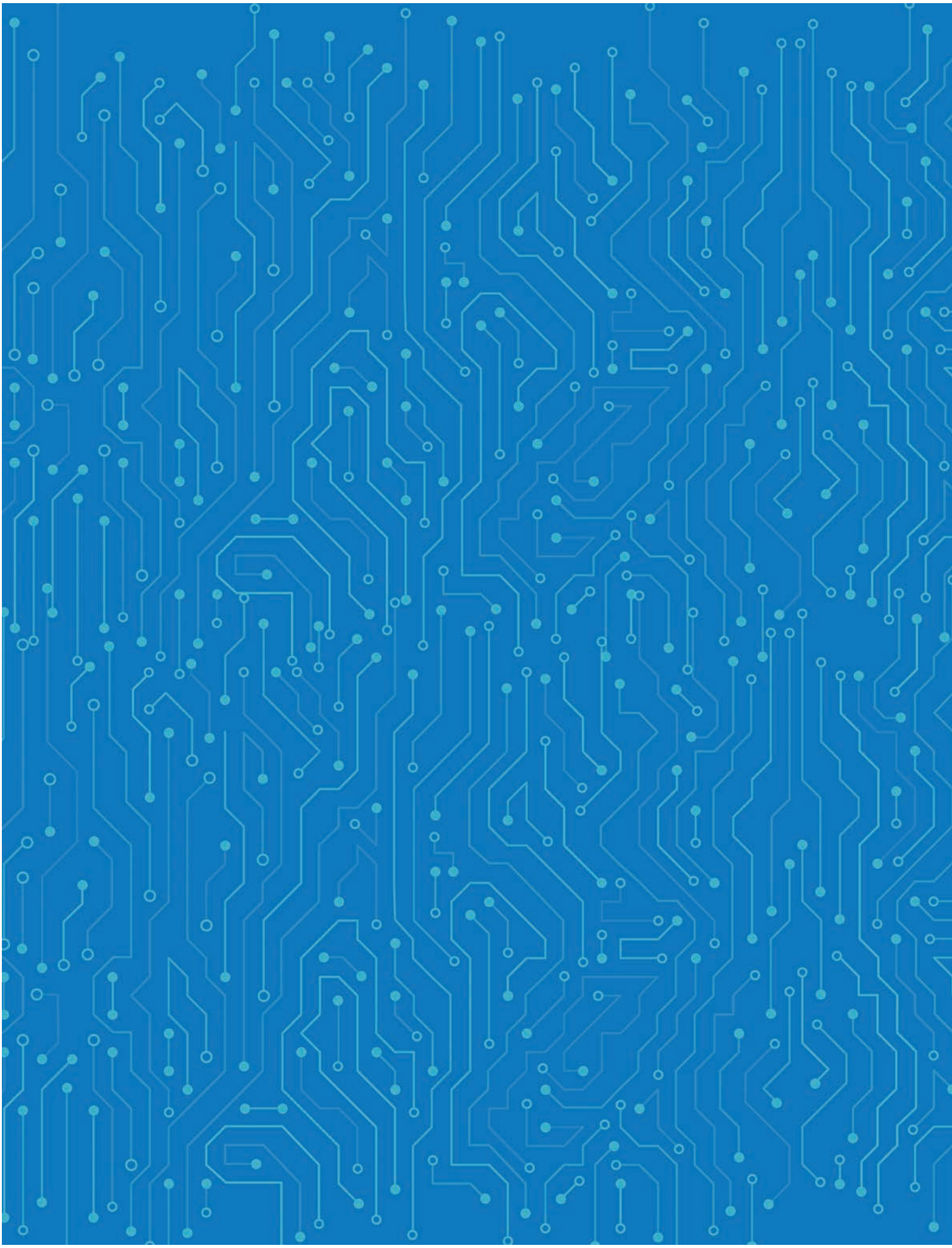


Chapter 2

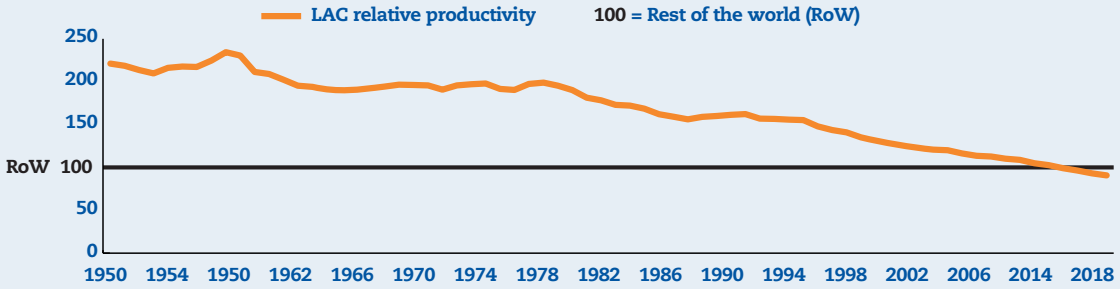
Fostering productivity and enhancing the digital transformation

Productivity in Latin America and the Caribbean relative to the Organisation for Economic Co-operation and Development (OECD) area has been falling since the 1950s. The growing gap reflects a production structure based on natural resources and abundance of low-skilled labour, which results in low value added. Large productivity gaps within sectors and firms reveal a heterogeneous productive structure. Structural difficulties could be amplified by the coronavirus (Covid-19) crisis. The digital transformation could help countries face the pandemic by improving productivity and efficiency and diversifying the productive matrix. However, its net impact will depend on policy choices and the development of indispensable and complementary factors, including communication infrastructure, transport connectivity as well as digital skills and capabilities.

The digital revolution can be a driving force of productivity growth

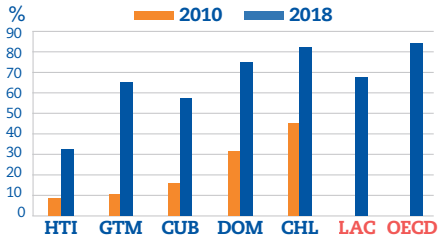
LAC countries' production structure and structural heterogeneity explain the growing productivity gap

LAC's labour productivity has decreased during the past decades, compared with the rest of the world



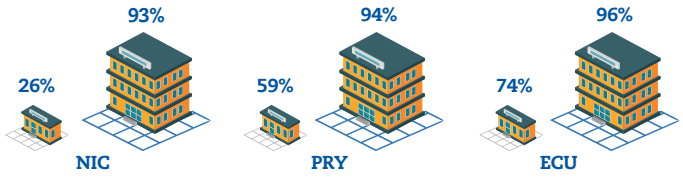
To take advantage of the digital revolution, indispensable elements, such as a holistic digital ecosystem and reliable infrastructure, are needed

The share of people in LAC using the Internet almost doubled since 2010



Low adoption of basic technologies, especially among small firms, remains an issue in some countries

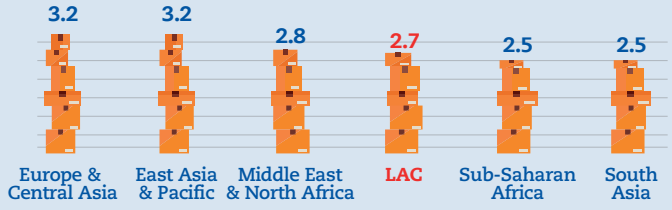
Share of small vs. large companies that own their own website, 2017



For LAC firms, a successful digital transformation depends on several complementary elements, including:

High transport costs hamper competitiveness, including the expansion of e-commerce

2018 World Bank Logistics Performance Index score



Digital skills are critical. LAC could further exploit the international market demand for IT services and programming

Introduction

Increasing productivity is one of the most relevant challenges for Latin America and the Caribbean (LAC) (OECD et al., 2019). The region's competitiveness is largely based on the advantages of natural resources and the abundance of low-skilled labour. This type of comparative advantage can provide periods of rapid growth in gross domestic product (GDP) (e.g. during the commodity boom) but not sustained productivity growth. The kind of competitiveness needed to achieve long-term productivity convergence with advanced countries relies on incorporating technology and diversifying the productive structure towards more dynamic sectors, both in technology and in terms of international demand (ECLAC, 2014).

Higher productivity gains go hand in hand with the accumulation of capabilities in advanced digital technological paths. As technological advances accelerate, there is less room for competition based on static comparative advantages, such as abundant natural resources and low-skilled labour. Economic development requires reallocating resources towards innovation and knowledge-intensive sectors, and diversifying towards sectors and activities with rapidly growing domestic and external demand.

The digital revolution involves large disruptions that could promote productive diversification and sustainable productivity growth in the region. Digital disruptions are triggering innovations in business models and production systems, reorganisation of economic sectors, new dynamics in the world of work, supply of smart goods and services, and new conditions of competitiveness. They involve various technologies, which have become increasingly numerous, cheap and powerful in recent years. Possibilities for progressive and inclusive structural change have increased in step but not uniformly across countries and sectors. Harnessing the digital revolution's opportunities increasingly depends on how economies, productive sectors, institutions and societies position themselves to absorb and adapt new technologies.

The digital transformation affects all sectors and adds value throughout production chains, but the magnitude of change depends on the state of indispensable and complementary factors. The digital transformation affects sectors with differing speeds and degrees (OECD, 2019a). Adoption of digital technologies by smaller companies in LAC shows potential, which is significant, considering the region's structural heterogeneity (ECLAC, 2013). Digital technologies also promote integration in productive chains by facilitating interaction in supply and distribution. Similarly, digital technologies can promote companies' commercial insertion by reducing information asymmetries, and transport costs. However, there is no direct relationship between the incorporation of information and communications technology (ICT) and increased productivity. The magnitude of the positive effect depends on indispensable and complementary factors, including proper access and diffusion of digital technologies, healthy business dynamism, small and medium-sized enterprise (SME) engagement in digital transformation, adequate transport connectivity and skills, and sufficient competition in the digital economy. Similarly, the specificities of the ecosystem in which the productive agents perform, characteristics of the technologies, features of the firms, and capacity to create efficient innovation systems also enable taking full advantage of the technologies (ECLAC, 2010; ECLAC, 2013).

Digital technologies and infrastructure have been more critical than ever during the coronavirus (Covid-19) crisis. Communication infrastructure and access to the Internet have been strategic in supporting economic and social life. For instance, in OECD economies some operators experienced as much as a 60% increase in Internet traffic compared to before the crisis (OECD, 2020a). The crisis will accelerate the ongoing structural changes of the past decade. Greater digitalisation will be a feature of the post-pandemic economy

(ECLAC, 2020a). As quarantines have increased virtualisation of economic and social relations, telework may prevail in more industries and regions, advancing digitisation even faster. The most technologically advanced companies, particularly selected micro, small and medium-sized enterprises (MSMEs) will increase their advantage. Long quarantines of workers encourage investment in automation and robotics and increased use of artificial intelligence (AI) tools (CAF et al., 2020).

This chapter begins by briefly analysing the coronavirus' (Covid-19) impact on the production structure. It then presents the causes of the persistent and growing productivity gap between LAC and OECD countries. It investigates how digital technologies could promote productivity growth, with an emphasis on the role of the digital ecosystem. The third section highlights the importance of communication infrastructure, transport connectivity, and digital skills and capabilities as indispensable and complementary elements to make the most of digital transformation. The fourth section explores the policies in the region to promote the digital transformation and increase productivity. The fifth section studies the role of the digital transformation in the region in the post-coronavirus context. Finally, the chapter concludes with policy recommendations.

Coronavirus (Covid-19) crisis: Impacts on an already challenged production and business structure

The coronavirus (Covid-19) pandemic has generated the greatest crisis of the last 100 years in LAC (see Chapter 1). It has exposed historical weaknesses in a production system characterised by a heterogeneous production structure between and within sectors and companies.

The economic crisis caused by the coronavirus' (Covid-19) affects supply and demand in the region. Concerning supply, sectoral impacts have been transversal but heterogeneous. Social restrictions have led to partial or total suspension of productive activities, mainly affecting sectors whose activity depends on physical proximity. Sectors defined as essential have had a moderate impact. The impact of the crisis is much greater for MSMEs, with serious job losses (ECLAC, 2020b). Owing to the interdependence of global value chains, interruption of certain productive activities has led to problems in supply of inputs, national and imported, creating difficulties for companies to continue operating.

Regarding demand, reduced consumer income and uncertainty about future scenarios have generated decline and change in consumption patterns. Most vulnerable groups have been affected by this crisis, in particular those informal workers hurt by a sudden income reduction. Decreased economic activity and other aspects of the international situation have reduced external demand. The decrease in commodity prices has affected in particular South American economies and some selected economies, including Mexico and Trinidad and Tobago (OECD, 2020b).

Companies have registered sharp decreases in income and experienced difficulties in the continuity of activities, which may significantly degrade the regional productive fabric. The lack of productivity and heterogeneity that characterises the productive structure has amplified the coronavirus' (Covid-19) impacts. The pandemic makes weaknesses more evident and exacerbates economic, social and environmental challenges. In the productive sphere, the situation intensifies the urgency of mitigating destruction of capacities, without forgetting the need to increase productivity sustainably, generate productive chains and promote innovation and digital transformation.

Economic reactivation must suppose important changes in firms and productive chain organisation. The pandemic has forced changes in companies' security conditions and relations among workers, suppliers and customers. Social distancing has accelerated

digital transformation and promoted processes that seek to increase productivity and efficiency. In an environment of rapid change and strong uncertainty, many companies have been forced to innovate, re-evaluate operations and change business models (ECLAC, 2020b).

Measures adopted by LAC countries to face the health emergency have led to firms' increased use of digital technologies[1] in their dealings with consumers, suppliers and employees, and in the organisation of internal management processes. Many changes will continue in the post-pandemic, particularly regarding consumer behaviour. Digital technologies will be key to new operating models in three respects. First, they will figure in promotion, sale and delivery of goods and services operations, and in supplier interactions. Second, companies will have to incorporate capabilities to acquire and process large amounts of information (Big Data) for decision processes (e.g. monitoring and adapting to changes in demand but also redefining supply chains). Third, in industry, it is reasonable to expect greater incorporation of connected devices in production processes and greater use of robotics to increase efficiency, especially given that health security may necessitate fewer workers in some stages of production.

The coronavirus (Covid-19) has exposed structural deficiencies in LAC's productive system. To face it, companies must seek greater efficiency and productivity, considering a series of key elements: how business models are rethought and value chains organised; orientation towards higher value-added products; change in energy consumption; greater interaction among firms (collective efficiency); and incorporation of new technologies and promotion of the digital transformation (ECLAC, 2020b).

Patterns of productivity and heterogeneity in Latin America and the Caribbean

Productivity dynamics are one of the most problematic aspects of LAC's economic performance (OECD et al., 2019; ECLAC, 2018a; ECLAC, 2014; ECLAC, 2010). LAC has a high and increasing productivity gap with developed economies. The lag of GDP per capita is mainly explained by low labour productivity. Increased labour productivity allows for more favourable insertion into the global economy while increasing disposable income, which promotes both internal and external demand.

The persistent productivity gap

LAC's aggregate labour productivity shows reduced and little persistent growth from 1950 onwards. LAC's productivity has decreased compared with the rest of the world since the 1960s (Figure 2.1).

GDP growth in LAC owes mainly to labour force expansion, with little contribution from productivity growth (Figure 2.2). There is, in this sense, growth by absorption of employment linked to increased aggregate demand, coupled with low or no technical progress and innovation. This contrasts with fast-growing emerging economies, such as the People's Republic of China (hereafter "China"), India or Korea, where productivity is an important driver of GDP growth.

The evolution of the region's employment structure largely explains the low productivity growth. The sectoral structure of employment in LAC from 1980 onwards shows three major changes: decreased share of agriculture, decreased share of manufacturing and increased participation of commerce (wholesale and retail trade). The combination resulted in rural-urban migration, which failed to produce productivity growth. The decline of labour in the agriculture sector prevented further deterioration of its productivity level. Nevertheless, the labour force arriving in cities failed to obtain

quality jobs owing to the simultaneous phenomenon of premature deindustrialisation since the 1980s. The commercial sector served as an avenue for emergency employment – largely informal and predominated by MSMEs (particularly microenterprises offering low-productivity jobs). This is reflected in the commercial sector's increased participation in total employment, from 14.3% in 1981 to 25.3% in 2018 (Table 2.1).

Figure 2.1. **Labour productivity of Latin American and Caribbean countries relative to the rest of the world, 1950-2019**

Note: Simple average of the 17 LAC countries covered by The Conference Board. Labour productivity is measured as the labour productivity per person employed in 2018 USD.

Source: Own calculations based on Conference Board (2020), *Total Economy Database* (database), www.conference-board.org/data/economydatabase.

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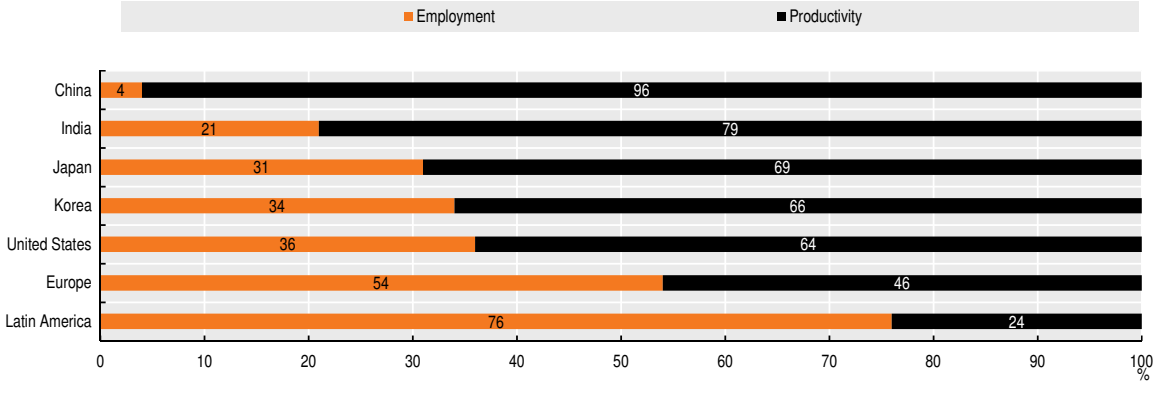
Figure 2.2. **Contribution of employment and productivity to GDP growth in selected countries and regions, 2000-19 (%)**



Note: Simple average of the 17 LAC countries covered by The Conference Board.

Source: Own calculations based on Conference Board (2020), *Total Economy Database* (database), www.conference-board.org/data/economydatabase.

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Table 2.1. **Participation in gross domestic product and employment by sector in selected Latin American and Caribbean countries, 1981, 2002 and 2018**

	Value added (%)			Employment (%)		
	1981	2002	2018	1981	2002	2018
Agriculture	5.2	5.6	5.5	23.3	20.2	14.6
Mining	6.9	8.0	5.2	1.0	0.5	0.6
Manufacturing	18.9	16.7	13.6	16.2	14.2	12.2
Electricity	1.6	2.6	2.5	0.9	0.5	0.5
Construction	10.2	6.6	7.1	7.1	6	7.7
Wholesale and retail trade	15.4	13.7	14.5	14.3	23.3	25.3
Transport and communications	4.3	6.7	9.6	4.7	5.1	6.4
Financial and business services	15.2	16	18.6	5.6	5.5	7.7
Community services	22.3	24.3	23.3	27	24.7	25
Total	100	100	100	100	100	100

Note: Selected LAC countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

Sources: ECLAC (2020c), *Databases and Statistical Publications* (database), https://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/buscador.asp?idioma=i&string_busqueda=; ILO (2020), *Statistics and Databases* (database), www.ilo.org/global/statistics-and-databases/lang--en/index.htm.

The productive structure

LAC countries' productive structure and structural heterogeneity explain the growing productivity gap. Most countries in the region have developed productive activities that use low-skilled labour and operate with few connections with the rest of the economy. These activities do not create or benefit from technological spill-overs and local capacity building. Dynamic productive chains are isolated cases that do not affect the general economic landscape.

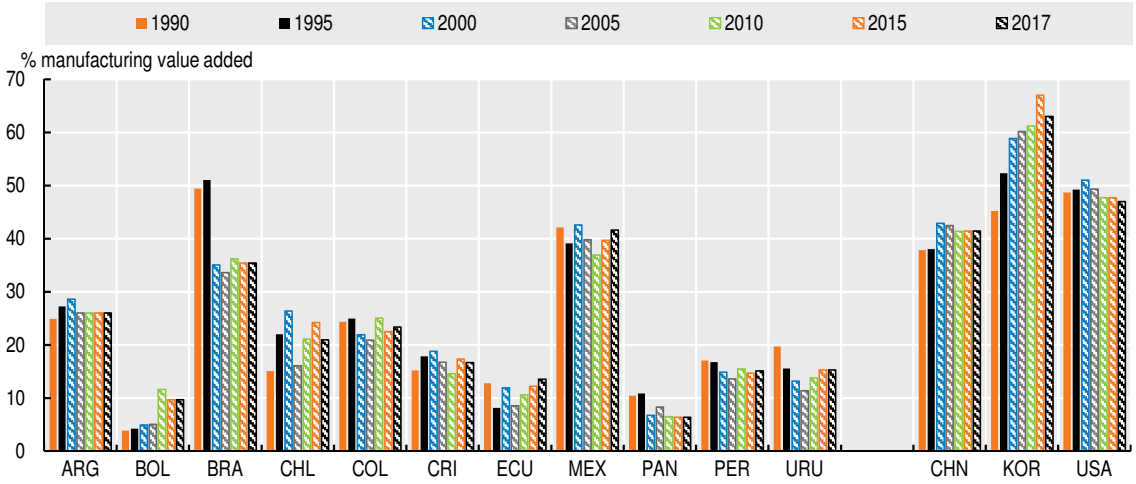
LAC has a poorly diversified productive structure, resulting in low value added. Countries' export specialisations are concentrated in goods with low technological content. This correlates with relatively lower value added generated by the manufacturing sector and, in particular, medium- and high-tech industries – an element especially relevant as technological progress is increasingly important (Figure 2.3). The region's poorly diversified productive structure and highly heterogeneous productivity across firms may make the digital transformation a greater source of polarisation, increasing productivity differentials within countries. Developing greater productive and technological chains requires policies that facilitate and promote the incorporation of technologies by firms in all sectors and independent of their size.

The productive structure's impacts on average labour productivity are rooted in structural heterogeneity (defined as wide variation in labour productivity among and within sectors). Variation in the region is marked enough to segment the productive system and the labour market. Technological and remuneration conditions are strongly asymmetric across segments (Cimoli and Porcile, 2013).

Two indicators highlight structural heterogeneity in productivity in LAC economies. The intersectoral indicator has shown high heterogeneity in recent years, compared with previous decades (Table 2.2): for instance, heterogeneity between mining and wholesale and retail trade increased between 1981 and 2018. Intrasectoral heterogeneity (units of production within a sector) is typically measured based on the coefficient of variation of the level of productivity of sectors. Using the standard deviation over the average of sectoral productivity, internal structural heterogeneity is estimated to have increased by almost 20% during the period: in particular, it increased by 50% between 1981 and 1998

owing to productivity movements in the mining and hydrocarbon sectors, then decreased by 35% by 2018 (Figure 2.4). Intersectoral and intrasectoral indicators are complementary, and both contribute to understanding the increased structural heterogeneity.

Figure 2.3. **Medium- and high-tech industry manufacturing value added in selected countries, 1990-2017**



Source: UNIDO (2019), *UNIDO Statistics* (database), www.unido.org/researchers/statistical-databases.
StatLink https://doi.org/10.1787/888934171647

Table 2.2. **Levels of relative productivity by sector in selected Latin American and Caribbean countries, 1981, 2002 and 2018**

	1981	2002	2018
Agriculture	20	25	34
Mining	606	1 322	846
Manufacturing	105	105	100
Electricity	165	448	409
Construction	131	99	84
Wholesale and retail trade	98	53	51
Transport and communications	84	119	135
Business services	247	259	218
Community services	75	89	84

Note: Selected LAC countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela. Base 100 = manufacturing sector in 2018.

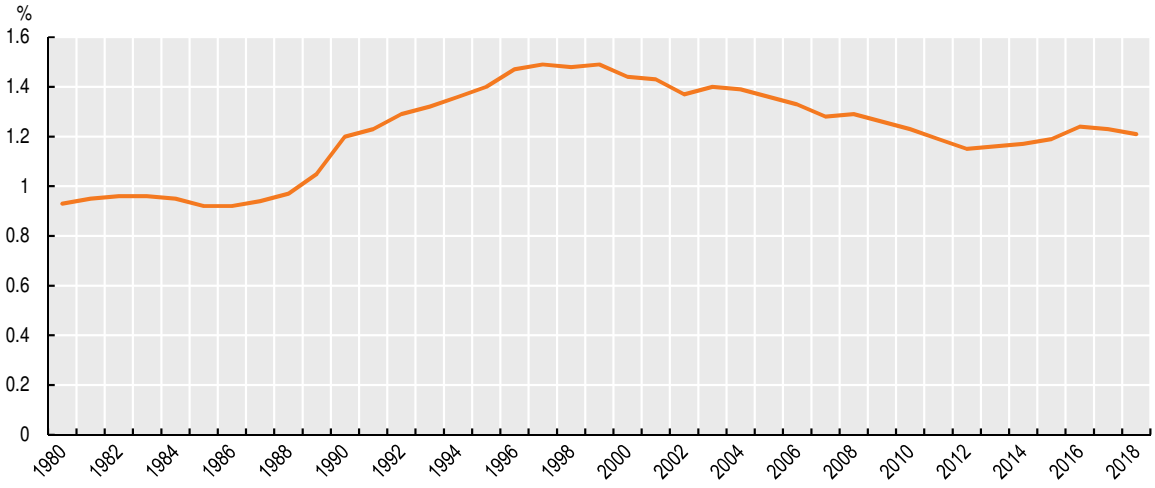
Sources: Own calculations based on official country data; ECLAC (2020c), *Databases and Statistical Publications* (database), https://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/buscador.asp?idioma=i&string_busqueda; ILO (2020), *Statistics and Databases* (database), www.ilo.org/global/statistics-and-databases/lang--en/index.htm.

Structural heterogeneity is also observed in productivity by firm size. Productivity of micro, small and medium-sized enterprises in 2016 was 6%, 23% and 46% that of large companies in Latin America (LA), respectively – levels virtually unchanged since 2009 – vs. differentials observed in the European Union for micro (42%), small (58%) and medium-sized (76%) enterprises (Figure 2.5). The differentials are more pronounced when comparing firms' productivity in selected countries. Small enterprise productivity gaps are more than 18 times larger than those observed in European countries. For instance, in Brazil, microenterprise productivity represents 4% that of large companies, compared with 74% in France.

Productivity heterogeneity is important in identifying the potential impacts of the digital transformation. In a region where productivity disparities are apparent among

and within economic sectors and production segments, and where workers' productivity levels vary widely (associated with education levels), the digital transformation brings opportunity but also a risk of reinforcing disparities.

Figure 2.4. **Coefficient of variation of sectoral productivity in selected Latin American and Caribbean countries, 1980-2018**

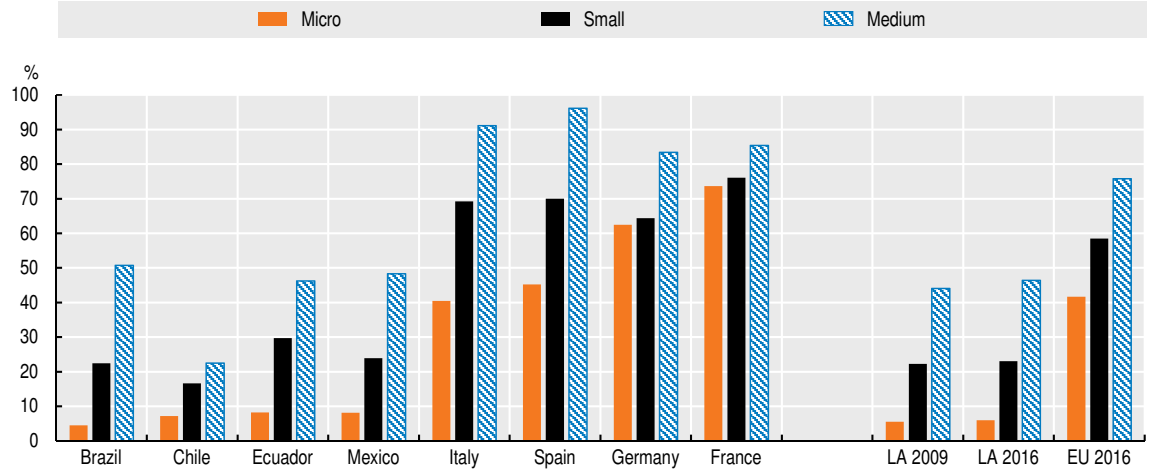


Note: Simple average of the 18 LAC countries selected, depending on data availability.

Sources: Own calculations based on official country data; ECLAC (2020c), *Databases and Statistical Publications* (database), https://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/buscador.asp?idioma=i&string_busqueda; ILO (2020), *Statistics and Databases* (database), www.ilo.org/global/statistics-and-databases/lang--en/index.htm.

StatLink https://doi.org/10.1787/888934171666

Figure 2.5. **Productivity gaps by firm size compared with large companies in selected countries and regions, 2016**



Source: ECLAC (2020b), "Sectors and businesses facing COVID-19: Emergency and reactivation", *Special report: Covid-19*, Economic Commission for Latin America and the Caribbean, Santiago, https://repositorio.cepal.org/bitstream/handle/11362/45736/5/S2000437_en.pdf.

StatLink https://doi.org/10.1787/888934171685

Structural heterogeneity is a key consideration in designing policies that balance economic growth with equality. Structural heterogeneity strongly influences the region's unequal income distribution. The low-productivity sector, which represents a large weight, mostly employs low-educated workers and offers almost no social security coverage (ECLAC, 2010; ECLAC, 2014; OECD et al., 2019).

Increased productivity with digital technologies

Digital technologies and productivity growth: A complex relationship

Productivity growth is the core engine of sustained economic growth (Solow, 1988).[2] Since the first industrial revolution, new technologies have improved productivity (Dosi, 1984) and can contribute to close the gap in Latin American and the Caribbean countries (ECLAC, 2016). On the cusp of the fourth industrial revolution, there is a growing debate on the potential of digital technologies to foster productivity in developed and transitioning countries. Traditional debate is polarised, with techno-optimists predicting a positive impact (Brynjolfsson, McAfee and Spence, 2014) and techno-pessimists questioning the incremental impact on productivity and growth (Gordon, 2012).

Innovation and technology dynamics are not independent of industrial structures, labour relations and income distribution (see Chapter 3 for the social effects of the digital transformation). Rather, they are embedded in complex political economies and thus highly context specific (see Box 2.1 for a specific case in the region). Ultimately, digital technologies' impact on productivity will result from proper access and diffusion of digital technologies, healthy business dynamism, SME engagement in digital transformation, adequate skills and sufficient competition in the digital economy (OECD, 2019a). These aspects have been discussed in the framework of the OECD Third LAC Regional Programme Ministerial Meeting on Productivity (Bogota-Colombia, October 2019). Finally, policies must tailor digital frameworks and include social and economic factors.

Data availability and theoretical and empirical assumptions make it difficult to disentangle the links between technology and productivity. The complexity may explain the mixed evidence (Box 2.2). Digital technologies are complementary to other factors: country, industry and firm structural characteristics. Cross-country studies suggest that firms' adoption of digital technologies varies widely among and within countries (Hagsten et al., 2012), depending on firms' capabilities and incentives (Andrews, Nicoletti and Timiliotis, 2018). Firm- and industry-level studies show that firms' capabilities and industry sophistication matter in accelerating the benefits of new technologies.

Box 2.1. **Digitalisation of production in Peru**

The United Nations (UN) Economic Commission for Latin America and the Caribbean, in co-ordination with the Development Bank of Latin America (CAF), is developing a pilot project focused on the digitalisation of production processes. It identified a production chain with significant impact on Peru's economy.

The Ica region is a key contributor to national GDP, and its exports represent 7.4% of the national total. The main agricultural exports are asparagus, avocado, hard yellow corn and tangerine. The project first evaluated the region's digital connectivity and the potential for digital solutions to key problems identified along value chains.

Results of agricultural export industry analyses led to the identification of potential technological solutions for various industries and value chains (Table 2.3). For the fishing value chain, they included radio-frequency identification-enabled catch sensor tracking systems, seabed and marine bank visualisations, geolocation systems for fleets, digitalisation of supplier-customer relationships and inventory management, and automation of product auctions. For the electric energy value chain, they included remote monitoring systems and atmospheric sensors, automatic management of energy reserves, predictive maintenance of assets, identification by leakage sensors in the distribution stage, and automatic monitoring of transport paths using drones.

Box 2.1. **Digitalisation of production in Peru** *(cont.)*

Table 2.3. **Potential technological solutions for various industries in Peru**

Technological solutions and production	Logistics and exports
Smart irrigation systems	Cold chain control
Field monitoring	Tracking and product traceability system
Smart collection tools	Efficient inventory management system
Geographic remote sensing	Logistics optimisation and management tools
Smart pest control	
Technological enablers include: IoT, Big Data, Cloud services, data analysis and drones.	

Note: IoT = Internet of things.
Source: Own elaboration based on official information.

The exercise showed that, to achieve a greater impact, policies related to the digitalisation of production must consider each sector's distinctive characteristics. Despite common enabling elements, such as infrastructure and digital skills, each sector requires tailor-made solutions.

Box 2.2. **Productivity measurement in the digital age**

Labour productivity is commonly measured as GDP per hour worked. Productivity growth usually measures the efficiency of productive processes in terms of input/output ratio: it rises when output increases more than input. Measuring productivity in the digital age, and thus productivity gains resulting from technology adoption, raises measurement issues.

1. Prices and quality may not be fully identified, implying mismeasurement of output growth in GDP. Price, volume and quality are fundamental to productivity measurement. Disentangling their relationship is particularly challenging in the digital age. In efficient markets, prices reflect some dimension of quality priced by consumers (Stiglitz, Sen and Fitoussi, 2009). The relationship between the quality and the price of digital products and services can be counterintuitive, e.g. digital product quality has increased but prices have fallen in the last decade. Some products, such as apps or digital services, are free to access and do not enter into GDP measures. Consumers nonetheless pay in personal data and exposure to advertisements. Owing to the complexity of disentangling price and quality effects, increasing digitalisation can increase mismeasurement of productivity.

2. Digital products have offsetting effects on multifactor productivity (MFP) measures. MFP measures the output produced by the combined effect of labour and capital. Digital products are both input and output and thus contribute to both sides of the MFP ratio, leading to an understatement of their contribution as input and resulting in the overstatement of the MFP measurement.

3. Globalisation and cross-border trade make input and output measurements more difficult. Aggregate-level production statistics can disguise measurement issues in output reporting. This could be the case in developed countries' offshore production, which is reported in the producing rather than in the owner country, negatively affecting the latter's productivity measurement. Cross-border trade might also affect capital measurement, especially in understating the contribution of knowledge assets, leading to MFP overestimations.

Productivity gains are strongly correlated with firms' performance and capabilities, and new technologies might widen productivity dispersion among and within countries. A new stream of research finds a positive link between sector-level diffusion of digital technologies and productivity growth (Table 2.4). Results are stronger for high-productivity firms. Firms closer to the frontier are more likely to adopt new technologies owing to the existence of important complementarities between new technologies and other investments that raise productivity. The efficient use of digital technologies is related to firms' capabilities, technological sophistication, managerial competences and workers' skills. High-productivity firms in technology-intensive sectors are also more likely to adopt new technologies and experience productivity gains (Berlingieri, Blanchenay and Criscuolo, 2017; Gal et al., 2019; Sorbe, 2019; OECD, 2019b).

Table 2.4. **Impact of digital technology complementarities on productivity gains: Evidence from the developed world**

Complementary variable	Focus of analysis	Results
Innovation and technological investment	OECD	**Investment in R&D and technology accelerates the benefits of digital technologies.** 1. Knowledge spill-overs at sectoral and country levels magnify the impact of ICT on productivity (Corrado, Haskel and Jona-Lasinio, 2017). 2. Innovation and R&D activities can contribute to productivity gains at the aggregate level and, if combined with digital technologies, can increase within-firm benefits (Bartelsman, Leeuwen and Polder, 2016). 3. ICT investment is an important channel to boost productivity gains (Cette, Lopez and Mairesse, 2017). 4. R&D, ICT and organisation capabilities are complementary, and joint investment increases productivity gains (Mohnen, Polder and van Leeuwen, 2018).
Skills and human capital	European Union	**Widening digital-related skills could strengthen the link between digital technology adoption and productivity.** 1. Shortage in technical skills at the industry level reduces the link between technology adoption and productivity performance (Gal et al., 2019). 2. Investment in skills upgrading is key to facilitating efficient technology adoption. Skills shortage is a main factor in lack of productivity gains in laggard firms (Andrews, Nicoletti and Timiliotis, 2018).
Sectoral sophistication	OECD	**Productivity gains vary across sectors, with stronger benefits for manufacturing.** 1. Technology adoption varies across sectors and sector-level structural characteristics, such as technological sophistication and human capital (Andrews, Nicoletti and Timiliotis, 2018). 2. Productivity gains are higher for sectors with standardised and routine-intensive activities (Chevalier and Luciani, 2018). 3. Digitalisation generates higher productivity levels in manufacturing (Dhyne et al., 2018; Gal et al., 2019). 4. Proximity – within-sector or in global value chains – with other digitalised firms can generate positive spill-overs and increase technology adoption and productivity benefits (Andrews, Nicoletti and Timiliotis, 2018).
Organisation capabilities	United States manufacturing, OECD	**Organisation capabilities and managerial ability can magnify productivity gains.** 1. Technology adoption is associated with a larger productivity increase if it is systemic and associated with broader incentives but leads to little or no gain when adopted in isolation (Aral, Brunjolfsson and Wu, 2012). 2. Dispersion in IT investment per employee explains 8% of productivity dispersion; management quality explains up to 17% (Bloom, Sadun and Van Reenen, 2017). 3. Organisation capabilities are complementary to ICT and R&D investment (Mohnen, Polder and van Leeuwen, 2018).
Quality infrastructure	United Kingdom	**Quality infrastructure is key to guaranteeing efficient use of digital technologies but has no direct impact on productivity.** 1. Communication infrastructure is a determining factor for adoption and use of digital technologies. Access to quality broadband is linked to complementary investment in ICT. There is no clear link with firms' performance (De Stefano, 2018).

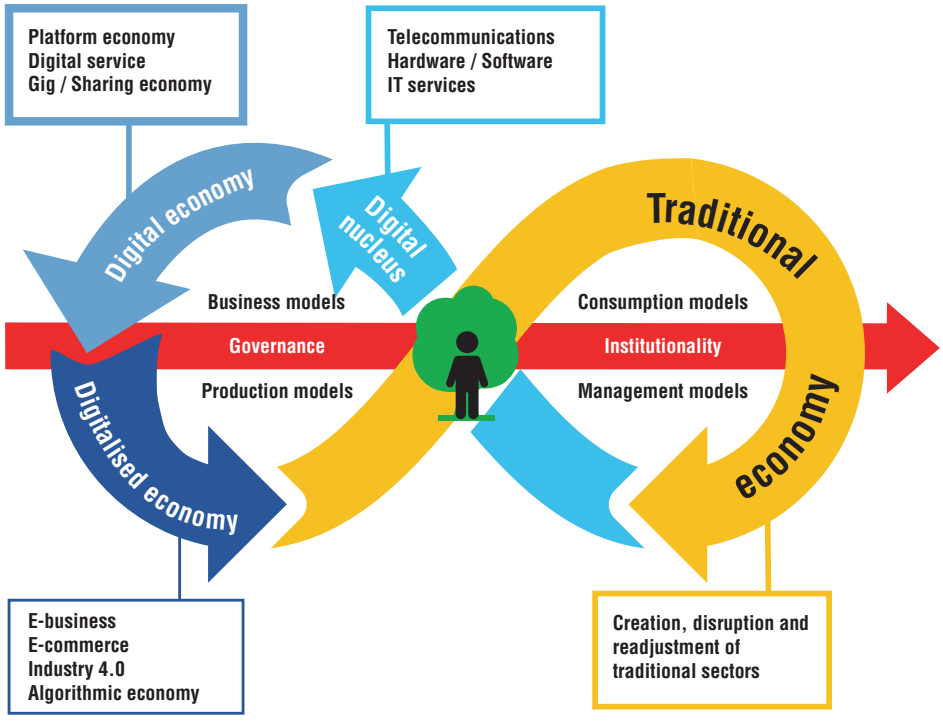
Notes: ICT = information and communications technology. IT = information technology. R&D = research and development.

The digitalised economy: Changing the production structure

The digital revolution is giving rise to a fourth industrial revolution, which is generating a digitalised economy. The current context is not simply a globalised world hyper-connected economically and socially; it is one in which the traditional economy's organisation, productive and governance schemes coexist and merge with the digital economy's innovations in business models, production, business organisation and governance (Figure 2.6). The coronavirus (Covid-19) pandemic has accelerated this phenomenon. Traditional and digital spheres are integrated and interact, leading to more complex ecosystems, which are undergoing rapid organisation, institution and regulatory transformation in keeping with the digital revolution (ECLAC, 2018b).

The first phase of the digital revolution led to the development of the digital economy: business models focused on the supply of digital goods and services (Bukht and Heeks, 2017). The value of goods and services changed radically. Digital cameras redefined photography, e-reading redefined print media, streaming redefined music, the sharing economy redefined transport and hotel industries, to name some of the first industries hit by the disruptive effects of the digital transformation.

Figure 2.6. **The digital transformation of the economy**



Source: Own elaboration.

Digital platforms make important contributions to the economy by creating new connections between supply and demand in various markets, reducing transaction costs and intermediation, generating efficiency gains in use of assets, and opening new markets and business opportunities, including for MSMEs to join global value chains (OECD, 2019c). New business models operate on digital platforms in multiple sectors in LAC. They facilitate commercial transactions (Amazon, Alibaba, Mercado Libre), financial services (Ant Financial, Avant, Mercado Pago, Nubank), social networks and over-the-top communication services (Facebook, Skype, WhatsApp), tourism and hosting

services (TakeOff, Booking, Airbnb), app development (Apple iOS, Google Android) and job matching (Laborum, LinkedIn, Workana, Freelancer). However, in part due to LAC's productive and social structure, the coronavirus (Covid-19) pandemic has demonstrated unequal adoption of these platforms across the population, which may accentuate digital exclusion by socio-economic status, age and location (see Chapter 3). These solutions require complementary factors, such as high connection speeds and digital skills. Lack of these factors compromises the use of more sophisticated digital platforms, as has been the case during the crisis.

Digital businesses have evolved to incorporate exploitation of data generated and exchanged on platforms. While offering services and digital goods with reduced intermediation and transaction costs, they have also expanded their business models. Data processed and analysed with intelligent tools allow for improved decision making and optimisation of the value proposition via greater agility in operations, market segmentation and customisation. This entails a need to regulate and consider the ethical issues of data collection and use. Protecting individuals from risk of data theft and misuse is another challenge (see Chapter 4).

Widespread adoption of digital technologies in all sectors made way for the second phase of the digital revolution: the digitalised economy. It is characterised by use of digitised information and knowledge as a production factor, productivity engine and optimisation tool for business models. Digitalisation goes beyond optimisation of production and management; performance is improved by reconfiguring products and services, business models and production based on the adoption of digital intelligence. This is driving the transformation of traditional industries, creating new ones: Autotech, Agritech and Fintech, to name a few (ECLAC, 2020d).

Algorithms revolutionised competition, presenting the possibility of collusion, cartels, segmentation, etc., and created government and private mechanisms capable of changing and regulating markets, for instance, through algorithmic fraud detection. However, given the large volume of data in LAC generated by the digital transformation and the value of those data to foreign companies, merger and acquisition strategies and the concentration of Big Tech markets may threaten the region's competitiveness. Furthermore, it is not clear which human decision-making will be supported by machines and the implications of the automation of decision-making processes for competition (OECD, 2017).

Creating a sustainable digital ecosystem depends on fair competition in markets. Sustainable digital transformation requires appropriate regulatory frameworks with solid institutions (e.g. guaranteeing competition, cybersecurity, privacy). The coronavirus (Covid-19) accelerated digital transformations, which in turn hastened the development of new legal and institutional frameworks.

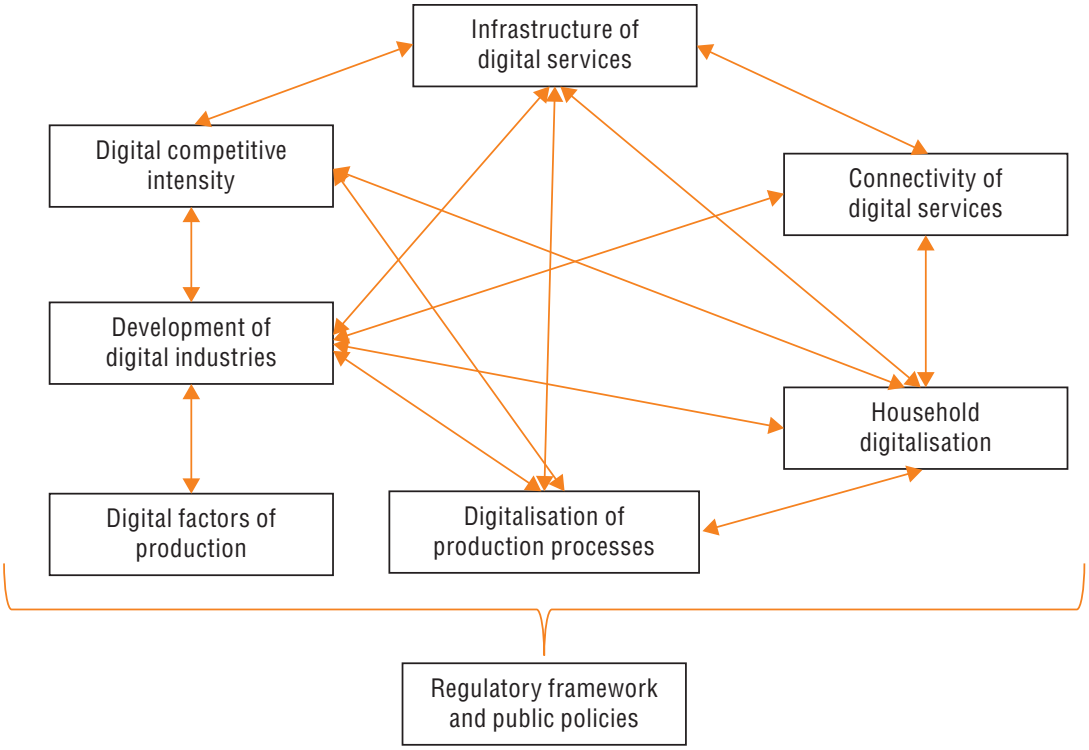
Digitalisation has the potential to increase productivity and achieve sustainable development, but its net impact will depend on policy choices and the digital ecosystem. Even in the most advanced OECD economies, the diffusion of digital technologies is far from complete.[3] Digitalisation changes consumption and production models, generating productivity and welfare gains among consumers that can be combined with environmental sustainability objectives to profit the whole society. However, development and adoption of digitalisation that is not guided by principles of inclusion and sustainability may reinforce social exclusion and discrimination, and unsustainable exploitation and production practices (ECLAC, 2020d). Digitalisation's net effect with respect to sustainable development will depend on the thorough assessment of the situation and policy action to route digitalisation adequately (see Chapter 4), and on the development of digital ecosystems that allow full realisation of the benefits of the transformation.

Digital ecosystem development in Latin America and the Caribbean

The digital ecosystem plays an important role in accelerating the benefits of digital technologies, with important implications for laggard firms, sectors and countries. It offers significant policy design opportunities, especially in LAC countries. Given the structure and technological sophistication of the region's productive sector, facilitating technology adoption is not enough. There is a need to develop all elements of the requisite digital ecosystem – infrastructure, human capacities and business environment – to promote investment, innovation and entrepreneurship.

The Digital Ecosystem Development Index[4] is based on eight multi-component pillars: infrastructure, connectivity, household digitalisation, digitalisation of production, competitive intensity, digital industries, factors of production, and regulatory frameworks (CAF, 2017; CAF et al., 2020). The ecosystem concept captures the pillars' systemic interrelation (Figure 2.7). For instance, communication infrastructure is essential for household access to and companies' use of digital content and services, and allows operators within the value chain (e.g. app and content providers) to connect and present a value proposition to the market (Katz, 2015).

Figure 2.7. **Structure of the digital ecosystem**



Source: CAF (2017), *Towards the digital transformation of Latin America and the Caribbean: The CAF Observatory of the Digital Ecosystem*, Development Bank of Latin America, Caracas, https://www.caf.com/app_tic/#es/home and https://scioteca.caf.com/bitstream/handle/123456789/1052/METODOLOGIA%20DE%20IDED.pdf?sequence=1&isAllowed=y; Katz and Callorda (2018), "Accelerating the development of Latin American digital ecosystem and implications for broadband policy", https://doi.org/10.1016/j.telpol.2017.11.002.

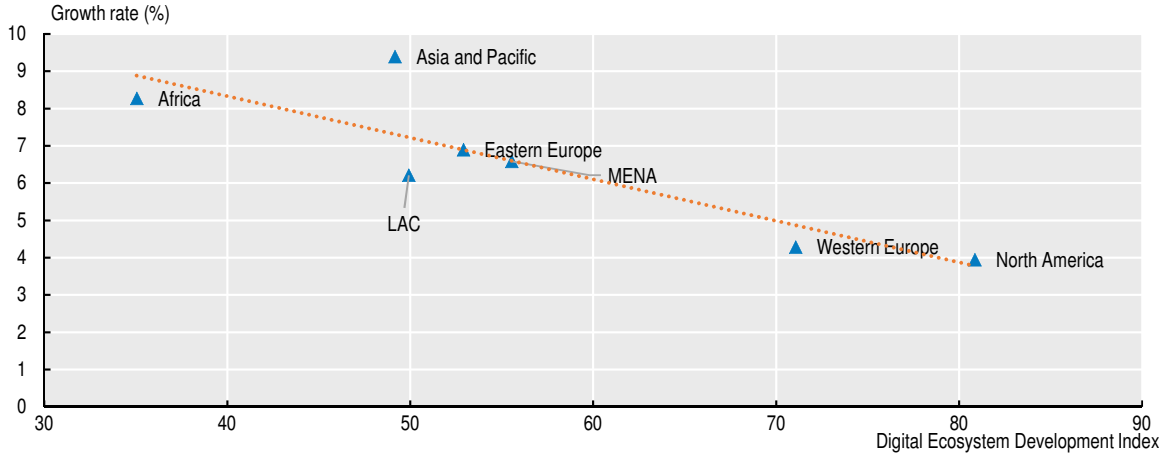
While the index shares indicators with the OECD Going Digital Toolkit, such as mobile and fixed broadband penetration, Internet users, UN E-Government Development Index and research and development (R&D) expenditure relative to GDP, the frameworks have different but complementary purposes (OECD, 2019d). The Going Digital Toolkit is structured along the seven policy dimensions of the Going Digital Integrated Policy

Framework, which cuts across policy areas to help ensure a whole-of-economy and whole-of-society approach to realising the promises of the digital transformation for all (OECD, 2019d). The Digital Ecosystem Development Index is based on an econometric model that measures digitalisation's economic development impact by assessing LAC's progress relative to OECD economies (CAF, 2017; CAF et al., 2020; Katz and Callorda, 2018). It includes conditions for the development of the ecosystem and related aspects, such as the degree of competitive intensity, regulatory frameworks (e.g. characteristics and attributions of the regulator) and the role of digitalisation in production processes (e.g. employees and access to the digital transformation).

Despite significant advances in the last 15 years, LAC's digital ecosystem is at an intermediate level of development (index value 48.7 on a scale of 0 to 100), compared with Africa (34.2), Asia-Pacific (42.1), the Middle East and North Africa (55.4), the OECD area (66.8), Western Europe (67.6) and North America (75.4) (Figure 2.8).

The annual growth rate of the index is lower in LAC than in other regions. Countries in the region belong to a group in the emerging world experiencing a moderate annual growth rate of digitalisation. LAC's index grew at a compound annual rate of 6.1% between 2004 and 2018, the third lowest among emerging regions after the Middle East and North Africa.

Figure 2.8. **Digital Ecosystem Development Index and its growth rate in selected regions**



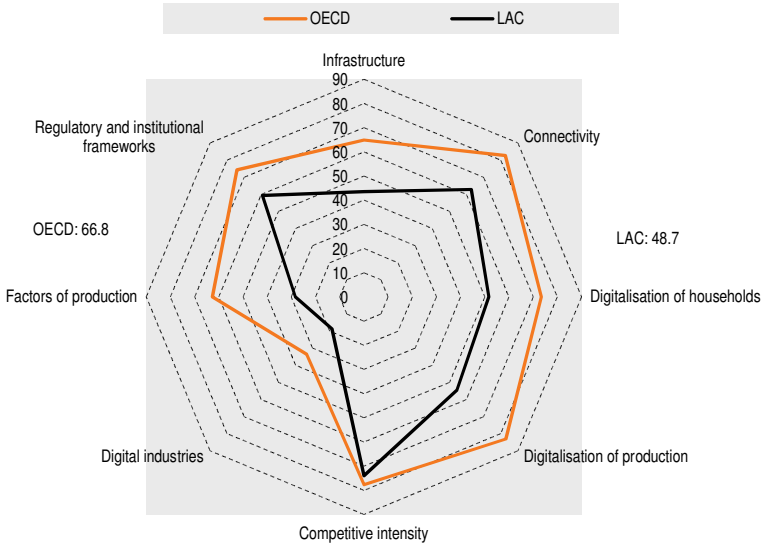
Source: CAF et al. (2020), *Las oportunidades de la digitalización en América Latina frente al Covid-19*, CAF 2020, UN ECLAC 2020, https://repositorio.cepal.org/bitstream/handle/11362/45360/4/OportDigitalizaCovid-19_es.pdf.

StatLink https://doi.org/10.1787/888934171704

Gaps between LAC and OECD countries remain in the eight multi-component pillars of this index. LAC's least developed pillars are infrastructure, factors of production (human capital, R&D investment and innovative capacity) and limited development of digital industries (Figure 2.9).

Factors of production and digitalisation of households show significant gaps with OECD economies. Factors of production lag in all variables (Table 2.5). Differences in digitalisation of households variables are heterogeneous, but in all variables the region performs below OECD average (Table 2.6). Gaps between LAC and OECD member countries in the infrastructure and connectivity pillars are also noteworthy (Table 2.7).

Figure 2.9. **Digital Ecosystem Development Index in Latin America and the Caribbean and the OECD, 2018**



Sources: CAF (2017), *Towards the digital transformation of Latin America and the Caribbean: The CAF Observatory of the Digital Ecosystem*; ECLAC (2019a), *Regional Observatory on Planning for Development in Latin America and the Caribbean* (database), https://observatorioplanificacion.cepal.org/en/opengov.

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Table 2.5. **Digital Ecosystem Development Index, factors of production variables in the OECD and Latin America and the Caribbean, 2018**

Component	Variable	OECD	LAC
Human capital	Expectation of years of education (years)	16.4	14.4
	Tertiary education enrolment (gross %)	73.7	50.3
Education technology	Education establishments with Internet access (% of establishments)	81.7	55.9
	Student/computer ratio	6.8	41.9
Innovation	USPTO patents granted per 1 000 000 people	211.4	1.2
	Income from use of intellectual property (USD per capita PPP at current prices)	268.6	31.3
Investment in innovation	Public and private expenditure on R&D (% of GDP)	2.2	0.7

Notes: Values are population-weighted averages. GDP = gross domestic product. PPP = purchasing power parity. R&D = research and development. USPTO = United States Patent and Trademark Office.

Sources: World Bank (2020), *World Development Indicators*; USPTO (2020), United States Patent and Trademark Office; World Bank/UNESCO (2020), *Education Indicators* (database), https://data.worldbank.org/topic/education.

Table 2.6. **Digital Ecosystem Development Index, digitalisation of households variables in the OECD and Latin America and the Caribbean, 2018**

	OECD	LAC
Internet users (% of the population)	84.3	67.7
Social networks (% of the population)	61.5	59.0
Mobile data ARPU as a percentage of total ARPU	57.2	54.8
UN E-Government Development Index	0.82	0.65
Electronic commerce as a percentage of retail	9.6	4.8
VOD/OTT penetration (households)	40.8	4.9*

* Includes Argentina, Brazil, Chile, Colombia, Mexico and Venezuela.

Notes: Values are population-weighted averages. ARPU = average revenue per user. VOD/OTT = video on demand/over-the-top.

Sources: Euromonitor (2020), www.euromonitor.com/; GSMA Intelligence (2020), "Definitive Data and Analysis for the Mobile Industry" (webpage), www.gsmaintelligence.com/; ITU (2020), *World Telecommunication/ICT Indicators Database 2020*, www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx; United Nations (2019), *UN e-Government Knowledge Database* (database), https://publicadministration.un.org/egovkb; UNDP (2019), *Human Development Data (1990-2018)* (database), http://hdr.undp.org/en/data.

Table 2.7. **Digital Ecosystem Development Index, infrastructure variables in the OECD and Latin America and the Caribbean, 2018**

	OECD	LAC
Fibre optic connections as a percentage of total fixed broadband connections (FTTH)	20.8	7.4
International bandwidth per Internet user (bit/s)	121 389.1	55 819.4
Population coverage of 3G networks (% of the population)	98.8	94.6
Population coverage of 4G networks (% of the population)	96.4	86
IXPs per 1 000 000 people	0.21	0.12

Notes: Values by group of countries are population-weighted averages. IXP = Internet exchange point. PPP = purchasing power parity. Mbps = Megabytes per second. FTTH = Fiber to the home.

Sources: Own calculations based on GSMA Intelligence (2020), "Definitive Data and Analysis for the Mobile Industry" (webpage), www.gsmaintelligence.com/; Packet Clearing House (2020), *Packet Clearing House Data* (database), https://web.archive.org/web/20060413225415/www.pch.net/resources/data/; ITU (2020), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

Communication infrastructure, transport connectivity and human capacity: Indispensable and complementary elements

The digital transformation affects all sectors and adds value throughout the production chain, but the magnitude of change will depend on indispensable and complementary factors. The digital transformation, as with other technological change, is not just about the diffusion of technology but also about the complementary investment firms need to make in skills, organisation changes, process innovation, new systems and new business models (Haskel and Westlake, 2017).

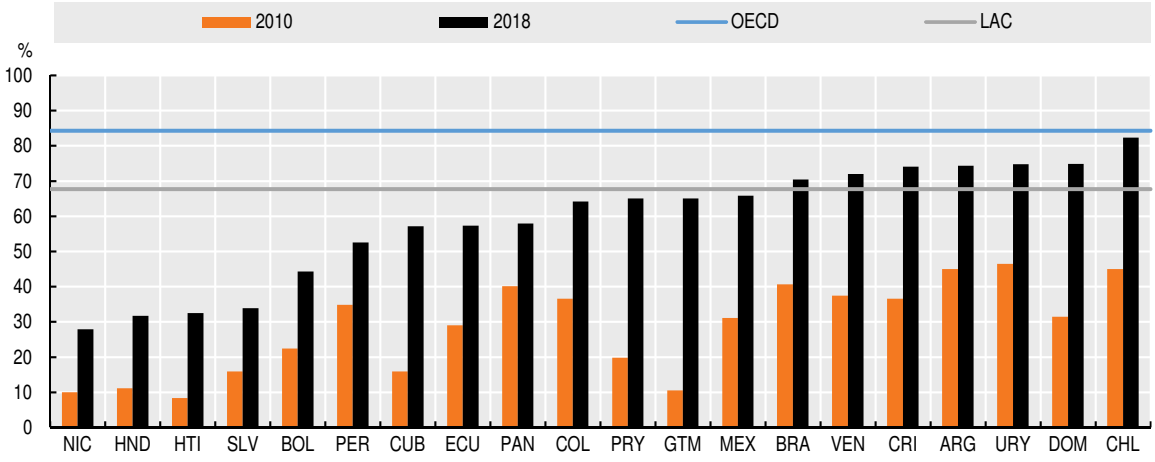
Connectivity and communication infrastructure deployment

Connectivity has evolved in recent years, particularly broadband, which was initially exclusively available through fixed networks but has now been complemented by a strong presence of mobile technology (OECD, 2019a). On average, the share of Internet users has improved in LAC countries and, despite a gap between the two regions, the digital divide with respect to the OECD area has been reduced. In particular, in 2018, 68% of the population used the Internet regularly – almost twice the share in 2010, although lagging behind the OECD average of 84% (Figure 2.10).

Active mobile broadband has evolved significantly in recent decades. In 2018, active mobile broadband subscriptions were more than five times higher than fixed broadband subscriptions (Figure 2.11), reaching, on average, almost 74% of the population.[5] The growth of active mobile broadband subscriptions is uneven across countries, exceeding 85% of the population in Brazil, Chile, Costa Rica and Uruguay in 2018 vs. close to 30% in Haiti and Honduras. Gaps between LAC and the OECD area have remained at around 30 percentage points, on average.

Despite improvements, connection speeds are below the world average, limiting types of services and apps available (Figure 2.12). Low connection speed prevents simultaneous apps, a critical issue during the coronavirus (Covid-19) pandemic: users in most LAC countries had to choose between telework, distance learning and entertainment.

Figure 2.10. **Internet users in selected Latin American and Caribbean countries, 2010 and 2018 (or latest available year)**



Notes: This indicator can include estimates and proportion of Internet users based on national household survey results. Figures reflect total population or individuals aged 5 or older. If neither were available (i.e. target population reflects a more limited age group), an estimation for the entire population was produced.

Source: Own calculations based on data from ITU (2020), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

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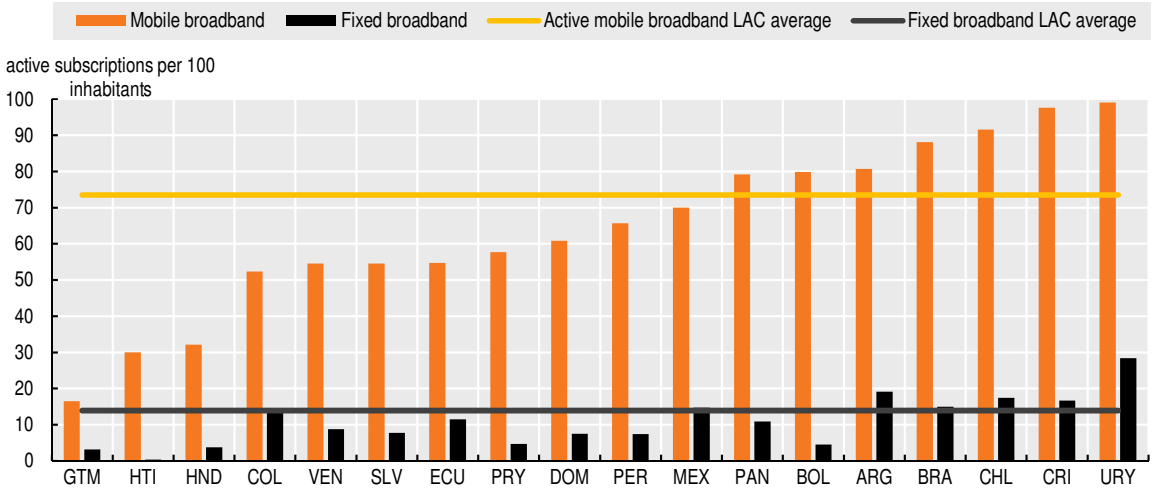
Figure 2.11. **Mobile and fixed broadband penetration in selected Latin American and Caribbean countries, 2018 (or latest available year), active subscriptions per 100 inhabitants**

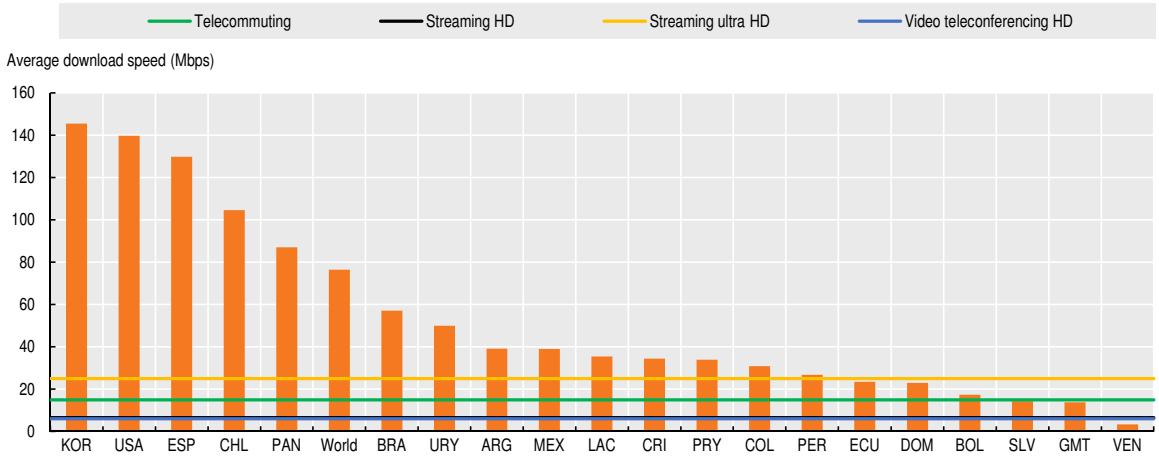


Note: Active mobile broadband subscriptions refer to the sum of standard mobile broadband and dedicated mobile broadband subscriptions to public Internet. They cover actual not potential subscribers, even though the latter may have broadband-enabled handsets.

Source: Own calculations based on data from ITU (2020), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

StatLink https://doi.org/10.1787/888934171761

Figure 2.12. **Fixed broadband download speeds in selected countries compared to bandwidth requirements for Internet services, March-July 2020**



Note: HD = High definition. Mbps = Megabytes per second. The indicator reflects wired broadband speed achievable "onnet". It does not fully represent the overall Internet experience and it provides only a partial view on Internet speed. Nevertheless, it provides a useful partial indicator available for both OECD and non-OECD countries (OECD, 2019e). Fixed broadband download speed data are a monthly average from March to July 2020.

Source: ECLAC Regional Broadband Observatory (ORBA), based on data from the Federal Communications Commission and Ookla Global Speed Test Index.

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Because most content accessed in LAC is generated outside the region (particularly in the United States), international connectivity infrastructure is highly relevant. The development of content distribution networks (CDNs)[6] and Internet exchange points (IXPs) are key to improving network efficiency. IXPs allow Internet service providers (ISPs) to exchange traffic between their networks locally. Development of IXPs reduces both transmission costs, by not having to exchange traffic at distant points, and latency, an essential parameter in the quality of services that requires integrity in transmission. IXPs also play an important role in facilitating entry of Internet Service Providers (ISPs), which can achieve domestic interconnection with other ISPs.

IXPs also reduce dependence on upstream suppliers (i.e. suppliers of international connections), increase efficiency and provide alternative routes for traffic, ensuring the reliability and stability of network quality. They facilitate local or regional traffic and favour in-country hosting of content (for instance, through the installation of CDNs) and have a positive impact on the massification of Internet access by reducing costs, mainly when abundant local content emerges. Where there is no interconnection of large and small ISPs through IXPs that allow domestic access to locally developed content and apps in non-discriminatory conditions, it is reasonable to incentivise it, either by applying competition law or by mandating local Internet interconnection between all ISPs in the country through regulation, according to the most convenient modality.

Access to broadband and connection quality remain uneven among and within LAC countries. There are several initiatives to improve connectivity, primarily in broadband, along with specific initiatives to facilitate infrastructure deployment by easing the rights of way (Table 2.8).

Table 2.8. **Connectivity initiatives in selected Latin American countries**

	Connectivity objectives			Universal Service Fund (year)	National digital agenda	National broadband plan
	Speed	Coverage	Year			
Argentina	20 Mbps	2 million new connections	NA	Yes (2000)	Yes Digital Agenda 2030	Yes National Connectivity Plan
Brazil	No objective	2 471 cities	NA	Yes (2000)	Yes Strategy for Digital Transformation	Yes Internet for All
Chile	10 Mbps	90% of households (20% fibre)	2020	Yes (1994)	Yes Agenda Digital 2020	Yes Agenda Digital 2020
Colombia	25 Mbps 4 Mbps average for 2019	70% of households with Internet access 50% of households with broadband	2022	Yes (1976)	Yes National Development Plan 2018-22; 2030 Agenda	Yes Plan Nacional de Desarrollo 2018-22
Mexico	No objective	100% of population	2024	No	Yes National Development Plan 2024	Yes Internet for All

Source: ECLAC (2019b), "Observatorio Regional de Banda Ancha" (webpage), www.cepal.org/es/observatorio-regional-de-banda-ancha based on Cullen International (2019), "Cullen International" (webpage), www.cullen-international.com/.

5G-enabling communication infrastructure for digitalisation of production processes

Unlike previous generations, the fifth generation of wireless networks, 5G, is expected to transform technologies' role in society and firms radically. 5G is expected to enable a new era of the Internet of everything via massive connection, faster transmission speeds, lower latency and lower power. 5G represents the evolution of previous generations (2G, 3G and 4G). It aims to provide 20 Gbps download speed, 10 Gbps upload speed and 1 ms latency, i.e. 200 times faster download speed, 100 times faster upload speed and one-tenth the latency compared with current Long Term Evolution networks (4G) (OECD, 2019f). 5G is expected to lead to new use cases, such as smart cities and smart agriculture, more efficient logistics, transformed health and education services, and renewed security agencies. It is also expected to revolutionise the industrial sector and give rise to new business models through the integration of technologies such as AI, virtual and augmented reality.

One-third of possible use cases of 5G are projected to be in manufacturing, but it can foster growth in all sectors. With 3G and 4G, new business models, such as e-commerce, profoundly changed consumer industries, including retail and media (O'Halloran, 2019). The distinctive characteristics of 5G make it suitable for further innovating and revolutionising business and production processes across sectors. It can support the development and introduction of new apps, improve firm efficiency, enable Internet of things (IoT) services and promote new forms of competition (OECD, 2019f). The high-speed connectivity that the 5G enables can strengthen business-to-consumer and business-to-business services and make them more responsive to preferences. Its low latency allows for real-time remote control of machines at scale and across distances. Real-time remote control is also set to revolutionise the logistics industry with autonomous fleets and remote-control vehicles. High connection density allows connection of multiple devices without network congestion, enabling installation of sensors on factory machines and smart decision making based on real-time data from interconnected machines – the so-called industrial IoT (WEF, 2020).

Automation of some repetitive production processes would allow workers to focus on higher value-added activities, conditional on complementary training (see Human capacity development section and Chapter 3). Factories' enhanced operational effectiveness could generate economic benefits. 5G may also have environmental benefits by helping industries manage their carbon footprint with real-time data and smart grids (WEF, 2020).

In 2018, 4G became the most used mobile technology worldwide. With 3.4 billion connections (43% of the total),[7] 4G is expected to consolidate as the dominant mobile technology by 2025 (GSMA, 2019). 5G networks are becoming a commercial reality. Following the commercial launches of 5G networks in Korea and the United States on April 2019, other countries are expected to launch 5G in the coming years (OECD, 2019f).

5G technology will be operational in the medium and long term in LAC. The first phase of commercial 5G device availability was at the end of 2019, but most releases are expected to be launched by the end of 2020 or in 2021. Preparedness for 5G depends on multiple factors and varies, particularly because regional markets are at various stages of maturity.

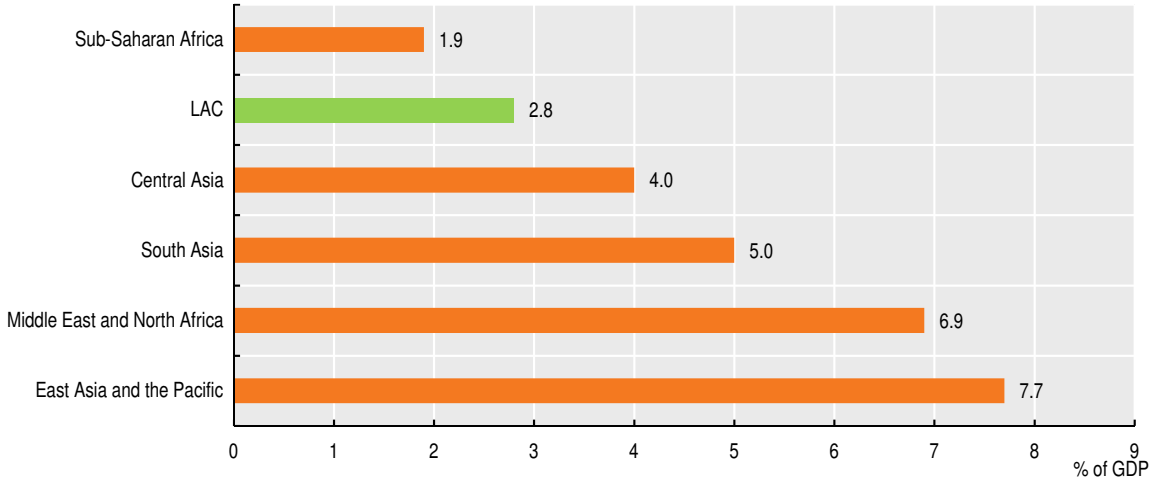
Transport connectivity: Transport infrastructure and logistics

When societies are well-connected, people experience greater overall productivity, access to jobs, basic education and health-care services, smooth social interactions, and empowerment through innovation and use of technology. New transport technologies have generally provided time savings, greater safety and lower environmental impact of mobility (ITF, 2019). Well-developed physical infrastructure reduces transaction costs, mitigates the obstacles of distance and time, facilitates the flow of goods, information and people, and helps markets integrate into global value chains. Inefficient and inadequate infrastructure hampers social integration and higher growth and prosperity.

Transport connectivity is fundamental to make the most of digital transformation. Thanks to digital platforms, e-commerce can expand markets and improve efficiency. Rapid growth in e-commerce could lead to increases in freight volumes of between 2% and 11%, depending on the transport mode (ITF, 2019). In that context, poor transport connectivity should be a barrier to the development of e-commerce for physical goods in most developing countries (Rodriguez, 2018). Well-functioning transport infrastructures, including roads, ports, airports, railways, as well as efficient logistics processes, such as postal delivery services and customs, help ensuring effective order fulfilment (Rodriguez, 2018). Conversely, inadequate transport infrastructure and logistics hamper firms to engage efficiently in e-commerce at local, regional and international levels. This is particularly evident for SMEs, which are for instance highly dependent on external logistics services.

Despite its income level, LAC does not have adequate infrastructures. More than 60% of the region's roads are unpaved, compared with 46% in emerging Asia and 17% in Europe. Two-thirds of sewage is untreated, and poor sanitation and lack of access to clean water result in a high mortality rate of children under age 5, according to the World Health Organization. Electricity disruptions and outages are among the highest in the world, affecting an adequate use of new technologies. Infrastructure spending against GDP is less than that of any other region except sub-Saharan Africa (Figure 2.13).

Figure 2.13. **Public and private infrastructure investment as a share of GDP in selected developing regions, latest available year**



Sources: ADB (2017), *ADB Annual Report 2017*, http://dx.doi.org/10.22617/FLS189307; International Bank for Reconstruction and Development/World Bank (2017), *Rethinking Infrastructure in Latin America and the Caribbean: Spending Better to Achieve More*, http://documents.worldbank.org/curated/en/676711491563967405/pdf/114110-REVISED-Rethinking-Infrastructure-Low-Res.pdf, based on Infralatam (2020), *Datos de Inversión en Infraestructura Económica* (database), http://infralatam.info; own estimates.

StatLink https://doi.org/10.1787/888934171799

Insufficient transport infrastructure in LAC

To make the most of digital transformation, it is essential to promote adequate transport connectivity. Transport infrastructure is a key ingredient to favour connectivity of people and merchandises. In Latin America, the total cost of transport, investment and maintenance for a road that is not maintained is three to seven times higher than the cost for one that is (OECD/CAF/UN ECLAC, 2018). Operational inefficiencies due to the poor condition of road and railway networks impede business development. Quality infrastructure is needed for sustainable and inclusive development (Box 2.3). Furthermore, adopting a multi-modal approach that shifts focus from roads (e.g. developing railways, ports and waterways) is central to promote adequate sustainable transport infrastructure.

Design flaws in concession contracts have caused excessive fiscal costs (OECD/CAF/UN ECLAC, 2018). Regulatory weakness and lack of institutional frameworks often result in significant delays with increased costs.

Affordable pricing for public transport is an important aspect of ensuring fair, inclusive public access and use. Regulatory frameworks ensuring affordability are required to promote equitable use of public transport. Innovative payment modalities accommodating particular income brackets, particularly those at the bottom of the distribution, should be considered. Regarding firms, transport costs-to-tariffs ratio in the region has been traditionally higher than in OECD countries (OECD, 2016).

Some countries in the region have improved regulatory and institutional frameworks for public-private partnerships. For instance, in the past five years, Colombia, Honduras and Peru have achieved more effective private participation in infrastructure through enhanced regulations (OECD/CAF/ECLAC, 2018).

However, most countries in the region have room to improve in several areas regarding road concessions. Exploiting the benefits of concessions requires stronger capacity for evaluating, tendering and managing contracts. In addition, better fiscal-accounting

procedures in the region could improve selection of contractors. This would prevent use of public-private partnerships solely to preserve fiscal space (OECD et al., 2019).

Box 2.3. **G20 Principles for Quality Infrastructure Investment**

In June 2019 in Japan, Group of 20 (G20) leaders endorsed the G20 Principles for Quality Infrastructure Investment (G20, 2019). The principles strive to maximise the spillover effects of infrastructure for sustainable and inclusive development by ensuring accessibility, affordability and inclusiveness, while also fostering gender equality, non-discrimination, human rights and labour standards, indigenous people's rights, climate action, job creation, poverty alleviation, mitigation of the effects of forced resettlement, transparent institutions and anti-corruption.

Principle 1: Maximising the positive impact of infrastructure to achieve sustainable growth and development
Principle 2: Raising economic efficiency in view of life-cycle cost
Principle 3: Integrating environmental considerations in infrastructure investments
Principle 4: Building resilience against natural disasters and other risks
Principle 5: Integrating social considerations in infrastructure investment
Principle 6: Strengthening infrastructure governance

The voluntary, non-binding principles can provide strategic direction for quality infrastructure investment in developing and emerging economies. To promote their implementation, the OECD Development Centre works with members and partner institutions to provide equal-footing policy forums that bring together developing and emerging economies and OECD countries to exchange experiences and lessons learned. Leveraging a unique membership of 30 non-OECD economies and 27 OECD countries, these policy dialogues can help identify concrete infrastructure development issues, cultivate a shared understanding of pressing needs and challenges, and promote better policy solutions through the exchange of knowledge and experience.

High logistics costs and the benefits of digitalisation

High logistics costs in LAC hamper competitiveness, including in the expansion of e-commerce. The region's 2018 World Bank Logistics Performance Index (LPI) score was 2.7: below Europe & Central Asia (3.2), East Asia & Pacific (3.2) and Middle East & North Africa (2.8) but above developing regions in sub-Saharan Africa (2.5) and South Asia (2.5) (Table 2.9). The region's main impediments are quality of infrastructure (see section above), efficiency of clearance processes, including customs, and cost and quality of logistics services.

Digital technologies can simplify administrative procedures and speed up cross-border shipments. Electronic single windows allow traders to submit import and export regulatory requirements electronically. Eliminating the need to send hard copies to various bodies enhances transparency, expedites clearance of international transactions and improves trade statistics. Countries including Argentina, Chile, Colombia, Costa Rica, Mexico and Peru have adopted the one-stop shops. Some countries have started interoperability efforts by sharing phytosanitary certificates (June 2016) and certificates of origin (end of 2017) (Opertti, 2019). This could create conditions for integrated one-stop border controls operating via cloud-based solutions, such as the IoT, which could make trade more seamless and reduce logistics costs (Martincus, 2016).

Table 2.9. **World Bank Logistics Performance Index (LPI) scores, by region, 2018**

Region	LPI score	Customs	Infrastructure	International shipments	Logistics competence	Tracking and tracing	Timeliness of shipments
Europe & Central Asia	3.2	3.0	3.1	3.1	3.2	3.3	3.7
East Asia & Pacific	3.2	3.0	3.0	3.0	3.1	3.2	3.5
Middle East & North Africa	2.8	2.5	2.7	2.7	2.7	2.8	3.2
Latin America & Caribbean	2.7	2.5	2.5	2.7	2.6	2.7	3.0
South Asia	2.5	2.3	2.3	2.5	2.5	2.6	2.9
Sub-Saharan Africa	2.5	2.3	2.2	2.5	2.4	2.5	2.8

Notes: LPI is the weighted average of scores on six dimensions: 1) efficiency of clearance processes by border control agencies, including customs (speed, simplicity and predictability of formalities); 2) quality of trade- and transport-related infrastructure (ports, railways, roads, information technology); 3) ease of arranging competitively priced shipments; 4) competence and quality of logistics services (transport operators, customs brokers); 5) ability to track and trace consignments; 6) timeliness of shipments in reaching destination within scheduled or expected delivery.
Source: World Bank (2018), *World Bank Global Logistic Performance Index 2018* (database), https://lpi.worldbank.org/international/scorecard/radar/254/C/DEU/2018/R/EAP/2018/R/ECA/2018/R/LAC/2018/R/MNA/2018/R/SAS/2018/R/SSA/2018?featured=17.

Digitalisation can make the logistics industry more resource efficient, agile and responsive to customer needs. New business models, including e-commerce, are contributing to the growing demand for logistics services. Industries with close links to logistics, such as retail, have undergone major transformations thanks to digital technologies. The logistics sector has been slower (Bauer, Dichter and Rothko, 2018; WEF, 2016), despite the benefits. Digital platforms not only help businesses connect with consumers but can better match shipment demand with logistics capabilities, e.g. through end-to-end online booking services. This could be particularly helpful for the internationalisation of SMEs, which often do not have the same experience as big firms in arranging international shipments. Moreover, the IoT, a network of smart devices, sensors and the cloud, coupled with advanced data analysis techniques, allows real-time analysis of supply chain data. Insights can be used to optimise decision making and rapidly detect and react to problems. Apart from reduced operating costs, improved data analytics brings environmental benefits. Network optimisation can reduce the number of trucks on the road, lowering emissions and waste. Digital platforms can support shared warehouse space and transport capabilities, increasing utilisation rates and reducing emissions (WEF, 2016).

Although the coronavirus (Covid-19) has accelerated the use of e-commerce platforms and encouraged companies to implement business models adjusted to decreased demand due to restrictions, barriers to e-commerce in the region should not be underestimated. Among them, high shipping costs, fear of misuse of confidential and sensitive information and low technological adoption by MSMEs require a systemic and policy approach, which will vary by country, in order to boost e-commerce.

Human capacity development for digitalisation in Latin America and the Caribbean

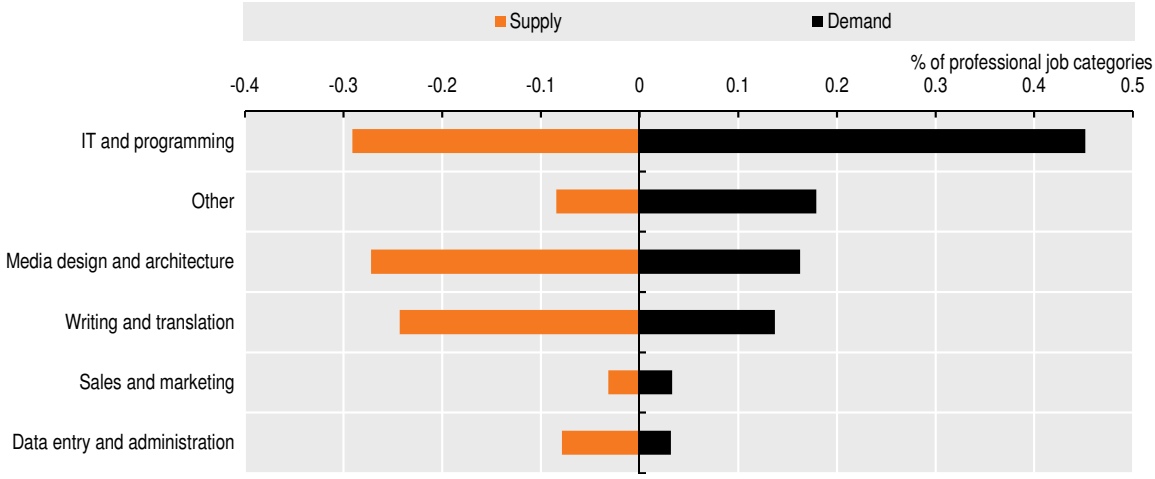
Benefitting from new technologies requires developing human capacities and adaptation to the new digital context. Evidence from the European Union suggests that productivity gains from digital adoption at the firm level tend to be weaker in the presence of skills shortages. Policies to support adoption should be complemented with the creation of conditions that enable laggard firms to catch up, e.g. via the promotion of better access to skills, notably ICT training for low-skilled workers (Gal et al., 2019; Andrews, Nicoletti and Timiliotis, 2018).

Factors of production represent the largest gap in digital ecosystem development between LAC and OECD countries. Formation of digital skills is a critical element.

Investing in appropriate skills and narrowing the region's gap relative to countries at the technological frontier will be essential for LAC to leverage digital technologies and avoid being left behind by the changes fundamentally altering the industrial landscape.

Gaps between skills supply and demand are large in LAC. In services related to IT and programming, global labour market demand significantly exceeds the supply of LAC professionals. The opposite is true for media design and architecture, and writing and translation services (Figure 2.14). The observed mismatch indicates a need to increase training in areas related to the digital economy to take advantage of the growing opportunities.

Figure 2.14. **Global labour market supply and demand of skills in Latin America and the Caribbean, 2019**



Notes: Other refers to: Local Jobs & Services, Freight Shipping & Transportation, Engineering & Manufacturing, and Business Accounting Human Resources & Legal. Based on Freelancer and Workana, two digital labour platforms. Freelancer has greater global reach; Workana focuses on Latin America. On these platforms, professionals offer specific skills, and clients seek assistance with specific projects. Both platforms offer professionals the opportunity to publish a profile and employers the opportunity to publish job opportunities.

Source: ECLAC (2020e), *Tracking the Digital Footprint in Latin America and the Caribbean*, https://repositorio.cepal.org/handle/11362/45484.

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To address human capacity gaps, it is important to consider both the demands of the productive structure and its expected or desired development trajectory. Limited training of researchers involved in creating new products and services affects the ability to develop new technologies and industries, while lack of human capacities for assimilating new technologies hinders adoption of potentially productivity-enhancing factors of production.

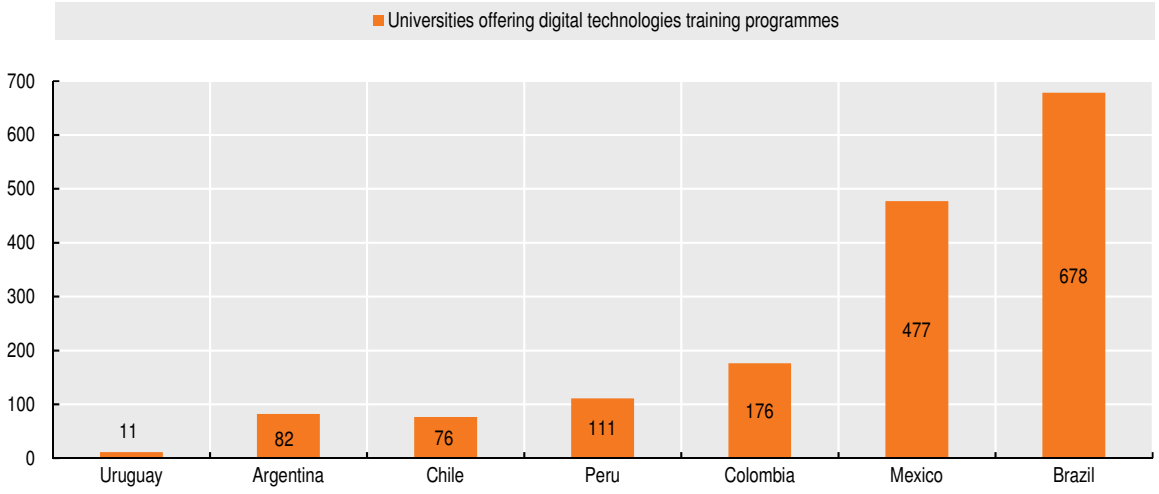
The skills and education requirements for each of these functions are distinct. Researchers involved in the development of digital technologies typically hold a master's degree and often a doctorate. Professionals incorporating digital technologies into production processes typically hold a certification of degree studies or master's, although they can also be qualified through a short career degree (e.g. vocational training or a certificate). Each profession entails very different skills. Those required for assimilating mature technologies include training in basic areas of management informatics; those required for incorporating advanced technologies into the production chain include training in areas such as AI and robotics.

ICT expands opportunities for continued education. Massive open online courses – free online courses open to anyone – and open education platforms offer affordable,

time-flexible training at all life stages and content adapted to personal or occupational needs. These technologies can boost productivity and help formal and informal workers with limited time or resources accumulate human capital and skills. Workers could benefit from alternatives to traditional education and training (OECD et al., 2019).

In the past two decades, LAC has developed a generous supply of digital technologies training programmes. More than 1 600 universities in Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay – 52% of total universities in the seven countries – offer more than 6 390 such graduate and postgraduate programmes (Katz and Callorda, 2018). Among the selected countries, Argentina has the most such universities (66%) (Figure 2.15).

Figure 2.15. **Number of universities offering digital technologies training programmes in selected Latin American countries, 2016**



Source: ECLAC (2018b), *Data, Algorithms and Policies: Redefining the Digital World*, https://repositorio.cepal.org/bitstream/handle/11362/43515/7/S1800052_en.pdf.

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Short-term course offerings are even more robust: more than 7 938 in the seven countries. Most include courses related to robotics and control, AI and machine learning, and Big Data and analytics (Table 2.10).

Table 2.10. **Number of short-term advanced digital technologies training courses by subject area in selected Latin American countries, 2016**

	Robotics and control	AI/machine learning	Big Data/analytics	Total
Argentina	196	216	201	613
Brazil	1 032	1 218	891	3 141
Chile	194	89	84	367
Colombia	441	208	178	827
Mexico	907	944	644	2 495
Peru	183	111	100	394
Uruguay	36	29	36	101
Total	2 989	2 815	2 134	7 938

Note: AI = artificial intelligence.

Source: ECLAC (2018b), *Data, Algorithms and Policies: Redefining the Digital World*, https://repositorio.cepal.org/bitstream/handle/11362/43515/7/S1800052_en.pdf.

Postgraduate offerings, especially doctorates, are limited. There are 294 doctoral programmes in digital technologies in the seven countries, with only 130 doctoral programmes offered by the top 20 top-performing universities (Table 2.11). This relative

shortage hinders development of specific digital skills and high-level basic and applied research, posing a major challenge for countries transitioning to knowledge-based economies that require citizens to innovate, adapt and leverage advanced human capital. The supply gap in high-level training programmes, mainly doctorates, affects the level and resources of R&D in the region.

Table 2.11. **Postgraduate digital technologies programmes in selected Latin American countries, 2016**

	Master's	PhD	Total
Argentina	37	35	72
Brazil	72	152	224
Chile	36	10	46
Colombia	68	13	81
Mexico	187	67	254
Peru	49	14	63
Uruguay	11	3	14
Total	460	294	753

Source: ECLAC (2018b), *Data, Algorithms and Policies: Redefining the Digital World*, https://repositorio.cepal.org/bitstream/handle/11362/43515/7/S1800052_en.pdf.

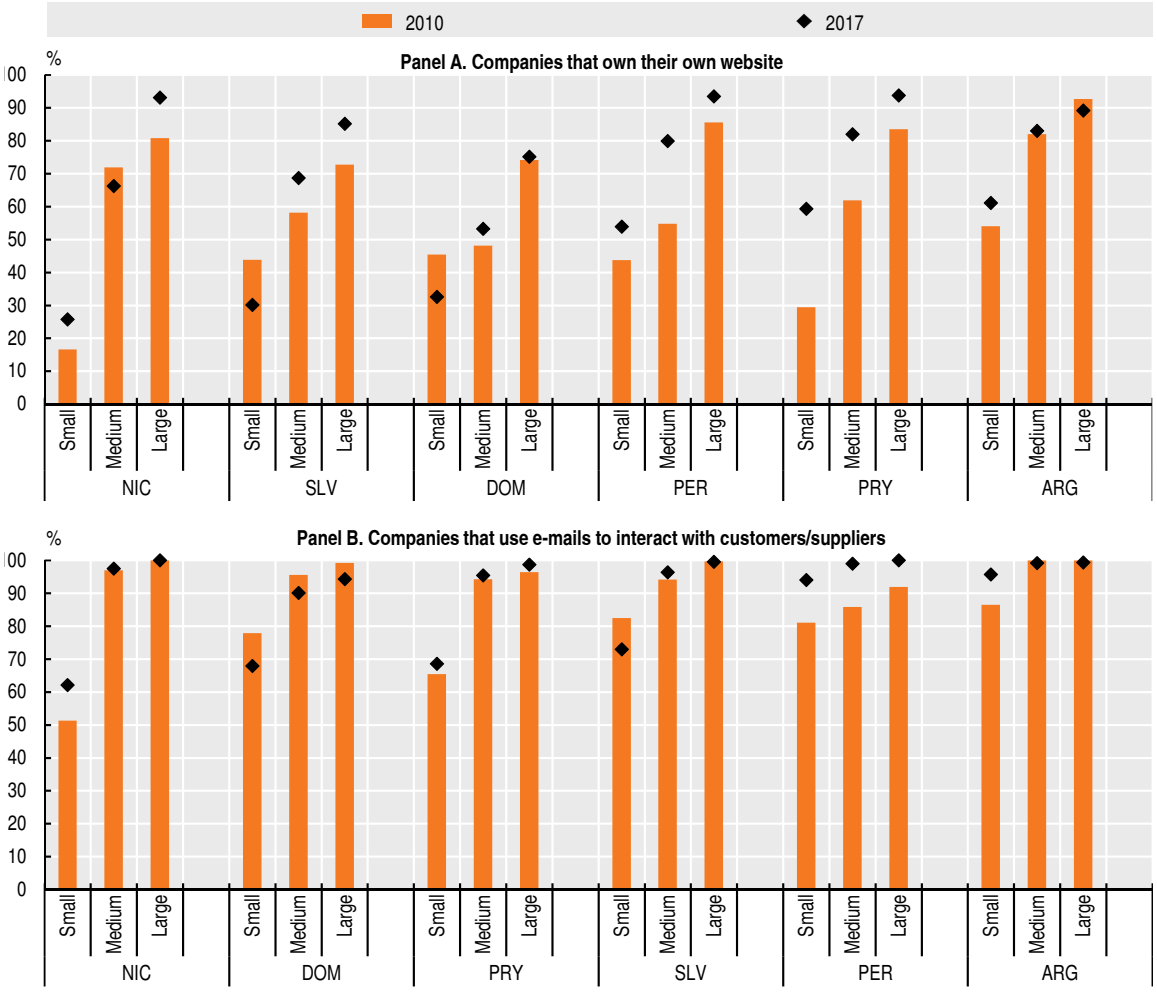
LAC policies to promote the digital transformation and increase productivity

LAC policies to promote the industrial sector's digital transformation and stimulate productivity show mixed results. Lack of strategic vision and stakeholder co-ordination often produce scattered initiatives. However, the potential of the digital revolution should not be underestimated, especially for MSMEs, given their important role in LAC's formal economy: MSMEs represent 99.5% of firms and 61.2% of employment but only 24.6% of production in the region (Correa, Leiva and Stumpo, 2018). With appropriate policies, digital technologies could help close the productivity gap with bigger firms. Despite advances in recent years, low adoption of even basic technologies, especially among small firms, shows that space remains for further policy intervention. For instance, in some countries of the region the gap between small and large companies that own their own website is higher than 30 percentage points (Figure 2.16).

LAC has yet to align public and private efforts to develop digital industries. Main reasons include limited understanding of the importance of the private sector, lack of co-ordination within public administration, lack of transparency and confidence in public-private relationships, and lack of co-ordination among stakeholders and in channelling private-sector efforts (see Chapter 4 for the role of national development plans and digital agendas [DAs] in the digital transformation) (Katz, 2015).

Some countries have recently begun to incorporate policies in their DAs to boost adoption and development of emerging technologies, including advanced robotics, sensors, AI, Blockchain and the IoT, to improve industry (see Chapter 4). Uruguay's DA created *Laboratorio de Fabricación Digital*, a digital manufacturing laboratory focused on priority industrial sectors. Similarly, the Cerro Industrial Technology Park laboratory facilitates training, invention and small-scale prototype production, and provides general access to tools for latest generation digital manufacturing. Brazil's E-Digital strategy objectives include implementation of the national IoT plan and testing platforms for the IoT in the value chains of four key sectors: health, agriculture, industry and smart cities. Colombia's ICT plan promotes projects oriented to the use of the IoT, AI and Blockchain in digital business transformation processes. The Centre for the Fourth Industrial Revolution Colombia, operated by the Ruta N Corporation in Medellín, was created to achieve this goal.

Figure 2.16. **Use of basic digital technologies by firm size in selected Latin American and Caribbean countries, 2010 and 2017**



Sources: Own calculations based on World Bank (2020b), *Enterprise Surveys* (database), www.enterprisesurveys.org/; Correa, Leiva and Stumpo (2018), "Avances y desafíos de las políticas de fomento a las mipymes", *Mipymes en América Latina: Un Frágil Desempeño y Nuevos Desafíos para las Políticas de Fomento*, https://repositorio.cepal.org/bitstream/handle/11362/44148/1/S1800707_es.pdf.

StatLink https://doi.org/10.1787/888934171856

In the last decade, the region has made advances in productivity policies for MSMEs. Many countries have adopted legal frameworks to support these firms; however, beyond historical institutions in Chile (SERCOTEC, INDAP, CORFO) and Brazil (SEBRAE), institutions to promote and assist MSMEs with operational and financial autonomy remain the exception. INNPULSA in Colombia and CONAMYPE in El Salvador have gained relevance in the last few years; the role of INADEM in Mexico still has room for improvement. Lack of common strategy among institutions, fragmentation of interventions and limited scope and budget remain the main limitations of LAC MSME productivity policies. Lack of systematic monitoring and evaluation of initiatives impedes learning from previous experiences (Correa, Leiva and Stumpo, 2018).

Many LAC countries have encouraged MSME adoption of digital technologies in the last decade, especially in order to stimulate entrepreneurship. Yet, there has not always been clear connection with national strategies for productive transformation. An analysis

of 11 categories of initiatives, on a scale of increasing complexity from creating an enabling ecosystem for the adoption of digital technologies to transforming technological and strategic capabilities of firms, shows that most initiatives are not yet implemented or still in the implementation phase (Figure 2.17). A vertical reading shows variation in the distribution of these programmes, with greater focus on enablers and policies to develop capabilities (upper part of the map) and less on more complex tools to change the productive structure (lower part).

Several countries have created dedicated online MSME platforms and portals. These include *Escritorio Empresa* in Chile, *Ventana Unica Pyme* in Costa Rica, *Portal Mi Empresa* in El Salvador and *Red de Apoyo al Emprendedor* in Mexico, which have physical offices, if needed. Awareness-raising and digital literacy initiatives are also common by way of awareness campaigns and technical assistance offered by dedicated bodies: *Centros de Transformación Digital Empresarial* in Colombia and the network of *Infocentros Comunitarios* in Ecuador, for instance, offer free digital skills training. Many countries have initiatives to facilitate access to and adoption of digital technologies. *Transformación Digital PyMEs* in Argentina, *Espacio Pyme* in Chile and *Kit Digital* in Peru provide digital training, technical assistance, software and apps to manage changes related to the digital transformation of firms. Financial assistance for adoption is offered through the innovation fund PROPYME in Costa Rica and the *Fondo Nacional Emprendedor* of INADEM in Mexico, among others. Brazil's SEBRAETEC is a SEBRAE programme offering assistance ranging from digital training to consulting for firms (Heredia, 2020).

There remain large opportunities to promote R&D, new business models and productive chain adjustments (Figure 2.17). Incentives for the ICT sector are sparse, although Argentina's Fiduciary Fund for the Promotion of the Software Industry and Mexico's Program for the Development of the Software Industry support SMEs in the ICT sector, among other activities. More needs to be done to support and promote research and innovation in industrial technology. Existing examples include Argentina's FONTAR, a fund for innovation in technology, and Brazil's EMBRAPII, an institution promoting R&D for industry, targeting risk sharing in the precompetitive phase of innovation (Heredia, 2020). The challenge for LAC is moving from policies that encourage adoption of digital technologies in the industrial sector to assistance for the complete transformation of production processes and the creation of new business models supported by new technologies (Heredia, 2020).

Industrial policies for the digital age are essential to encourage the economy to move towards higher value-added activities. The digital transformation of LAC's industrial sector is far from complete. Industrial policy for the digital economy must first strengthen the local IT industry. New technological sectors may contribute to technological development through the transfer and dissemination of technologies, generation of skilled human resources and export of services. Although countries, including Argentina, Brazil, Chile, Colombia, Mexico and Uruguay, have successfully promoted the IT industry, there are still deficiencies in diffusion of use of IT products and their appropriation for business activities, particularly among SMEs (ECLAC, 2018b).

Industrial policies must adopt a strategic vision and be part of both wider development plans and productive and technological sectoral plans. Collaboration between productive and research sectors (public research centres, universities, technological institutes) is fundamental for an institutional research structure closely linked to innovation and business development (Casalet, 2018). Creation of a virtuous digital ecosystem is essential for firms, governments and citizens to benefit from the digital transformation.

Figure 2.17. **Categories of promotion of digital technologies in micro, small and medium-sized enterprises in selected Latin American countries, circa 2019**

Category	ARG	BRA	CHI	COL	CRI	ECU	SLV	MEX	PER
Simplification of procedures (digital government)									
Awareness and digital literacy									
Facilitate access to digital technology									
Training									
Technical or financial assistance									
Development of new business opportunities									
Incentives for ICT sectors									
Support for the formation of digital companies									
Research and technological innovation									
Digital integration of production chains or suppliers									
Support for the development of new business models									

Notes: Colour intensity indicates the degree to which policy has been implemented; white indicates no implementation. ICT = information and communications technology.

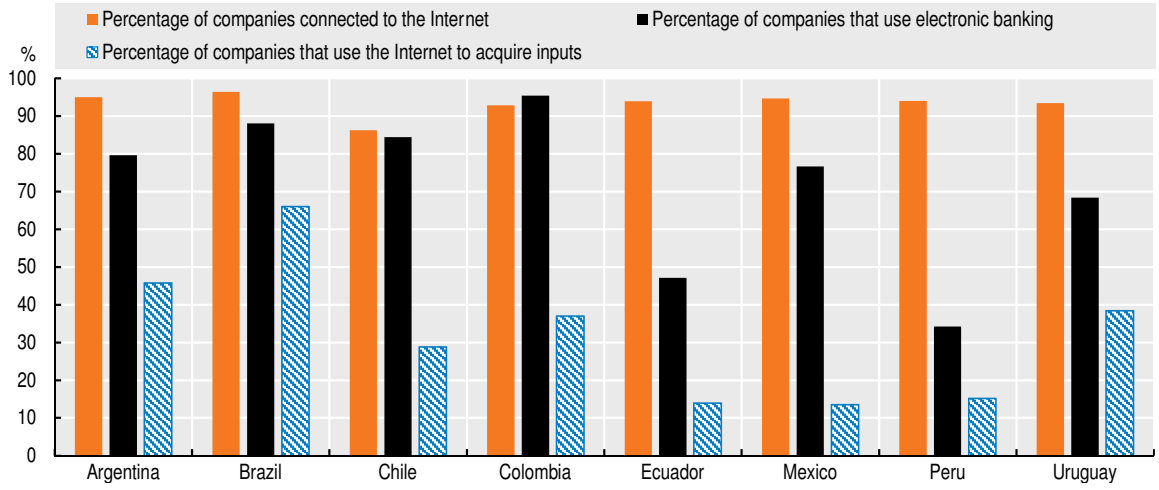
Source: Heredia (2020), *Políticas de Fomento para la Incorporación de las Tecnologías Digitales en las Micro, Pequeñas y Medianas Empresas de América Latina: Revisión de experiencias y oportunidades*, https://repositorio.cepal.org/bitstream/handle/11362/45096/1/S1900987_es.pdf.

Digital adoption will be facilitated by efficient resource allocation, since a firm's incentives to experiment with uncertain or risky digital technologies will be shaped by its perceived ability rapidly to scale up operations in the event of success and scale down and potentially exit the market at low cost in the event of failure (Andrews and Criscuolo, 2013). From this perspective, harnessing digital transformation for firms places an added premium on policies that foster business dynamism and efficient resource reallocation. This is a challenge in many countries, against the backdrop of declining business dynamism (Criscuolo, Menon and Gal, 2014) and rising resource misallocation (Adalet McGowan, Andrews and Mil, 2017); (Berlingieri, Blanchenay and Criscuolo, 2017) over the past decade.

The digital transformation post coronavirus (Covid-19)

For most LAC economies, recovery will be slower and more gradual than expected at the beginning of the pandemic. Despite government programmes, high loss of companies and jobs is expected. The greater the numbers, the greater the loss of accumulated capacities in firms, dispersion of knowledge and experiences and breakdown of relationships of trust among economic actors. Incentives other than those prevailing before the coronavirus (Covid-19) will be required for private companies, together with the state, to make necessary investments to diversify the economic structure, guarantee continuous and stable growth and avoid setbacks. Digital transformation will be central to firms' advancing towards greater efficiency and productivity, and there is room for improvement. For instance, the region entered into the Covid-19 crisis with low levels of companies using digitalisation in their every day operations (Figure 2.18). Digital technologies will be key to new operating models: companies will have to adopt technologies to process large amounts of information to improve decision processes, which may redefine business models. Industry should incorporate greater use of robotics to increase efficiency. Digital transformation may also affect business model operations through changes in the sale and delivery of goods and services or interactions with suppliers (ECLAC, 2020b).

Figure 2.18. **Latin America: Digitalisation of the supply chain, 2018**



Source: CAF (2020), *El estado de la digitalización de América Latina frente a la pandemia del COVID-19*, https://scioteca.caf.com/bitstream/handle/123456789/1540/El_estado_de_la_digitalizacion_de_America_Latina_frente_a_la_pandemia_del_COVID-19.pdf?sequence=1.

StatLink https://doi.org/10.1787/888934171875

The world should not be expected to return to pre-pandemic contexts. Although the crisis seems to highlight the fragility of multilateralism, globalisation will not be reversed: there will be demand for greater regional integration. The global economy could be regionalised around three poles: Europe, North America and East Asia. Given the structural challenges in LAC, this scenario would require progress towards greater productive, commercial and technological integration. The future of the region in the new economic geography entails regional value chains that make it less dependent on imported manufactures and enhance the productive structure towards more sophisticated goods. Industrial and technological policies must strengthen productive capacities and generation of new strategic sectors. This would provide greater resilience to regional production networks challenged by the diversification of suppliers (both in terms of countries and companies) that favours locations closer to final consumer markets (nearshoring) or relocation of strategic technological and production processes (reshoring).

The coronavirus (Covid-19) crisis has made it essential and more important than ever to reflect on the productive structure and regional integration mechanisms. Both must be part of the same strategy. There is an opportunity to recall the benefits of regional integration and resume actions towards inclusive and sustainable international governance based on the UN 2030 Agenda for Sustainable Development.

Conclusion

This chapter analysed the underlying causes of LAC's low productivity and evaluated the potential of digital technologies to augment productivity and facilitate the region's move towards a higher value-added productive structure with reduced structural heterogeneity.

Digital technologies are not independent from the sector, organisation structure and other context-specific aspects in which they operate. Digital technologies' impact is not deterministic and is dependent on multiple factors. Technological solutions and policies must be adapted to individual sectors and types of production units, including SMEs, to address the unique characteristics that influence their functionality. Despite the necessity

of context-specific interventions, common complementary investments are essential to reap the benefits of digital technologies' integration into productive processes.

Successful digital transformation strategies for industrial productivity rely on a broader range of interventions and sectors than ICT alone. Communication infrastructure, transport connectivity and skills are critical enabling elements in the digital era in which LAC lags behind the OECD area. Policy makers have numerous financing and business models for infrastructure investment. Appropriate mechanisms depend on the country and technological context. Policy makers must avoid the risk that adoption of digital technologies exacerbates inequalities. Expanding access to infrastructure and skills' development with targeted and context-specific policies is necessary to ensure that all individuals and firms benefit from new technologies and to avoid widening, with their distributional impacts, sectors' and firms' structural heterogeneity.

Notes

1. Digital technologies include smart phones, computing power, Internet of things, 5G networks, Cloud computing, artificial intelligence and blockchain.
2. In the economic debate started with Solow, productivity gains are considered measures of technological change, being the part of output unexplained by input adoption and therefore related to technological progress (Solow, 1957).
3. OECD research shows that there is potential to increase productivity in the digital age owing to supportive policy for firms (OECD, 2019g).
4. A composite index provides a useful general view of how countries are performing. Nevertheless, the use of aggregating multiple indicators into one composite is not without problem as good performance in one indicator can hide a bad performance in another indicator (OECD et al., 2019).
5. Proportions of Internet users are based on national household survey results for total population of individuals aged 5 or older. Active mobile-broadband subscriptions refer to the sum of standard mobile-broadband and dedicated mobile-broadband subscriptions to the public Internet.
6. Content delivery networks (CDNs) serve as aggregators of content, systems for the delivery of traffic directly to the terminating network, and providers of quality-enhancing inputs, such as caching of data close to the end user. CDNs are useful to providers of online services, such as the BBC, Google, Netflix and Hulu, which seek to improve their customers' experience. More direct delivery, fewer intermediate loops, and local caching reduce latency and improve the quality of service (OECD, 2013).
7. Not including IoT connections.

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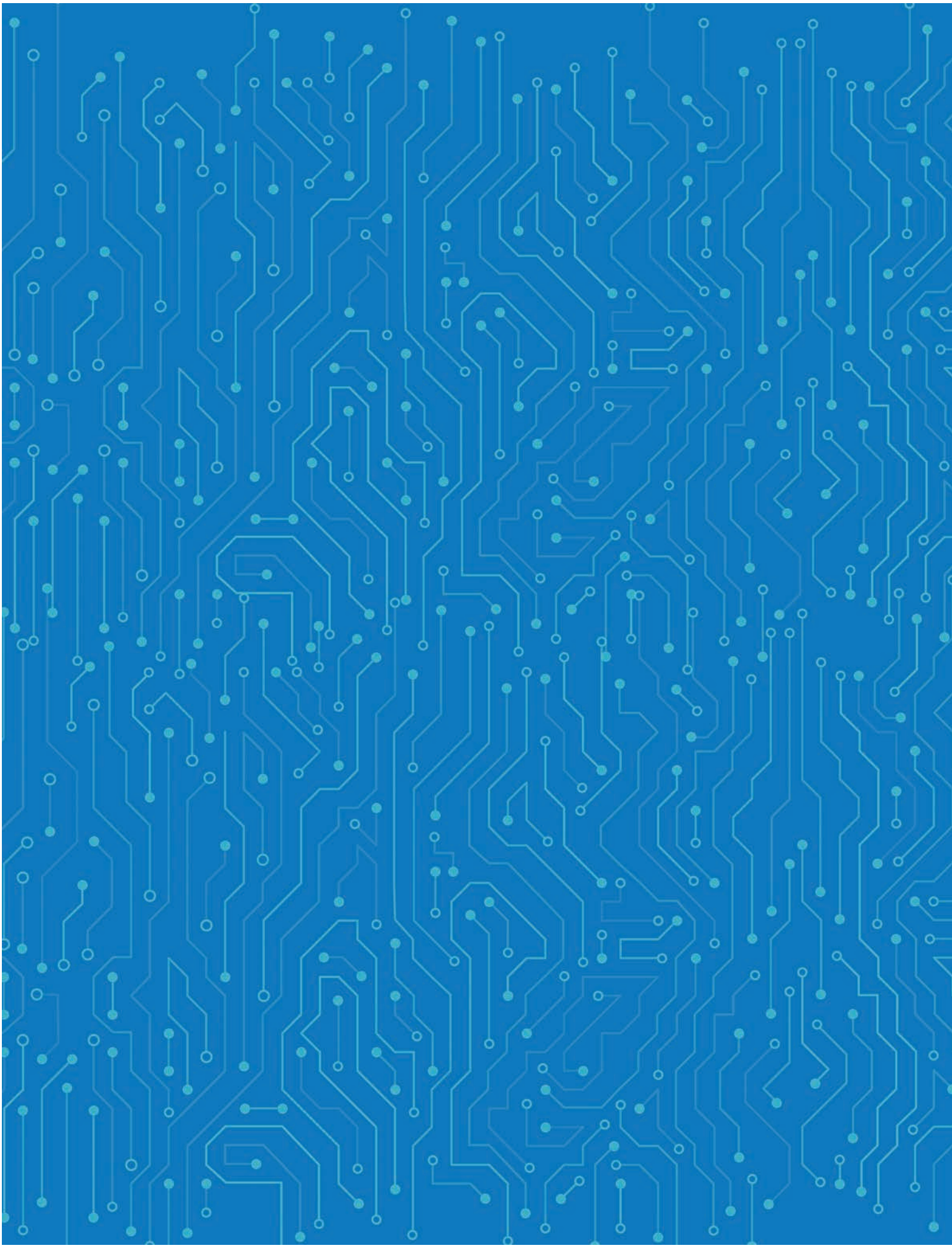


Chapter 3

The digital transformation for all

Access to and use of digital tools in Latin America and the Caribbean can have a strong impact on inclusiveness. Digital tools, such as the Internet, are less unequally distributed than income and some public services. Despite significant reductions in socio-economic, gender, age and geographical disparities, policies should focus on closing the remaining gaps. This chapter describes such advances and the trends in Internet access and use at home, work and school. It presents the potential impacts of the future of work, and assesses the digital skills of the current workforce. It also analyses schools' role in the digitalisation era and in fostering digital inclusiveness. It concludes by describing how, in the context of the coronavirus (Covid-19) crisis, the digital divide constitutes a vulnerability in the region and may amplify other inequalities in the absence of appropriate policies. In this context, digital inclusion must be understood as necessary to ensure social welfare.

LAC policies are essential in making the most of the digital transformation, fostering inclusion and improving well-being

Internet access and use is strongly linked to household income and location

Access to the Internet has expanded in the last decade and is better distributed than most services

Yet the Internet usage gap between the richest and poorest is almost 40 percentage points...

... and the gap between urban and rural households is more than 25 percentage points

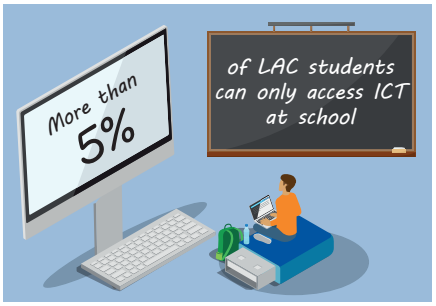
Policies should not focus only on job losses, but also on job creation and transformation

1 out of 4 jobs is at high risk of automation

Very few workers have proficiency in and use of digital tools at work

A large share of LAC adults have little or no computer experience

The Covid-19 crisis highlighted the equity role of ICTs in education



The % of primary school students with Internet connection at home varies

14% 80%

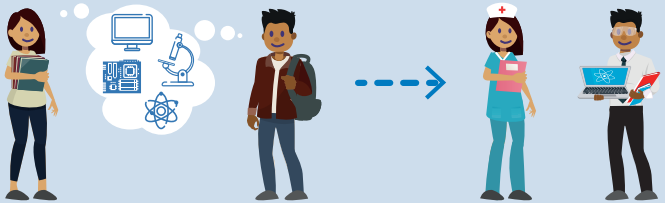
Poor Rich

In addition to physical obstacles, such as limited infrastructure, countries also face the lack of ICT-knowledgeable staff and teachers

Gender is a discriminating factor in many aspects of the digital transformation

Large gender differences persists in student disposition towards science-related careers

Although a similar share of boys and girls expect to work in a science-related occupation, they tend to select different fields



The under-representation of women in ICT careers negatively affects LAC's innovative and economic potential

Introduction

More people in Latin America and the Caribbean (LAC) are connected to the Internet than ever, but gaps persist, and new ones may emerge. The digital divide, or the opportunity gap of individuals, households, businesses and geographical areas to access information and communications technology (ICT), has contracted in many countries in the region. However, the scope and speed of digitalisation vary greatly across countries, sectors, people and geographical areas in LAC.

Technological progress has the potential to improve well-being and remove social barriers. It can also deepen income, gender, age and territorial inequalities. Digitalisation will only fully benefit individuals, societies and economies if policies spread the gains across all households, schools and firms. In the context of the coronavirus (Covid-19) crisis, lack of access to communication infrastructure and skills can widen disparities, producing winners and losers. Policy action must help accelerate digital transformation, ensuring social inclusion. In responding to the coronavirus (Covid-19) pandemic and economic recovery, policy needs to articulate better digital tools, which are a decisive factor in social welfare progress.

Digitalisation can bring new social inclusion opportunities, sustaining the progress of the past two decades. New technologies can improve access to public services, health and education, government transparency and job creation. They can bring previously under-represented groups, such as women, those with disabilities, migrants and indigenous populations, into public policy and create new occupations that expand entry into the labour market.

With its capacity to improve skills, services and jobs, digitalisation can mitigate the social vulnerability trap in LAC. Work trajectories in the region are unstable. The predominance of low-quality informal jobs and the high level of rotation between precarious jobs leave many workers vulnerable to the effects of individual, household or macro shocks (OECD et al., 2019). Digitalisation can automate dangerous or routine tasks, make work environments safer and healthier, and allow people to choose more freely when and where to work, improving work-life balance. Maximising new technologies can enable informal businesses to transition to the formal sector. By overcoming traditional barriers to labour market participation, new technologies can integrate previously under-represented groups. Digitalisation also offers cheaper and easier ways to save and invest in human capital and entrepreneurial activity. These impacts boost labour productivity, enhance job quality and support income stability, potentially transforming the vicious circle of low productivity, poor human capital and volatile income – in which 40% of the LAC population is trapped – into a virtuous circle of social inclusion and sustainable growth.

At the same time, new technologies can widen disparities and reinforce the social vulnerability trap (OECD et al., 2019). Digitalisation has increased automation and replacement of some tasks by technology. The first of those tasks were routine tasks, such as administrative work, financial tasks, paralegal work and reporting, putting low-skilled workers and women out of work. The surge in Big Data, artificial intelligence and computing power is progressively automating non-routine tasks (OECD, 2019a), requiring a population prepared to meet these new challenges. Gaps in ICT access, use, impact, and foundational, technical and digital skills can hinder the opportunities and advantages of digitalisation for vulnerable groups. Policies will determine whether digital tools foster inclusion or extend inequality. Technologies are changing rapidly, demanding enduring adaptation skills. Beyond basic digital device and Internet skills, people must develop computational thinking, ability to frame and solve problems using computers, and capacity to select and interpret the information produced by digital tools.

Early appropriate use of digital technologies, along with lifelong learning opportunities to develop skills to interact with and take advantage of them, is key to seizing the opportunities of digitalisation. LAC countries' readiness depends on addressing gaps in access to, use of and proficiency with new technologies in homes, schools and workplaces. As countries expand digital services, tools and infrastructure, education plays a central role, throughout the life cycle, in ensuring foundational, technical and digital skills for all and preventing the perpetuation of socio-economic inequalities in the labour market.

Digital technologies allow individuals to overcome some traditional barriers to labour participation and can reduce some costs for both employers and employees. However, new forms of work, such as telework and the platform economy, bring new challenges in terms of social protection. Well-being losses may emerge in systems not prepared to absorb and regulate non-standard ways of working.

The coronavirus (Covid-19) crisis highlights the digital divide as an urgent concern, as poor and vulnerable workers without the infrastructure or skills to benefit from digital tools are being left behind. Digital tools have allowed some sectors and firms to continue, at least partially, safely by complying with social distancing measures. For instance, in response to lockdown measures, digital transformation offered workers, students, firms and households opportunities for telework, online distance learning, platforms and e-commerce, and access to public and private services. However, the digital divide prevented most of the poor and vulnerable population from benefitting from these opportunities. Those unable to exploit these tools are likely to be more affected by the economic and social consequences of the crisis and potentially widening socio-economic inequalities.

Impacts of the coronavirus (Covid-19) crisis on jobs, individuals and households remain uncertain, but it is evident that people experience inequality in adapting to it. The affluent and middle class are more likely to be connected and to have integrated digital technologies into work, education and family life. The poor and vulnerable are more likely to have little or no digital access or skills, negatively affecting their access to public and private goods and services. Workers with no access or skills are more prone to short- and long-term economic and other losses, for instance, because they have no opportunity to telework or sell goods online, while their children may be unable to continue education remotely.

Several actions are needed to promote an economic recovery in which everyone benefits from the opportunities of digital transformation. In particular, there is a need to consolidate the process of expansion of access and use of digital technologies and ICT infrastructure, while also strengthening digital, cognitive and non-cognitive skills. Ensuring that all people can access, use and benefit from new technologies requires comprehensive and co-ordinated policy efforts (see Chapter 4). A package of policies needs to both promote digitalisation, where it increases productivity and well-being, and cushion its negative impacts (OECD, 2019b).

This chapter describes advances in expanding household Internet access and use across geographical areas and socio-economic, gender and age groups. It then focuses on digitalisation and labour markets and presents the potential impacts of the future of work in the region and the current labour force's digital skills. It compares trends in Internet access in schools and schools' role in fostering digital inclusiveness and future workers better equipped for digitalisation. It examines how the coronavirus (Covid-19) has highlighted the digital divide. All sections cover gender as a key consideration. The chapter concludes with policy implications.

Digitalisation and households: Inclusive connectivity

LAC countries have experienced significant growth in Internet access in the 21st century. In 2018, 68% of the population used the Internet, almost twice the share in 2010 (see Chapter 2). This expansion reduced the gap in the number of users connected to the Internet between LAC and the Organisation for Economic Co-operation and Development (OECD) countries (84% in 2018). Yet, large gaps remain across multiple dimensions.

As evidenced by the coronavirus (Covid-19) crisis, the digital divide can widen inequalities. Households with access to ICT infrastructure and quality Internet connection are more resilient and can more easily adapt to new ways of doing work and everyday activities. Access to and effective use of ICT and the Internet are defining inclusion in the labour market, participation in remote education and access to public and private goods, while also reducing contact and therefore the probability of infection. Households with fewer ICT resources are likely to be more affected by the crisis. This section looks at developments in Internet and ICT access and use in the region across socio-economic groups and geographical areas. ICT infrastructure and skills are also becoming complementary to social welfare; this section presents an overview of how prepared LAC households are to meet the challenges of digital transformation in the context of the coronavirus (Covid-19) crisis.

While the income digital divide remains, Internet access and use are more equally distributed than income, secondary education and pensions

The expansion of the Internet has generated a more equal distribution of opportunity than the expansion of other services in LAC (Figure 3.1). Access and use are also less concentrated than income and pensions. Yet, they are more unevenly distributed than access to sewerage and electricity.

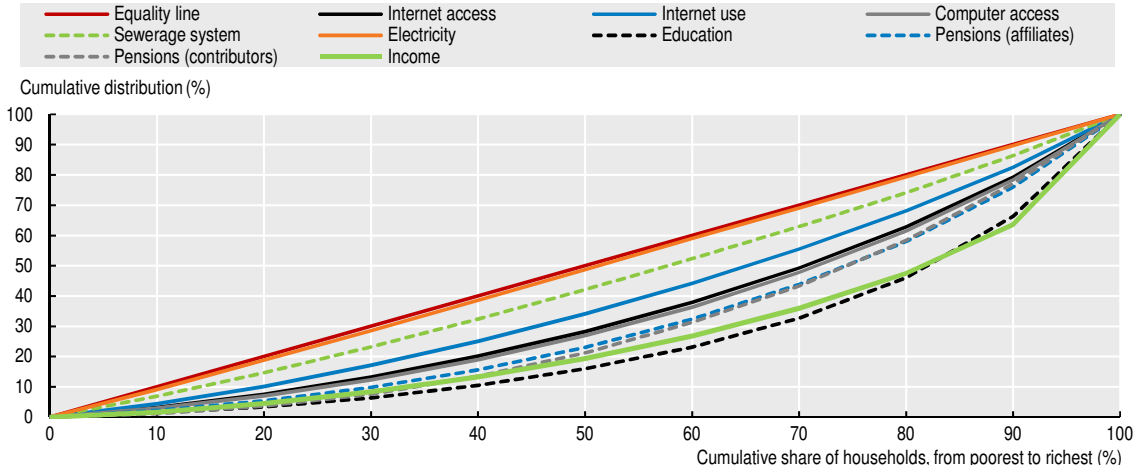
At an aggregate regional level, Internet use is less unequal than access. People can use the Internet in spaces other than their homes on a daily basis, for instance, at work, school, friends' or families' homes, specific urban public spaces or Internet cafes. Mobile phone connectivity is also increasing, helping close the gap.

Most countries, including Bolivia, Honduras, Paraguay and Peru, follow similar patterns, with Internet and computer access and use more equally distributed than access to secondary education and pensions (Figure 3.A1.1). The distribution of Internet use in Chile and Uruguay is as equal as the distribution of access to basic public services, such as sewerage and electricity. In Colombia, Ecuador and Mexico, Internet and computer access are more equal than access to education but more unequal than access to basic public services. In countries with large inequality in access to basic services, including El Salvador and Honduras, access to ICT is also unequal.

Policies must respond to the digital transformation with actions that mitigate the digital divide by: 1) providing the infrastructure needed to expand access; 2) supporting digital skills; and 3) enabling access for traditionally excluded groups.

Internet access and use in LAC is still strongly linked to household income. On average, the gap in Internet use between households in the richest and poorest quintiles is almost 40 percentage points (Figure 3.2). Most countries are in line with the LAC average. The gap is larger in Honduras (58 percentage points) and Peru (60 percentage points), and smaller in Chile (22 percentage points) and Uruguay (17 percentage points).

Figure 3.1. **Distribution of Internet access, Internet use and other services by income decile in selected Latin American countries, 2017 or latest available year**



Notes: Simple average by decile for selected LAC countries. X-axis = income decile. Y-axis = cumulative percentage of people with Internet and computer access in their households; cumulative percentage of people reporting Internet use in the previous 3 or 12 months, depending on household survey question; cumulative percentage of people in a household with sewerage or electricity; and cumulative percentage of people aged 20 or older with at least secondary education. Calculations based on 2017 household surveys or latest available year: 2016 for Bolivia, Honduras and Mexico. Start age of Internet use varies by country: El Salvador and Paraguay measure from age 10; Bolivia, Chile, Ecuador and Honduras from age 5; Peru and Uruguay from age 6. Previous Internet use period, from survey data, is the previous 3 months for Bolivia, Honduras, Paraguay and Uruguay, and the previous 12 months for Chile, Ecuador and El Salvador. Other variables include all ages. Brazil, Chile, Costa Rica, Ecuador, El Salvador, Paraguay and Uruguay include mobile Internet in Internet access. Bolivia, Colombia, Mexico and Peru do not specify whether mobile Internet is included. Bolivia, Brazil, Chile, Costa Rica, Ecuador, Paraguay and Uruguay include laptops and tablets in computer access. Colombia, El Salvador, Mexico and Peru do not specify whether laptops or tablets are included.

Source: Own calculations based on ORBA/ECLAC (2019), *Household Survey Data Bank* (database), www.cepal.org/es/observatorio-regional-de-banda-ancha.

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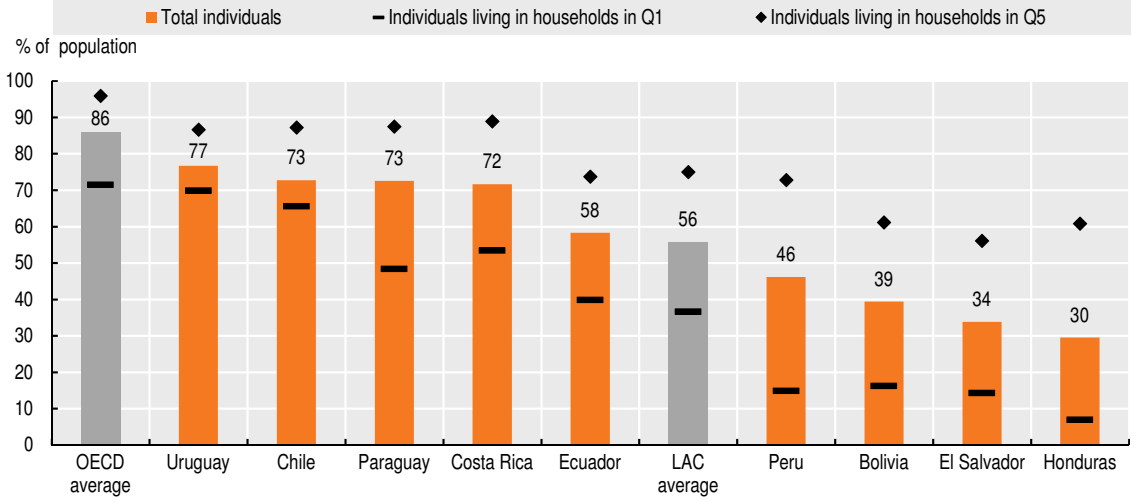
Figure 3.2. **Internet users by income quintile in selected Latin American countries, 2017 or latest available year**



Notes: Start age of Internet use varies by country: El Salvador and Paraguay measure from age 10; Bolivia, Chile, Ecuador and Honduras from age 5; Peru and Uruguay from age 6. Previous Internet use period, from survey data, is the previous 3 months for Bolivia, Honduras, Paraguay, Uruguay and the OECD, and the previous 12 months for Chile, Ecuador and El Salvador. Bolivia data are from 2016. LAC average is a simple average by quintile for the available countries. The OECD sample shows figures for the first and fourth quartile for individuals aged 16 or older.

Source: Own calculations based on ORBA/ECLAC (2019), *Household Survey Data Bank* (database), www.cepal.org/es/observatorio-regional-de-banda-ancha.

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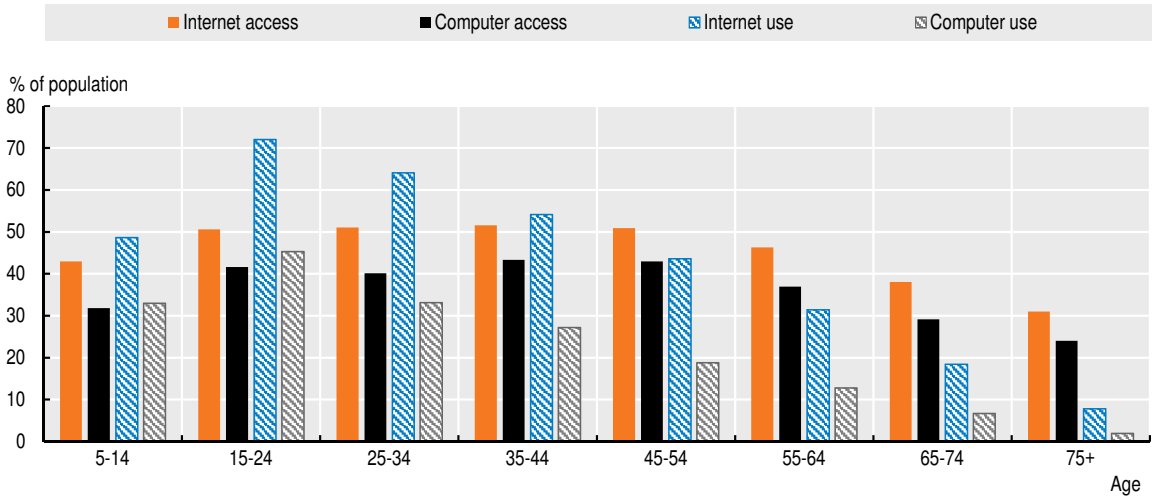
Connectivity and ICT use gaps need to be closed

Older age groups are not taking advantage of the opportunities of connectivity. Computer and Internet use is significantly higher among the younger population (aged 15 to 34) (Figure 3.3). Access is more homogeneous across groups, although older people (aged 65 and older) still lag. Adults and older people could benefit from Internet use to access private and public goods and services more efficiently and to a greater extent. Policies to build adult digital skills are key for development and inclusion.

Figure 3.3. **ICT access and use by age group in Latin America and the Caribbean, 2018 or latest available year**



Notes: Access variables refer to the population living in a household with an Internet connection and in a household owning a computer. Internet access includes Argentina, Bolivia, Chile, Colombia, Costa Rica, El Salvador, Mexico and Peru. Computer access includes Argentina, Bolivia, Chile, Colombia, Costa Rica, El Salvador, Honduras, Mexico and Peru. The inclusion of fixed or mobile connections varies in household surveys. Internet use refers to the percentage of people reporting Internet use at least once a week. Owing to varying definitions of use, averages may differ from other figures. Internet use includes Argentina, Bolivia, Chile, Colombia, Costa Rica, El Salvador, Honduras and Peru. Computer use refers to the percentage of people reporting computer use at least once a week. Computer use includes Bolivia and Colombia. Chile has no available data on Internet and computer access for people under age 15.

Source: Own calculations based on household surveys (2018 or latest available year): *Encuesta Permanente de Hogares* (2018) (Argentina), *Encuesta de Hogares* (2018) (Bolivia), *Encuesta de Caracterización Socioeconómica Nacional* (2017) (Chile), *Encuesta Nacional de Calidad de Vida* (2017) (Colombia), *Encuesta de Hogares de Propósitos Múltiples* (2017) (El Salvador), *Encuesta Permanente de Hogares de Propósitos Múltiples* (2014) (Honduras), *Encuesta Nacional de los Hogares* (2018) (Mexico), *Encuesta Permanente de Hogares* (2018) (Paraguay) and *Encuesta Nacional de Hogares* (2018) (Peru).

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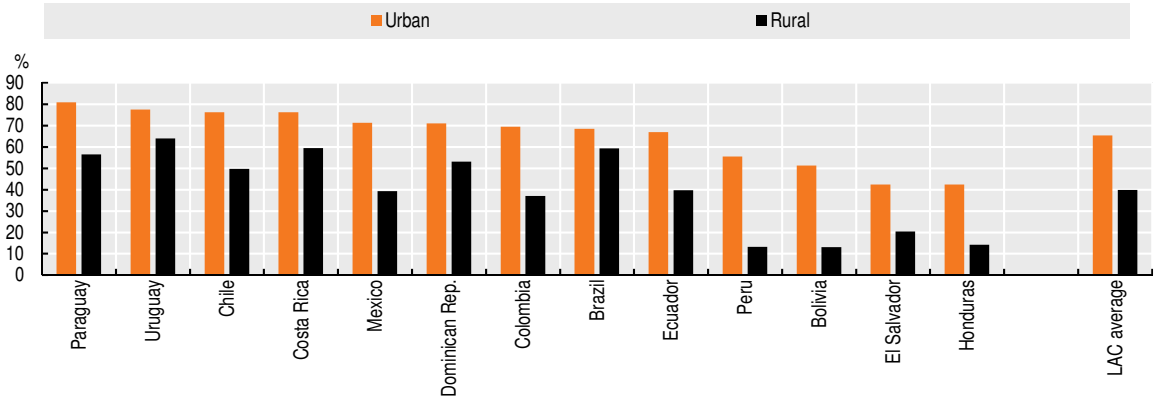
Addressing the large urban-rural digital divide across LAC countries at national and local levels is especially critical. Among countries analysed, urban Internet users exceeded rural users in both number and share – up to fourfold in some countries (Figure 3.4). The narrowing urban-rural divide in a majority of OECD countries is partially linked to policies setting national targets for broadband availability (OECD, 2018a). Bridging the digital divide in rural areas is challenging for LAC countries owing to the strategic location of backbone networks closer to large, densely populated cities (OECD, 2018a). Clear strategies to connect less populated areas and extend the Internet to all citizens should be a priority of national digital agendas and strategies (DAs) (see Chapter 4). The digital transformation first requires basic infrastructure and closing basic services gaps between rural and urban areas (see Box 3.1). Access to the electricity and roads or fluvial transport systems required for high-speed infrastructure remains a challenge in some LAC countries.

Figure 3.4. **Share of urban and rural Internet users in Latin America, 2017**



Sources: Own calculations based on ORBA/ECLAC (2019), *Household Survey Data Bank* (database), www.cepal.org/es/observatorio-regional-de-banda-ancha; ITU (2019), *World Telecommunication/ICT Indicators Database* (database), www.itu.int/pub/D-IND-WTID.OL-2019.

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Box 3.1. **Ensuring Internet access and use across Latin America and the Caribbean**

Strategies to increase Internet access and use for disadvantaged populations focus on barriers to demand or supply. On the demand side, Latin Americans have difficulty accessing the Internet, mostly owing to the cost of ICT devices and provider fees. Income inequality exacerbates affordability barriers, as low-income households tend to have a much lower income than the average (OECD/IDB, 2016). On the supply side, among other barriers, limited telecommunications infrastructure, tax burdens, inefficiencies in service provision, price distortions due to lack of competition and adequate regulation limit the reach of ICT services for a significant share of the population (West, 2015).

Supply-side initiatives that have increased Internet affordability include enhanced competition, effective broadband expansion strategies, efficient spectrum allocation and infrastructure-sharing models (A4AI, 2019). Peru's *Internet para Todos* (Internet for all) aims to bring 4G mobile Internet access to 6 million people in more than 30 000 rural areas by the end of 2021. This partnership between *Telefónica*, Facebook, IDB (Inter-American Development Bank) Invest and CAF – Development Bank of Latin America – enables operators to use communication infrastructure to expand coverage in rural areas. *Telefónica* has 3 130 towers across Peru; *Internet para Todos* aims to install an additional 866 by 2021. This programme also constitutes a growth opportunity for *Telefónica* by offering the possibility to test new business models and technologies in new locations and potentially expand the customer base in new markets (MAEUEC, 2020). The long-term goal is to replicate the approach in other LAC countries, where some 100 million still have no Internet access (IDB, 2020).

Redes Comunitarias (Community networks) are gaining ground in the region. As part of Ecuador's digital plan, *Ecuador Conectado* (Connected Ecuador) aims to bring community networks to 127 000 households, enabling Internet access at a reduced price (MINTEL, 2019). The Colombian government is scaling community access areas to increase rural connectivity: the programme aims to connect 1 000 rural zones and install networks with the capacity to serve at least ten users simultaneously at a minimum speed of 9 Mbps (MinTIC, 2019). Similarly, *Conectar lo no conectado* (Connecting what is not connected) supports the implementation of community networks in Argentina, Ecuador and Mexico by providing ICT training, ensuring the sustainability of networks and promoting the creation of better regulatory frameworks (APC, 2020).

Box 3.1. **Ensuring Internet access and use across Latin America and the Caribbean** *(cont.)*

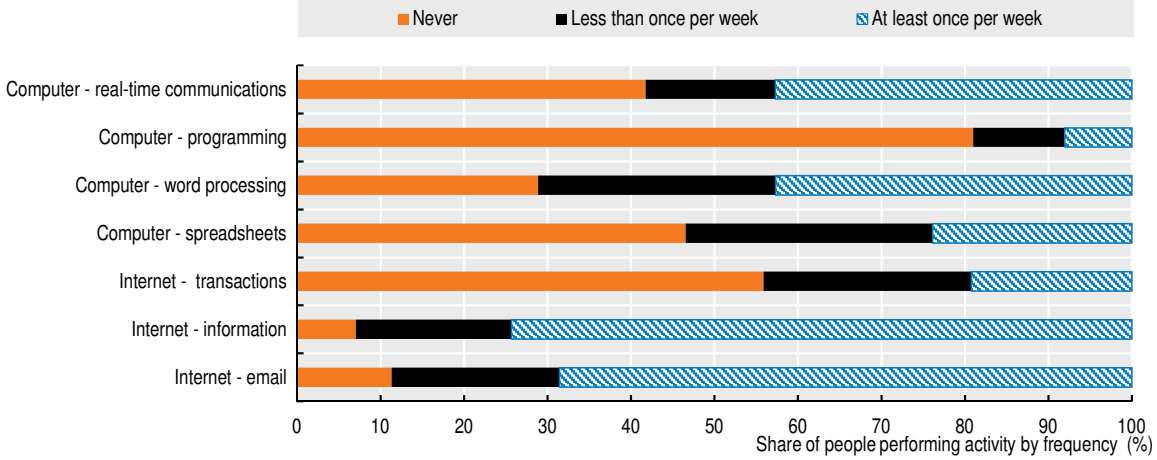
On the demand side, although general transfer schemes (e.g. conditional cash transfer programmes) can alleviate cost barriers, beneficiaries choose how to spend the money, i.e. potentially on other goods and services. Direct Internet-only subsidies channel resources to increase Internet use by targeted groups. These subsidies can be distributed through a voucher system or direct transfers to operators, or through lower prices, which are effectively equivalent to income increases (OECD/IDB, 2016). This type of programme also allows targeting of vulnerable populations, such as the elderly, women and rural households. Colombia's *Vive Digital* (Live Digital) aims to increase Internet access among the poorest two of six strata of the population, including through subsidies to buy devices and Internet services, and computers and digital pedagogical content for rural public schools. Costa Rica's *Hogares Conectados* (Connected households) aims to help vulnerable people in quintiles 1, 2 and 3 access ICT with subsidised computers and Internet access for shortlisted households (OECD/IDB, 2016).

Few people have skills to use ICT in everyday life

The number of Internet users[1] grows as more households, businesses and public spaces connect. 68% of the LAC population uses the Internet on a regular basis (at least once in the previous three months), almost twice the share in 2010 but lagging behind the OECD average of 84% (see Chapter 2).

To make the most of ICT, people need to be able to use it to get information, solve problems, interact with others and access goods and services. The Survey of Adult Skills, part of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), measures proficiency in key information-processing skills, such as literacy, numeracy and problem solving, and gathers information and data on how adults use their skills at home, at work and in the community.

Figure 3.5. **ICT use by activity in selected Latin American countries**



Note: Latin American average is a simple average including Chile, Ecuador, Mexico and Peru. Chile participated in the Survey of Adult Skills (PIAAC) Round 2 and the rest of the countries in PIAAC Round 3.

Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

StatLink https://doi.org/10.1787/888934171970

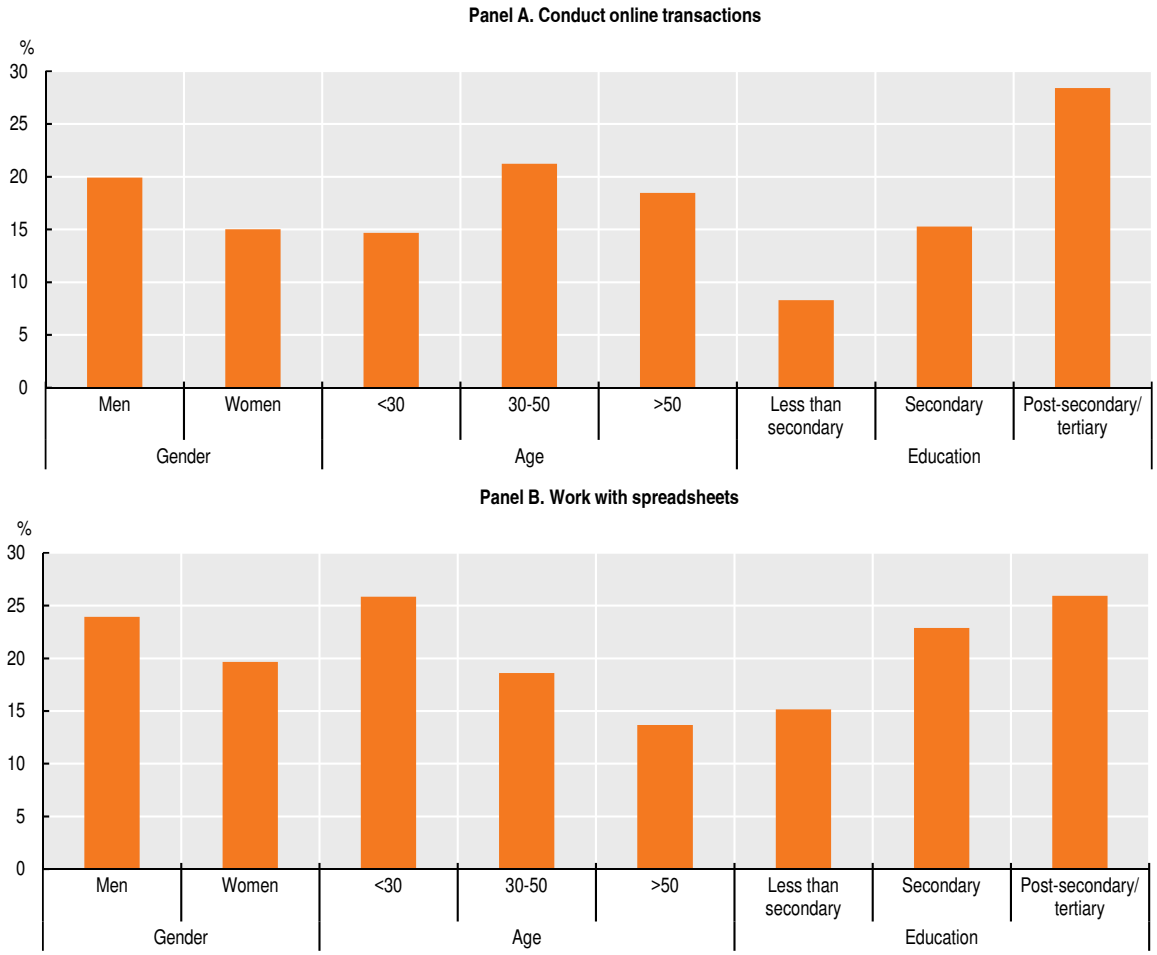
Gaps in ICT use are important. Less than half of Latin Americans have used a computer or have sufficient skills to use computers for basic professional tasks. On average, 50% of

adults aged 16 to 65 in the LAC countries surveyed (Chile, Ecuador, Mexico and Peru) had used a computer or had basic computer skills, according to the computer-based section of the PIAAC, ranging from 42% in Mexico to 67% in Chile (OECD, 2019c).

The most common daily activities among those with computer skills were using the Internet for information gathering (73%) and email (69%), followed by real-time communications, such as videoconference or chat (Figure 3.5). Only 8% used computers for programming. Computer and Internet use varies by country. In Mexico, 15% use ICT to conduct transactions at least once per week, compared with 30% in Chile (Figure 3.A1.2).

Figure 3.6. **ICT use by gender, age and education in selected Latin American countries**

Share of individuals performing activity at least once per week



Notes: Latin American average is a simple average including Chile, Ecuador, Mexico and Peru. Tabulations based on self-reporting after taking out individuals with no ICT skills or who do not use ICT in everyday life. Chile participated in the Survey of Adult Skills (PIAAC) Round 2 and the rest of the LAC countries in PIAAC Round 3.

Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

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There is little variation across respondents in the use of basic digital tools, such as email and chat. Gender, age and education affect the use of more complex tools (Figure 3.6). Men are more likely than women to use ICT to conduct transactions or work with spreadsheets. Individuals with tertiary education use these tools more frequently than those with less education, while the latter are slightly more likely to engage in

real-time communications. Middle-aged and older individuals conduct transactions more frequently than younger individuals, while the latter work with spreadsheets much more often.

Digitalisation and labour markets: The future of work and skills

New production technologies, new organisation models and evolving worker preferences are generating new forms of work and new demands for skills. Digital technologies in production have contributed to automation, restructuring of operations and processes, and development and implementation of technological solutions. Categories of jobs are being replaced, modernised and created. Many worry about the potential for massive unemployment, precarious work, workers with little or no bargaining power, and skills gaps as people age. Most jobs will change as economies go digital.

With the economic crisis generated by the pandemic, job loss could be massive. Unemployment in LAC could rise to 13.5% at the end of 2020 (ECLAC, 2020a). Governments have implemented policy actions to support employed workers and businesses, such as job retention schemes and targeted subsidies for income substitution. These actions should leave no one behind. The crisis presents an opportunity to rethink support programmes for workers, especially young and other traditionally vulnerable groups, in both education and training opportunities and in the labour market entry experience, to avoid having a generation of young people whose careers are permanently diminished by the disruption to the labour market (OECD, 2020a). With quarantines, telework and non-standard ways of working have become prevalent. However, such measures are just benefitting a portion of workers whose occupations can be done remotely and are associated to a higher level of training and higher salaries (ECLAC, 2020b), potentially amplifying existing inequalities. Fostering access to ICT infrastructure and, more importantly, digital skills is essential for workers to adapt to new labour market conditions.

This section is based on the findings and main policy messages of the *OECD Employment Outlook 2019: The Future of Work* and *Skills Matter: Additional Results from the Survey of Adult Skills* (OECD, 2019a, 2019c). It analyses the risk of automation, use of digital skills at work, key determinants and why digital skills matter for workers and economies. It draws on data from the Survey of Adult Skills, which tests the ability to solve problems in technology-rich environments using ICT tools, such as email, spreadsheets, word processing and the Internet. Four Latin American countries participated in PIAAC surveys: Chile in Round 2 (2015) and Ecuador, Mexico and Peru in Round 3 (2018). LAC averages are a simple average of the four countries' results.

Jobs will disappear, change and emerge owing to digitalisation

Despite widespread anxiety about potential job loss driven by technological change and globalisation, a sharp decline in employment seems unlikely. Tasks are disappearing, evolving and emerging, generating structural changes in labour markets and skills demands. Yet, employment has been growing, and there is no evidence indicating a jobless future any time soon (OECD, 2019a).

Two methodologies have been developed to estimate the impact of digitalisation on employment levels. First, occupational analysis calculates the share of workers in occupations that could be performed by computers, algorithms and robots. Frey and Osborne (2017) labelled a sample of US occupations as automatable or not automatable. Using a standardised set of features for each occupation, they used a machine learning algorithm to generate a "probability of computerisation" of occupations, generating

a single prediction per occupation. Results, therefore, assume that all workers in an occupation face the same risk of replacement due to digitalisation.

Second, task analysis accounts for the considerable variation in the task composition of occupations with the same title. Rather than assume replacement of entire occupations by computers, algorithms and robots, it considers replacement of tasks within occupations. Arntz, Gregory and Zierahn (2016) and Nedelkoska and Quintini (2018) used the same outputs as Frey and Osborne (2017) to calculate the effect of automation on each task and estimated the probability of automation of each occupation based on the share of repetitive and routine tasks that could be replaced. Estimates account for the fact that the same occupation may be more or less susceptible to automation in different workplaces. The methodology applied depends on the availability of information; task analysis requires much greater detail.

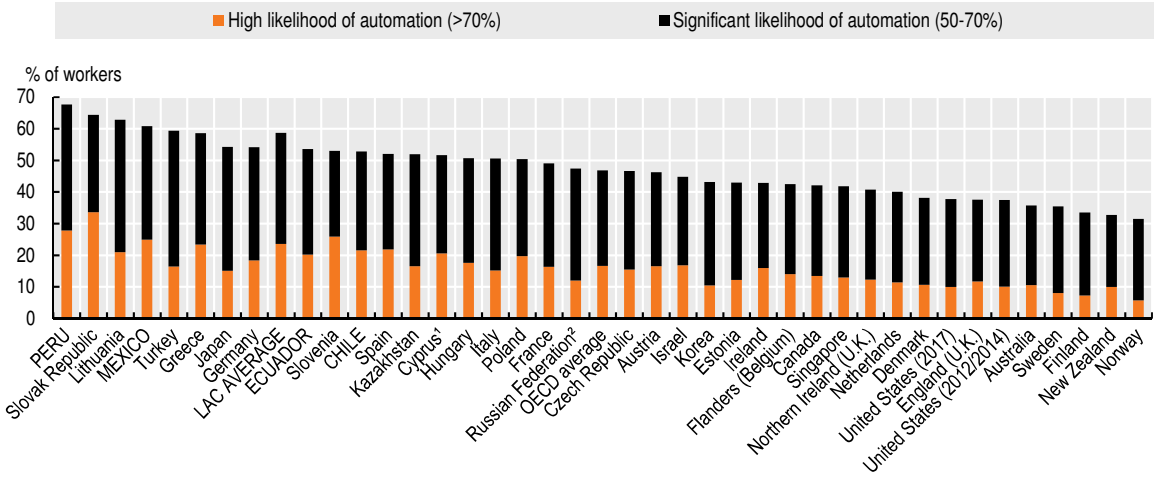
Some 25% of jobs are at high risk of automation in LAC countries, according to OECD task analysis estimates for Chile, Ecuador, Mexico and Peru. Estimates range from 21% in Chile to 28% in Peru. Additionally, 35% of jobs in these countries may undergo substantial changes in the tasks performed and how they are carried out (OECD, 2019a). Jobs are at high risk of automation if at least 70% of their tasks are likely to be automated. Jobs are at risk of significant change if 50% to 70% of their tasks are likely to be automated (Nedelkoska and Quintini, 2018). By comparison, an estimated 14% of jobs in the OECD area could be replaced through automation. The potential automation of jobs does not mean machines will replace workers in the near future; automation may not always be cost-effective or desirable, may raise legal and ethical concerns, and will be affected by worker preferences and policy decisions (OECD, 2019a).

Estimates for OECD countries (including Chile and Mexico) and other partners, such as Ecuador and Peru, were calculated using task analysis and Survey of Adult Skills data on a comprehensive list of tasks people perform in their occupations (Nedelkoska and Quintini, 2018) (Figure 3.7). By using individual data, estimates account for the variation in tasks performed within the same occupation. The self-reported tasks are likely a better indicator of actual tasks than occupational descriptions.

ECLAC occupational analysis estimates indicate that 16% of jobs in LAC are at high risk of automation, ranging from 5% in Bolivia to 29% in Uruguay (ECLAC, 2019) (Figure 3.8). A further 16% may change substantially (occupations at medium risk of automation). These estimates were calculated using an adjusted occupational analysis methodology following Weller, Gontero and Campbell (2019) and labour force survey data. Frey and Osborne's (2017) occupational analysis methodology is based on the US labour market. LAC labour markets differ significantly in at least two respects: market segmentation and lag in technology implementation (Katz, 2017, 2018).

On average, results indicate a similar probability of technological substitution for occupations typically held by men and women, with some variation across countries (Bustelo et al., 2020; ECLAC, 2019).

Figure 3.7. **Percentage of workers by risk of automation (task analysis) in selected OECD and Latin American and Caribbean countries, 2018 or latest available year**



Notes: Occupations are at high risk of automation if their likelihood to be automated is at least 70%. Occupations are at risk of significant change if their likelihood to be automated is 50% to 70%. Estimates based on Nedelkoska and Quintini (2018). Values for OECD countries are simple averages.

1 Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

2 The sample for the Russian Federation does not include the population of the Moscow municipal area. Detailed information regarding Russian Federation data can be found in the *Technical Report of the Survey of Adult Skills, Third Edition* (OECD, 2019d).

Sources: OECD (2019c), *Skills Matter: Additional Results from the Survey of Adult Skills*, OECD Skills Studies; OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

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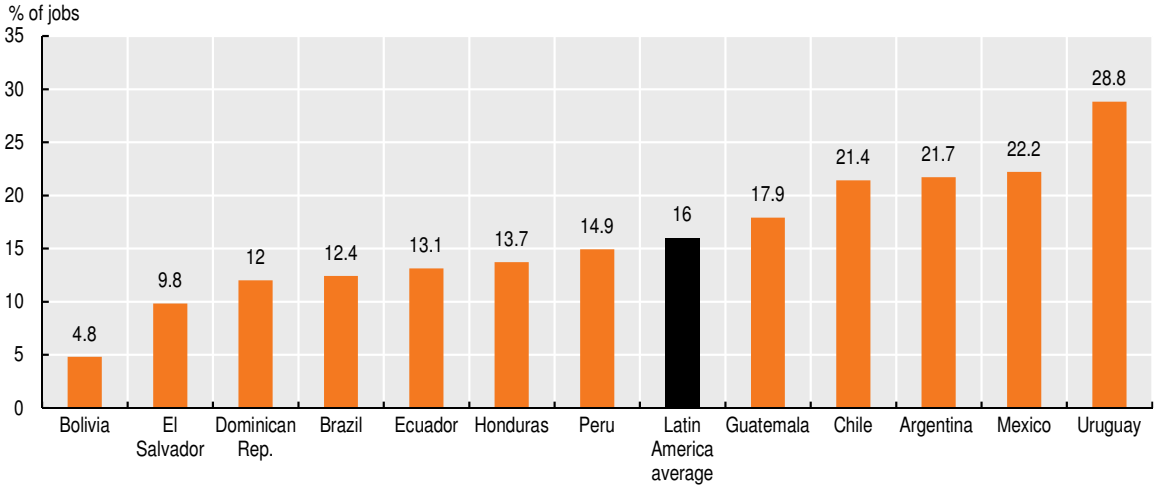
Figure 3.8. **Percentage of jobs at high risk of automation (occupational analysis) in selected Latin American countries, 2018**



Source: Weller, Gontero and Campbell (2019), "Cambio tecnológico y empleo: Una perspectiva latinoamericana. Riesgos de la sustitución tecnológica del trabajo humano y desafíos de la generación de nuevos puestos de trabajo", www.cepal.org/es/publicaciones/44637-cambio-tecnologico-empleo-perspectiva-latinoamericana-riesgos-la-sustitucion.

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Digitalisation is changing jobs, tasks and skills demands

The shift in occupations is driving shifts in skills requirements (Amaral et al., 2018). LinkedIn recent hires data for Argentina, Australia, Brazil, Chile, France, India, Mexico, South Africa, the United Kingdom and the United States show that advanced digital and tech-related skills are among the fastest growing: tech-related skills categories are among the top two fastest growing in all countries except Brazil. Other trends include skills in data storage, software development life cycle, social media management, human-computer interaction and mobile app development. The shift in occupations also appears to be driving an increase in categories such as marketing, advertising, graphic design and digital marketing, which overlaps with the tech category.

Demand for project, business, people and account management skills are declining. Administrative assistance and procurement skills are among the fastest declining categories. Given that these are people-centred skills, although jobs requiring them may be declining, their value may be increasing if combined with technical skills (Amaral et al., 2018).

Adults working in digital-intensive environments more frequently perform different types of tasks from those working in non-digital-intensive environments. For this section, workers in the same group of occupations (1-digit ISCO-08 [International Standard Classification of Occupations 2008]) are divided according to their jobs' exposure to a digital environment. Workers in digital-intensive jobs are defined as those who score higher than the median on the index of use of ICT skills at work.[2] Workers in non-digital-intensive jobs are defined as those who score lower than the median of all Latin American countries.

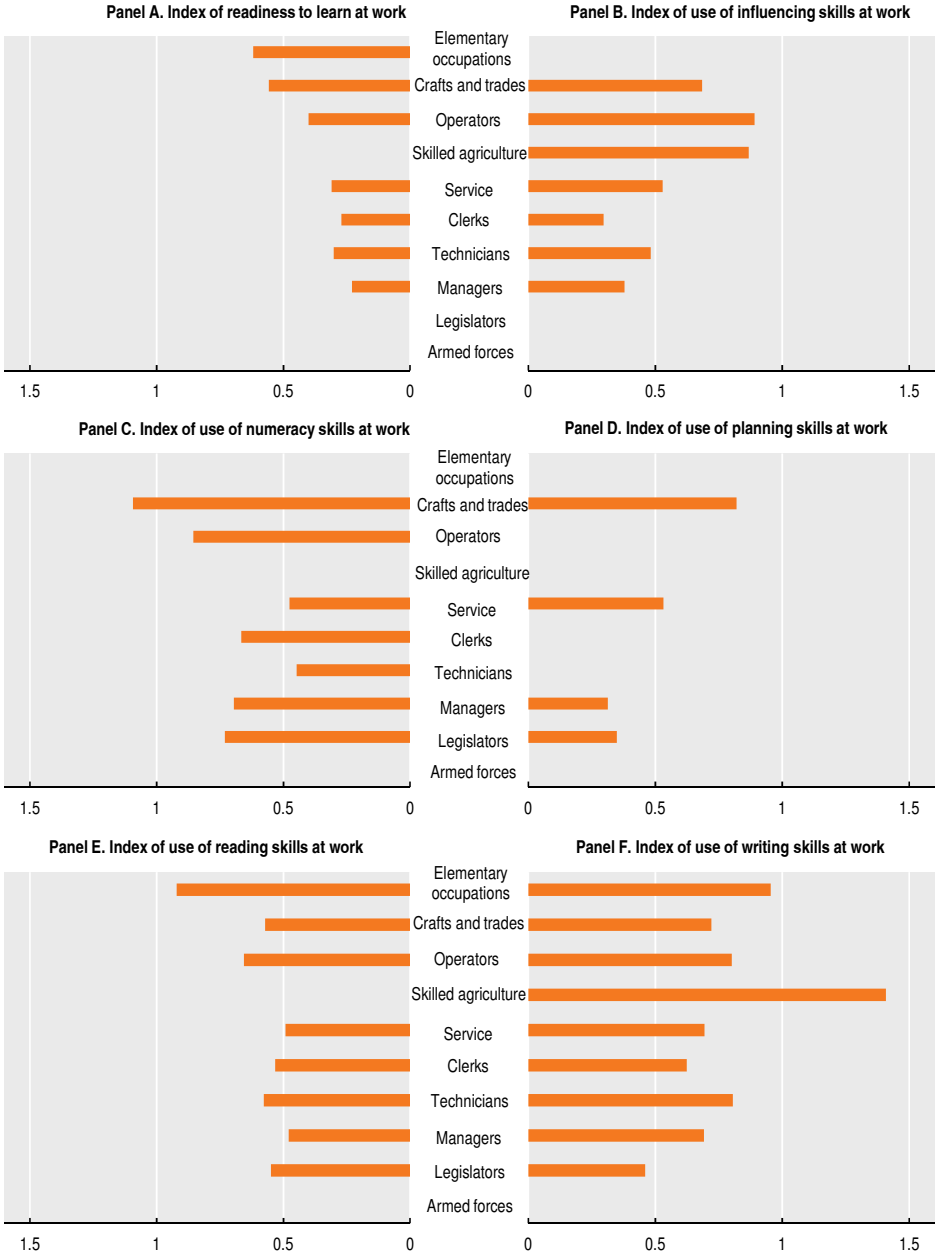
Workers in digital-intensive jobs use skills beyond those required for use of digital devices and ICT. In particular, they require greater use of reading and writing skills (across most occupations) and numeracy skills (especially for plant and machine operators and assemblers, craft and related trades workers, legislators and managers) (Figure 3.9).

Effective lifelong learning policies to train students and workers in fundamental and technical skills are essential to minimise the risks and maximise the benefits of labour market changes. Identifying and understanding countries' emerging and declining occupations and skills requirements will help inform policy decisions regarding training, career guidance and resource prioritisation (Amaral et al., 2018). In a context of changing skills needs, both foundational skills and ability to learn and update skills are central to strong skills policies. Adult learning can help prevent skills depreciation and obsolescence and facilitate transition from declining to expanding occupations and sectors. Vocational education and training systems need to adapt to the rapidly evolving skills demand (OECD, 2020a).

Disadvantaged workers usually face multiple training barriers. Low-skilled workers, workers in occupations at high risk of automation and workers who lose their jobs are often reluctant to train or unable to identify relevant learning activities. Even when well informed and motivated, some workers face other barriers, such as lack of time, money or skills to start a specific training. At the same time, employers are more likely to invest in training higher skilled workers, as return on investment is expected to be higher.

Figure 3.9. **Difference in skills use between digital-intensive and non-digital-intensive jobs in Latin America**

Effect of dummy variable of being in a digital-intensive occupation over standardised indexes of skills use, accounting for years of schooling (bars displayed when difference is significant at 5%)



Notes: Figures display estimated coefficients of having a digital-intensive occupation on different indexes of skills use derived from the Survey of Adult Skills (PIAAC) Rounds 2 and 3 (coefficients only displayed when significant at 5%). The higher the value, the greater the difference in skills use within the same occupation. Having a digital-intensive occupation is measured by a dummy variable equal to 1 if the index of use of ICT skills at work is greater than or equal to the median of the index across the four participating LAC countries: Chile, Ecuador, Mexico and Peru. The dependent variable corresponds to the standardised values of the use of skills indexes using the mean and standard deviation for the pool of participating LAC countries. In this sense, coefficients measure the change in standard deviations from the mean in the use of skills indexes for a person in a digital-intensive occupation compared with a person in a non-digital-intensive occupation. Separate regressions are estimated for each 1-digit ISCO-08 occupation. Regressions are estimated using standard ordinary least squares methodology and are controlled by years of education and country fixed effects.

Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

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Few workers can or do use digital tools at work in Latin America

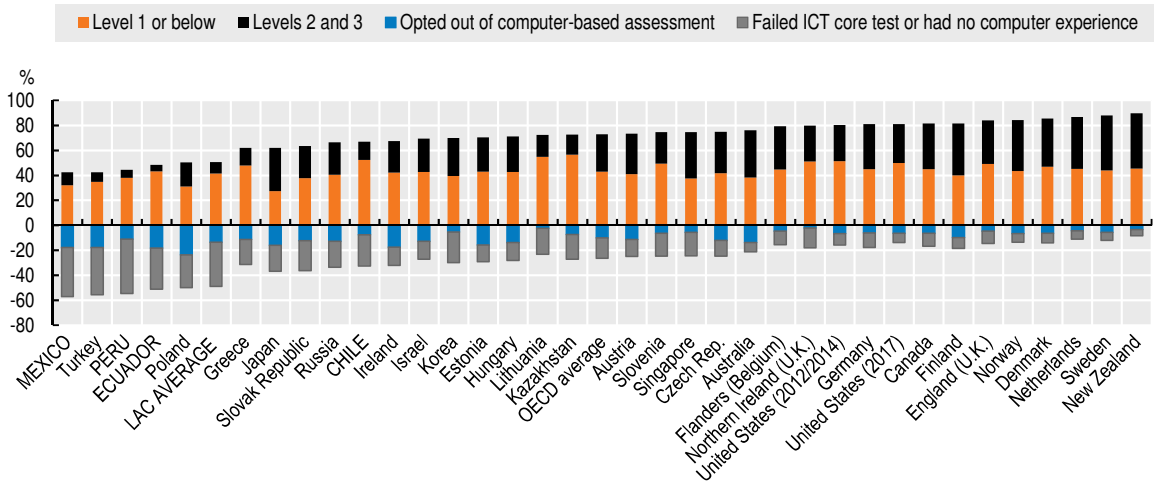
In technology-rich environments, the use of digital skills at work is as important a determinant of individual and aggregate economic outcomes as the use of general skills. Countries will continue to face significant labour market changes with implications for skills demands. Digital devices, connectivity, software and data are profoundly changing work tasks and the organisation of production and firms.

Digital and problem-solving skills in technology-rich environments are increasingly important for people to participate in labour markets, education and social life. PIAAC assesses workers' basic computer literacy skills, as well as problem solving in technology-rich environments, both at and outside work. It should be noted that the PIAAC is not representative of informal workers. Given the large share of informal labour in LAC countries, some of the figures of this section based on PIAAC data might be biased, if informal workers use ICT differently from formal workers.

Problem solving in technology-rich environments is defined as "using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks" at a proficiency level of 1 to 5 (PIAAC Expert Group in Problem Solving in Technology-Rich Environments, 2009). Proficiency below level 1 refers to the ability to use only familiar apps to solve problems that involve few steps and explicit criteria, such as sorting emails into existing folders (Figure 3.10).

Figure 3.10. **Proficiency in problem solving in technology-rich environments in selected OECD and Latin American countries**

Percentage of adults aged 16 to 65 scoring at each proficiency level



Notes: The "missing" category comprises adults unable to provide sufficient background information to impute proficiency scores because of language barriers or learning or mental disabilities (i.e. literacy-related non-response) and those unable to complete the assessment because of technical problems. Countries and economies ranked in descending order of the combined percentages of adults scoring at levels 2 and 3.

Sources: OECD (2015a); OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

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A large share of Latin American adults have very little or no computer experience, ranging from 43.6% in Peru to 25.2% in Chile. The share of adults with no basic ICT skills or computer experience reflects countries' level of economic development and ICT penetration (OECD, 2019c). Aside from adults who did not meet minimum requirements to take the problem-solving assessment, a large proportion of adults opted out of the

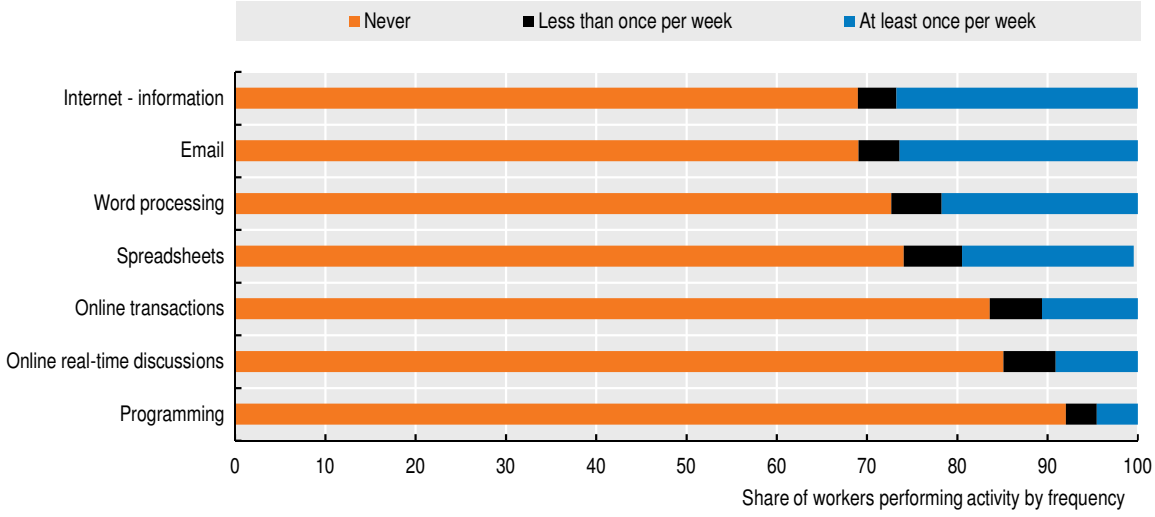
computer assessment, even when they had computer experience (a 7.5% share in Chile, 10.0% in the OECD, 11.1% in Peru, 17.8% in Mexico and 18.1% in Ecuador).

Few adults in LAC have medium and strong computer use knowledge and problem-solving skills in technology-rich environments. Shares of adults performing at levels 2 and 3 were much lower than the OECD average (29.7%): 5.2% in Ecuador, 6.6% in Peru, 10.2% Mexico and 14.6% in Chile.

One-third of LAC workers use computers, smartphones or other ICT tools at work once per week or more, compared with over half of European workers (OECD, 2018b). Skills used at work are those observed in a worker's job within a given skills domain (OECD, 2016b). Some 30% of those who took the computer assessment did not use problem-solving skills to solve complex problems at work (OECD, 2019g).

There is large variation in use of computers, Internet, email and software. More than 25% of LAC workers used ICT regularly for simple tasks, such as email or job-related information searches. Less than 10% used ICT for more advanced tasks, such as programming and real-time communications (Figure 3.11).

Figure 3.11. **ICT use at work by activity in selected Latin American countries**



Note: "Never" includes workers who have never used a computer or who do not use ICT in their occupations. Chile participated in the Survey of Adult Skills (PIAAC) Round 2 and the rest of the LAC countries (Mexico, Peru, Ecuador) in PIAAC Round 3.
Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.
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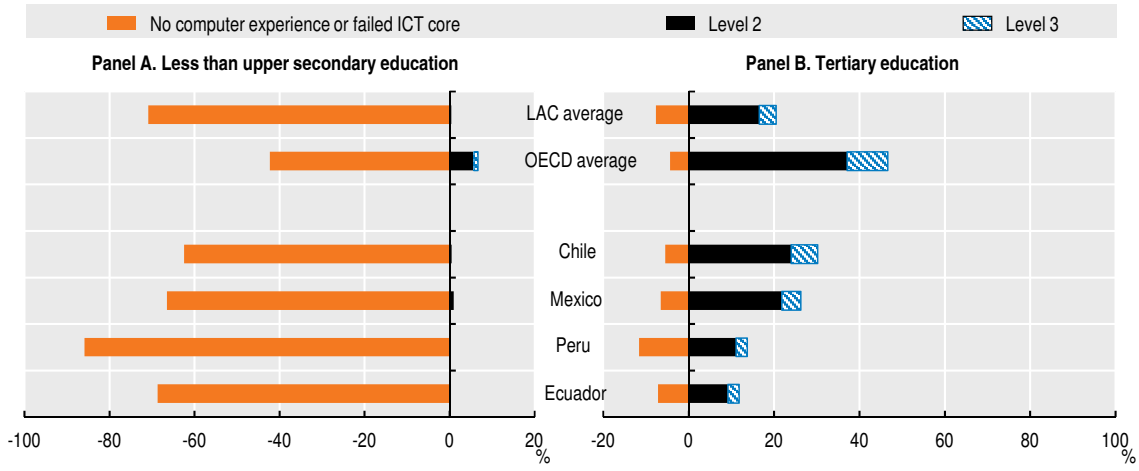
Socio-economic factors shape ICT skills use in Latin America. A large share of adults without upper secondary education lacked the basic proficiency required to take the Survey of Adult Skills problem-solving assessment, e.g. the ability to operate a mouse (OECD, 2019c). On average, 42% of low-educated adults in OECD countries had no computer experience or failed the ICT core test, compared with 66% in Chile, 69% in Mexico and Ecuador and 86% in Peru. Less than 2% of adults in the four Latin American countries scored at levels 2 or 3 in ICT skills use, compared with 47% in OECD countries. Some 20% of Latin Americans with tertiary education scored at level 2 or above, on average: 30% in Chile, 26% in Mexico, 14% in Peru and 12% in Ecuador (Figure 3.12). Improving access and quality of pre-primary, primary and secondary education is key to strengthening the digital skills of LAC's working population, as are lifelong learning and overcoming barriers to training, given that many leave education without having acquired the necessary skills.

Figure 3.12. **Proficiency in problem solving by education level in selected Latin American countries**

Percentage of low-educated and highly educated adults scoring at levels 2 or 3 in problem solving in technology-rich environments or having no computer experience (adults aged 25 to 65)



Notes: Adults are divided into one of the following mutually exclusive categories: opted out of the computer-based assessment; no computer experience; failed the ICT core test; below level 1, at level 1, at level 2 and at level 3 (of the problem solving in technology-rich environments scale). For detailed results for each category, see OECD (2019c). Countries and economies are ranked in descending order of the combined percentages of adults with tertiary education scoring at level 2 or 3. Chile participated in the Survey of Adult Skills (PIAAC) Round 2 and the rest of the LAC countries (Mexico, Peru, Ecuador) in PIAAC Round 3.

Source: Own elaboration based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

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Gender gaps were not as large. Across OECD countries, men had a small advantage in scoring at levels 2 or 3: 32% of men vs. 28% of women. Gaps were similar or slightly smaller in LAC countries. However, at the bottom of the skills distribution, in all countries, a higher proportion of women than men had no computer experience or failed the ICT core test: 26% vs. 24% in Chile, 35% vs. 31% in Ecuador, 41% vs. 38% in Mexico and 47% vs. 41% in Peru.

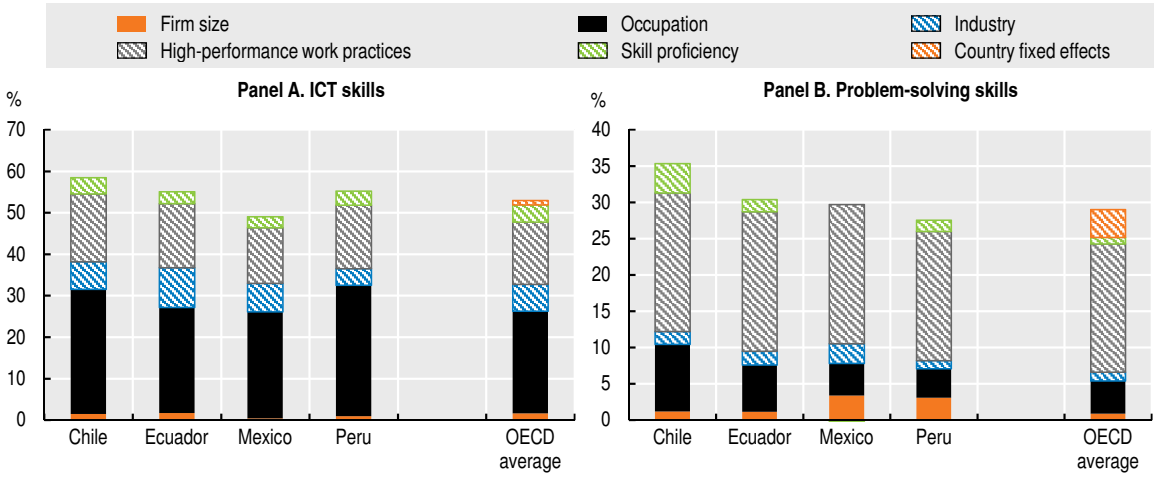
Proficiency explains a remarkably small part of the variance of skills use at work in LAC (1% to 6%), mainly affecting industry, occupation, firm size and high-performance work practices (Figure 3.13). The use of the workers' skills is affected by both the extent to which they deploy those skills at work – which in turn may depend on incentives and the workers' own initiatives – and the skills required for the job. Some workers may have skills in excess and may not use them fully; others may have insufficient skills but maintain their jobs, at least in the short term, despite resulting poor performance (OECD, 2016b). The relationship between skills proficiency and skills use is thus likely to be mediated by workers' sorting into occupations, industries and firms (OECD, 2016c).

The characteristics of occupations and firms, as measured by the application of High-performance work practices, are important predictors of digital and problem-solving skills use at work in LAC. Occupations explain between 25% (Ecuador) and 31% (Peru) of the variance in ICT skills use at work. High-performance work practices explain between 17% (Peru) and 19% (Ecuador) of the variance in problem-solving skills use at work in technology-rich environments.

Digital skills use varies strongly by occupation. Managers, professionals, technicians and clerical support workers use ICT skills relatively frequently; workers in service and sales, agriculture, forestry and fishery, craft and trades, plant and machine operators and elementary occupations use them much less (OECD, 2016b).

Figure 3.13. **Contribution of skills proficiency and other factors to variance of skills use at work in selected Latin American countries and OECD average**

Percentage of the variance in skills use at work by factor



Notes: OECD average corresponds to the regression for OECD pooled countries including country fixed effects. Reading, writing, numeracy and ICT skills use indicator ranges from 0 to 1. Index of problem-solving skills at work is computed by averaging the frequency with which workers solve simple and complex problems and ranges from 0 to 4. High-performance work practices include the following variables: choosing and changing the sequence of tasks, speed of work and how to do the work; organising time and planning activities; co-operating with others; instructing, teaching or training people; sharing information with co-workers; earning bonuses; participating in training; and having flexible work hours. For problem solving, skills proficiency = proficiency in problem solving in technology-rich environments; analysis therefore excludes countries that do not test this proficiency domain. Chile participated in the Survey of Adult Skills (PIAAC) Round 2 and the rest of the LAC countries (Mexico, Peru, Ecuador) in PIAAC Round 3.

Source: OECD (2019c), *Skills Matter: Additional Results from the Survey of Adult Skills*, https://doi.org/10.1787/1f029d8f-en.

StatLink *https://doi.org/10.1787/888934172122*

Policies can foster inclusion in LAC labour markets

Labour markets are partially polarised in most LAC countries. Share of employment and wages have grown substantially for high-skilled and some low-skilled jobs, especially in the service sector, and fallen for middle-skilled jobs (Azuara Herrera et al., 2019). Manual work in highly automatable occupations, such as machine operator or equipment repair, has declined significantly, and wage gains in other automatable occupations have decreased. However, these changes are smaller than observed in other regions and the OECD area.

The labour market for the most qualified people has not absorbed the volume of highly educated professionals who joined the labour force between 2000 and 2015. This contrasts with more developed countries, where the incorporation of new technologies has boosted demand for and wages of professionals with higher levels of education. Also, in contrast to the OECD area, knowledge occupations have experienced lower wage gains than manual occupations (Azuara Herrera et al., 2019).

Cleaning personnel and financial specialist jobs grew the most in LAC between 2000 and 2015. Salesperson, computer and mathematics specialist, food preparer, health technician, lawyer, pilot and air traffic controller, construction worker and administrative personnel jobs also grew, according to the household surveys of Bolivia, Brazil, Chile, Costa Rica, the Dominican Republic, Ecuador, Jamaica, Mexico and Paraguay. Manager, machinery operator, caregiver, machine maintenance and repair, driver, physical science technician, education specialist, biology technician, artist, athlete and security guard jobs decreased the most during the period (Azuara Herrera et al., 2019).

Digitalisation and rapid progress in ICT have accelerated "winner-takes-most" dynamics, which could contribute to further wage inequality in LAC. ICT has improved matching of geographically distant sellers and buyers. It has also facilitated the emergence of markets with global scale in a number of traditional services industries, such as retail and transport, as well as ICT services, for which the marginal cost of scaling up is near zero (OECD, 2018c). In some of these industries, especially ICT services, retail and transport, network externalities that favour a dominant player have become more important. Consistent with winner-takes-most, evidence suggests that trade integration and digitalisation have contributed to the wage divergence between the most successful firms and the rest (Berlingieri, Blanchenay and Criscuolo, 2017).

Digitalisation raises concerns about job quality. While diversity in employment contracts can provide flexibility for many workers and firms, challenges remain in ensuring the quality of non-standard contracts. Labour market disparities could increase unless policy action ensures more equal sharing of the costs of structural adjustment in the world of work (OECD, 2019a).

Many OECD and emerging economies have seen growth in non-standard forms of employment, bringing various challenges. New forms of work are the result of changes in worker preferences, innovations in business models and work organisation, technological developments and policy choices. They include the gig economy, in which workers provide services through online platforms. Other non-standard forms of work, such as on-call or zero-hour contracts and own-account work, have expanded in many countries. These more flexible working arrangements often emerge in response to the needs of both employers and workers but may result in well-being losses for workers in the absence of policies guaranteeing adequate rights and protections. This is an important concern in countries where non-standard forms of work are proliferating and where firms increasingly rely on networks of contractors and subcontractors to perform many functions rather than on a permanent labour force (giving rise to the concept of the "fissured workplace") (OECD, 2019a).

In countries with a large incidence of informality, gig economy work could offer a route to formalisation. It could reduce costs and improve monitoring of economic activities through the digitalisation of transactions. However, to capitalise on these opportunities, emerging economies will need to ensure adequate tax and social protection mechanisms.

As these transformations occur, challenges arise in managing the transition of workers in declining industries and regions to new employment opportunities, and moving towards universal social protection. The key message of the *OECD Employment Outlook 2019* is that the future of work will largely depend on policy decisions (OECD, 2019a). Policies and institutions can support workers to seize the opportunities of digitalisation, globalisation and longer lives and mitigate the risks (OECD, 2019a).

Policies to build a more rewarding and inclusive world of work will require adequate financial resources, in particular for strengthening adult learning and social protection. Given constraints on public finances, new thinking on how to find the necessary resources is needed. At the same time, some policy options involve barely any public expenditure and may even increase tax revenue.

Digitalisation and schools: Equity and quality in education

Digitalisation brings advantages and opportunities for those with the needed skills but can exacerbate inequality and vulnerability for those not adequately prepared. Acquisition of skills, distribution of knowledge and education opportunities are crucial to improving citizen well-being in the digital age. Preventing increased education gaps

during the pandemic is key to promoting inclusive recovery. It is therefore crucial to increase digital capacities in schools and support digital skills acquisition by teachers, parents and students (see Digitalisation and the coronavirus [Covid-19] section).

New technologies could be useful to reduce skills gaps between LAC and the OECD and, more importantly, promote basic skills acquisition among traditionally marginalised groups. Use of technologies at school could support addressing these challenges, especially as tackling the effect on skills of unfavourable conditions, for instance socio-economic disadvantage, is more effective early in life (Cunha, Heckman and Schennach, 2010). At the same time, education systems need to teach young people the skills they will use in an increasingly digital-intensive future.

New technologies allow the development of innovative teaching practices, enable personalised and remote courses and feedback, and encourage student interest and engagement through new learning modalities, such as gamification. Connectivity allows schools to access new learning resources and materials; the digital transformation could therefore provide additional support for the development of fundamental cognitive, non-cognitive and digital skills, preparing students to live and succeed in the digital world.

This section analyses schools' role in training better-equipped future generations to face the digital era and promoting digital inclusiveness. It explores how well equipped schools are to foster strong digital skills, how students aged 15 use ICT tools and acquire digital skills, and which students benefit the most. It draws on data from the OECD Programme for International Student Assessment (PISA). Some 600 000 students completed PISA 2018, which represents about 32 million 15-year-olds in schools in 79 countries. The section presents results from the ten Latin American countries that participated in PISA 2018 (Argentina, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Mexico, Panama, Peru and Uruguay), although Argentina, Colombia and Peru did not administer the optional ICT Familiarity Questionnaire.[3]

Students are accessing ICT at increasingly younger ages

Rapid digitalisation over the last decade has influenced how students learn, do homework, interact with peers and spend leisure time. Internet access and use have had a particular impact. Internet use at school among students aged 15 in LAC more than doubled between 2012 and 2018 to over one hour on a typical school day. Time on line outside school increased, on average, by almost 1.4 hours per day, to 3.0 hours on weekdays (Figure 3.14) and almost 3.5 hours on weekends, in line with the OECD average.

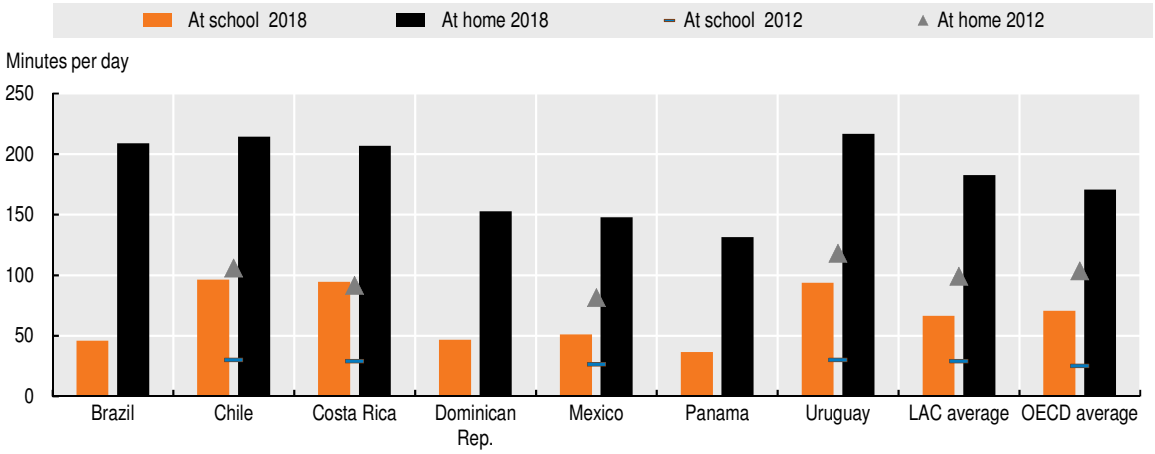
LAC students are going on line at increasingly younger ages. In 2015, in the five LAC countries with available PISA ICT information in both 2015 and 2018 (Brazil, Chile, Costa Rica, the Dominican Republic, Mexico, Peru and Uruguay), 61% of students aged 15 accessed a digital device for the first time before age 10, rising to 62% in 2018. In 2018, more than 20% accessed a digital device before age 6 and 7% before age 3. These trends are likely to continue (OECD, 2016d, 2016e).

There is a large variation in the average age of digital initiation across LAC countries. In 2015, 73% of students aged 15 in Chile had interacted with digital devices, compared with 41% in Peru. In 2018, almost 75% of students aged 15 in Chile and Uruguay started using digital devices before age 10 vs. just over 50% in Mexico and the Dominican Republic. In the Dominican Republic and Panama, between 3% and 5% had never used a digital device (OECD, 2018d).

On average, people go on line at a younger age in the OECD area. In 2015, in OECD countries with PISA data, 73% of students aged 15 accessed the Internet for the first time

before age 10 – 34% before age 6 (OECD, 2017a) – with small changes for 2018. Less than 1% of students aged 15 in OECD countries had never used a digital device vs. more than 2% in LAC.

Figure 3.14. **Time spent by students on the Internet at school and at home on weekdays in selected Latin American countries, 2012 and 2018**



Notes: Responses were no time, 1-30 minutes, 31-60 minutes, 1-2 hours, 2-4 hours, 4-6 hours and more than 6 hours. Responses were converted into the smallest number of minutes in the interval: 0, 1, 31, 61, 121, 241 or 361. As such, numbers are lower bounds of the average time spent on the Internet per day. OECD and LAC averages are simple averages using available data for each year.

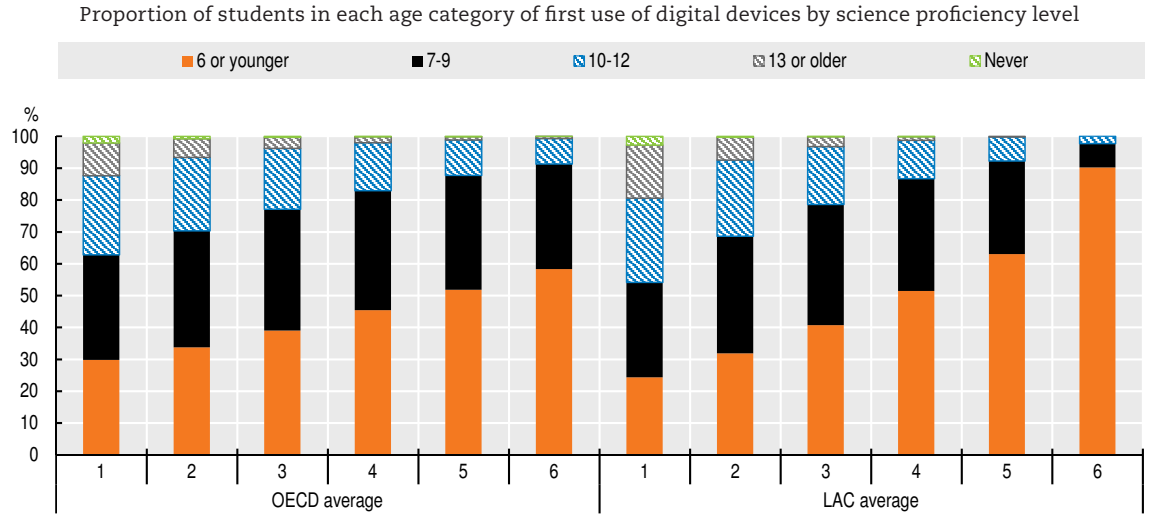
Source: OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink *https://doi.org/10.1787/888934172141*

Access to ICT and developing digital skills are linked to basic skills acquisition. When looking at the age of first exposure to digital devices by school performance, on average, students with higher levels of proficiency in PISA (i.e. levels 5 and 6 in science) started using digital devices at a younger age (Figure 3.15). Students at level 2, the baseline for science, can draw on their knowledge of basic science content and procedures to identify an appropriate explanation, interpret data and identify the question being addressed in a simple experiment. At level 2, students demonstrate sufficient scientific knowledge and skills to participate actively in life situations related to science and technology. All students should attain level 2 by the end of compulsory education (OECD, 2015b, 2016e). A large proportion of those performing below level 2 had never used or had started using technologies at age 10 or older. The proportion is higher in LAC countries, indicating a digital divide.

Early exposure to digital devices is correlated with better performance in PISA: starting to use ICT before age 9 is significantly associated with higher scores than starting after age 12. Starting before age 3 has a lesser beneficial effect on performance than starting between ages 3 and 6, meaning that starting at the earliest ages has no major correlation with school performance (Figure 3.16). It is unclear whether technology is behind correlations between ICT use and performance in PISA. Students more motivated to study and perform better may also be more motivated to use ICT early in life. Students who use ICT earlier in life may have parents who stimulate them more and encourage new experiences, including use of ICT, which may support skills development and better performance. However, simply providing ICT might not immediately improve performance, there is a need for co-ordinated ICT and education policies.

Figure 3.15. **Age of first use of digital devices by PISA science proficiency level, OECD and LAC averages, 2018**

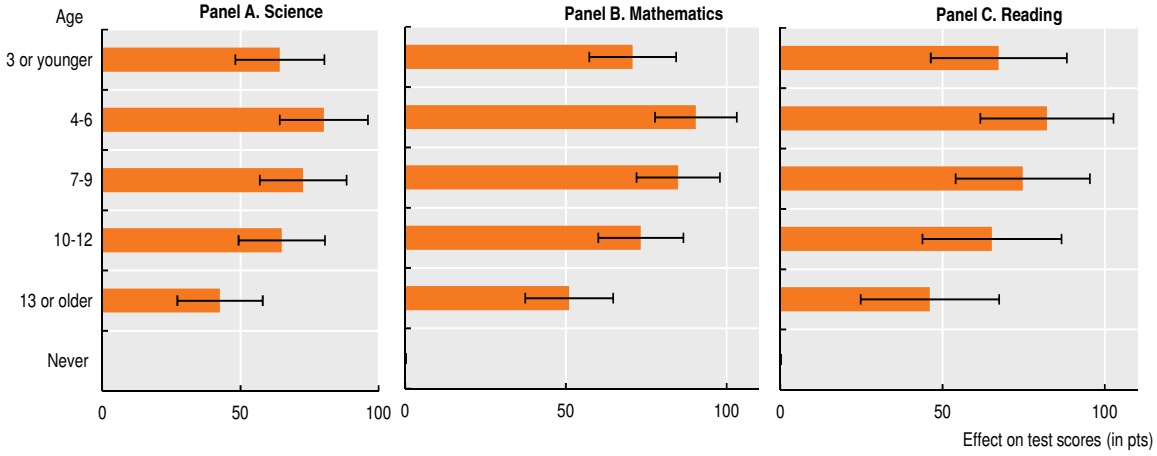


Note: The difference between LAC and the OECD area (excluding Mexico, Colombia and Chile) in the proportion of students who used a digital device for the first time at older than age 9 is significant.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink https://doi.org/10.1787/888934172160

Figure 3.16. **Age of first use of a digital device and performance in PISA in Latin America and the Caribbean, 2018**



Notes: Estimated effects of the age of first use of a digital device, by age categories relative to the category "Have never used a digital device", on performance in science, mathematics and reading. Bars display coefficients from a regression estimating the effect of age categories for first use of a digital device on performance. Regression controls include the PISA index of student socio-economic status, age, gender, immigration status, a dummy variable for attending a private school and a variable for living in a rural area. Country fixed effects are included in the regression. Error bars correspond to 1.96 standard errors and, as such, represent the 95% confidence interval. Sample includes all LAC countries that participated in PISA 2018 with available data.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink https://doi.org/10.1787/888934172179

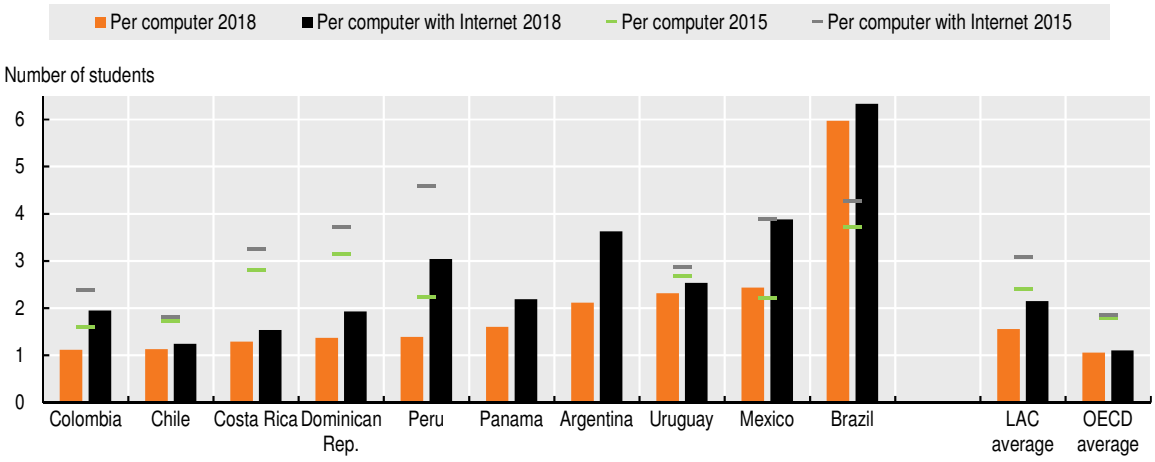
Schools contribute to equity in access to ICT in LAC

In countries where household connectivity is not universal, public spaces and institutions, such as schools, facilitate Internet access (UNESCO, 2017). More than 5%

of LAC students have access to ICT exclusively at school. This section uses the school module of PISA 2018, answered by principals or authorities, to analyse access by students aged 15 to computers, ICT and the Internet at school.

Although LAC schools increasingly offer access to digital tools, the gap with the OECD area remains. On average, two or more students share a school computer vs. one computer per student in the OECD. Internet access is also essential for acquiring relevant digital skills. Some 95% of school computers in the OECD area have connectivity, compared with 74% in LAC (Figure 3.17).

Figure 3.17. **Number of students per computer and per Internet-connected computer in selected Latin American and Caribbean countries, 2015 and 2018**



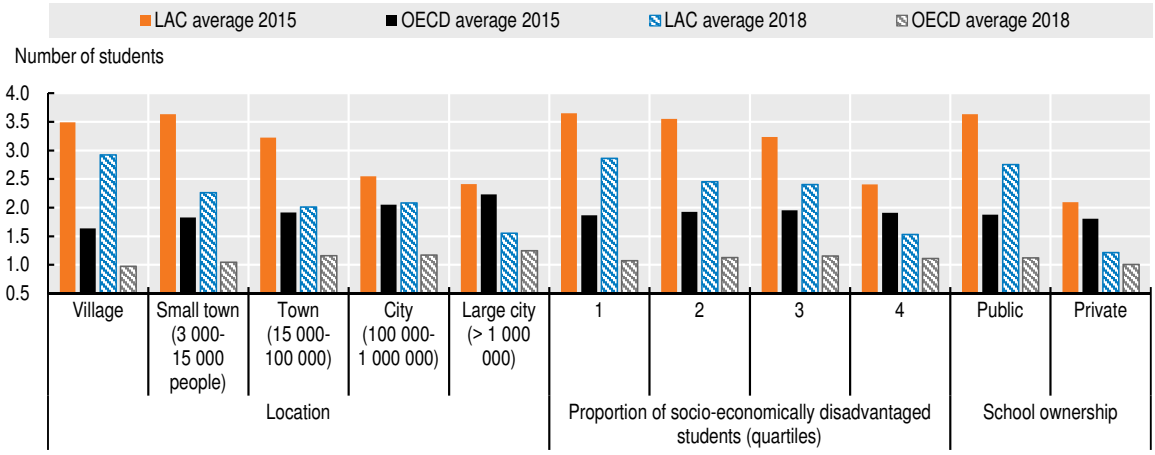
Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.
StatLink https://doi.org/10.1787/888934172198

Having computers but lacking connectivity or trained staff hinders the effective use of ICT as a tool for developing foundational and digital skills. LAC countries face not only physical barriers, including limited infrastructure, software, hardware and Internet connection quality, but others, in particular lack of ICT-knowledgeable staff and teachers (OECD, 2019g), which is key for quality education. Technology is not enough to improve education quality and skills development: access is a necessary but not sufficient condition. A more wide-ranging approach to education is needed. Education studies suggest that the effect of ICT on student performance rests on how technology complements or substitutes for teaching practices (Box 3.2).

Computer access at school varies among and within LAC countries. Schools in Chile and Colombia provide almost one computer per student, on a par with most OECD countries. Almost all have an Internet connection in Chile; fewer than two-thirds do in Colombia. In Brazil, more than five students share each Internet-connected computer.

There is large variation in access and connectivity within LAC countries, in several respects. In villages, three students share each Internet-connected computer, compared with two students in large cities. Three students in the bottom quartile of the PISA index of economic, social and cultural status (ESCS) indicator share an Internet-connected computer, compared with two or fewer in the top quartile. In public schools, on average, three students share each Internet-connected computers vs. almost one per student in private schools (Figure 3.18).

Figure 3.18. **Number of students per computer and per Internet-connected computer by socio-demographic characteristics, LAC and OECD averages, 2015 and 2018**



Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/ and OECD (2015c), *PISA 2015 Database* (database), www.oecd.org/pisa/data/2015database/.

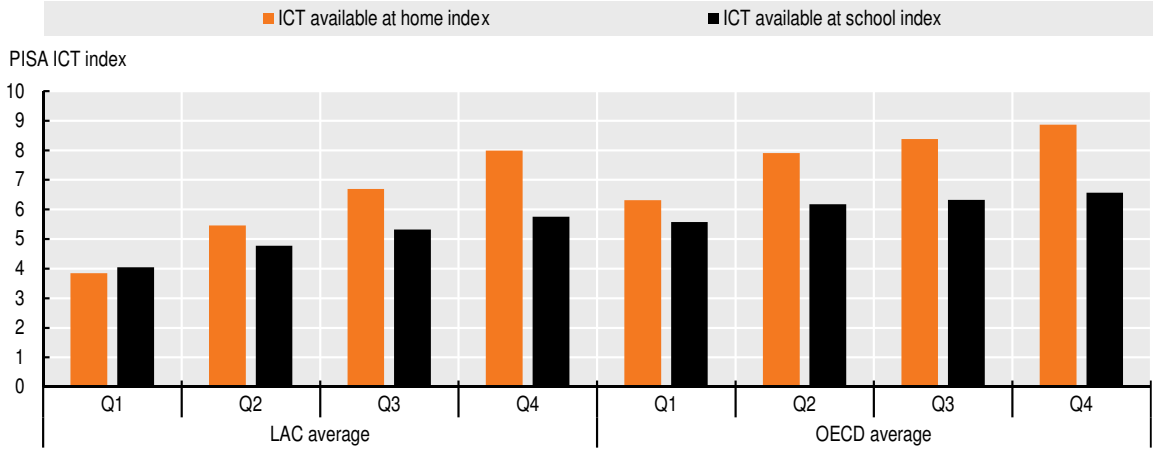
StatLink https://doi.org/10.1787/888934172217

By providing computer and Internet access, schools help bridge the gap between students with and without ICT access at home (OECD/IDB, 2016). PISA derives ICT availability indexes for school and home.[4] These indicators calculate the combined availability of various digital tools, including computers, the Internet and smartphones, on a scale of 0 (no access to any digital tool) to 10 (access to every tool listed; 11 in the case of ICT availability at home). Inequality in ICT availability between socio-economically advantaged and disadvantaged students is greater at home than at school. In LAC, the ICT availability index at home is 50% (40% in the OECD area) higher for students in the fourth quartile of the PISA index of economic, social and cultural status (ESCS) than for students in the first quartile. The ICT availability index at school is 42% (18% in the OECD area) higher for students in the fourth quartile (Figure 3.19). Schools help reduce the digital divide in access to ICT. Extending ICT infrastructure in LAC schools is relevant and needed.

Fairness in resource allocation is important to ensure equity in education opportunities and is related to education system performance overall. High-performing countries tend to allocate resources, including computers and digital tools, more equitably, regardless of schools' socio-economic profiles. Better access to ICT at school may compensate for low access in rural or socio-economically disadvantaged homes (OECD, 2015d).

Too often, scarce education resources, such as ICT, are inequitably distributed between advantaged and disadvantaged schools in LAC. Principals in most schools report inadequate education resources. Costa Rica, Mexico and Peru tend to allocate the scarce resources to advantaged schools; lack of or inadequate resources hinder learning in many schools, particularly in socio-economically disadvantaged schools. By contrast, principals in Finland report a similar share of resources, regardless of how advantaged their schools are (OECD, 2016d).

Figure 3.19. **ICT availability index at home and at school by quartile of the PISA index of economic, social and cultural status, LAC and OECD averages, 2018**



Notes: The PISA ICT Familiarity Questionnaire asks about the availability of ICT at home and at school and its use for various purposes. ICTHOME is an index based on the sum of the availability of all items listed in IC001. IC009 asks about the availability of ICT at school. The respective derived variable ICTSCHOOL is an index based on the sum of the availability of all items listed. In ICTHOME and ICTSCHOOL, the difference between the fourth and first quartiles is significant in LAC and not significant in the OECD area. On average, both ICTHOME and ICTSCHOOL are significantly different between the OECD area and LAC. The means of both indexes for each level are significant.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink *https://doi.org/10.1787/888934172236*

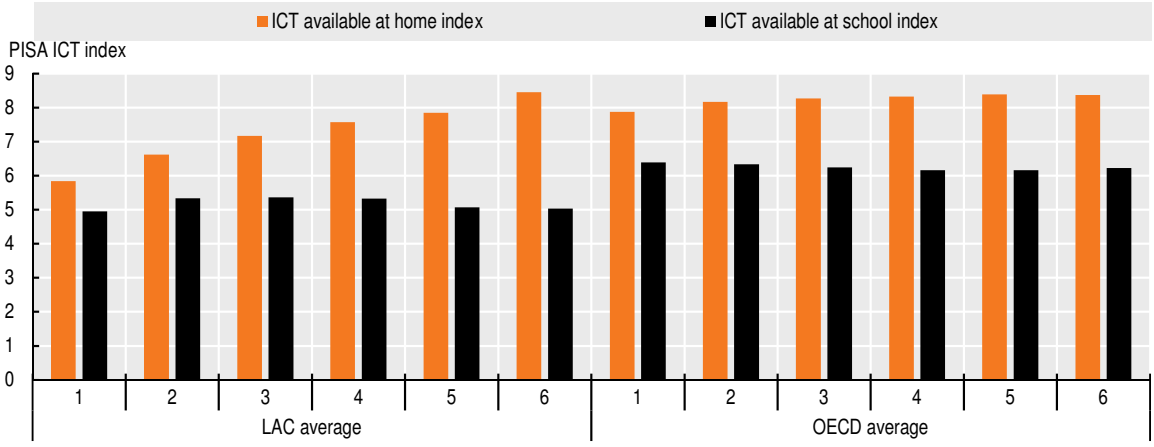
Improving ICT access at home and in schools in LAC is important, as it has a positive correlation with education performance. Most students who perform in the top two levels of the PISA science assessment had access to ICT at home, as reflected by a higher ICT availability at home index, than those who perform in the lowest levels (Figure 3.20). Home ICT access could help students achieve better results, or better performance could result from better performing students demanding more ICT. ICT availability is likely to be correlated with higher income, among other development indicators. Availability of ICT at school is similar for all students in both LAC and OECD countries, regardless of proficiency.

Providing disadvantaged schools and students with more computers and ICT is not enough to improve performance (Box 3.2). It is crucial that digital tools be used in a way that improves not distracts from learning (OECD, 2016c). Digital skills development is key to making the most of the digital transformation. Access to digital devices should be complemented by programmes that develop both students' and teachers' ICT skills. Schools in LAC have expanded digital skills curricula; however, variation across schools is large and enhances disparities. Schools with a higher proportion of Internet-connected computers are more likely to offer clubs focused on computer or ICT skills development, reinforcing the divide in ICT access and use at school among LAC students. Even in schools with a higher proportion of Internet-connected computers, the chances of having a programme to use digital devices for teaching and learning in specific subjects are low.

Until now, policies to boost the benefits of digitalisation have paid more attention to increasing access and connectivity than to quality of experience or use (Bulman and Fairlie, 2016). Lack of or inadequate digital pedagogy likely affects the potential positive effects of access to ICT on learning outcomes. LAC countries that provide one Internet-connected computer per student have similar proportions of schools with extracurricular activities to develop ICT skills or specific programmes to use ICT in teaching and learning. Being prepared for the digital transformation implies more than Internet access and use.

Education systems must adapt content and services to the demands students will face in a digital-intensive future.

Figure 3.20. **ICT availability index at home and at school by PISA level of proficiency in science, LAC and OECD averages, 2018**



Notes: The PISA ICT Familiarity Questionnaire asks about the availability of ICT at home and its use for various purposes. ICTHOME is an index based on the sum of the availability of all items listed in IC001. IC009 asks about the availability of ICT at school. The respective derived variable ICTSCHOOL is an index based on the sum of the availability of all items listed. For LAC and the OECD area, the difference in ICTHOME is significant between levels 1 and 6, while ICTSCHOOL is not significantly different. On average, both ICTHOME and ICTSCHOOL are significantly different between the OECD area and LAC. The means of both indexes for each level are significant.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink *https://doi.org/10.1787/888934172255*

Most regional governments have limited resources. They must evaluate which programmes to implement and scale-up policies that would substantially improve education quality. Evidence on the effect of programmes that provide digital tools (computers, software, connectivity) and skills is key to determining which are most beneficial to learning (Escueta et al., 2017; *J-PAL Evidence Review*, 2019; Malamud et al., 2018).

Box 3.2. **Computers in education**

ICT has become a critical part of learning inside and outside the classroom. LAC governments have invested heavily in adopting ICT in their education systems over the last two decades, but the impact of access and use on student performance and achievement has not been as expected.

Lessons learned from One Laptop per Child programmes

One Laptop Per Child programmes in LAC, which distribute laptops to students for school and home use on a large scale, have been key in the debate about the ability of computers to enhance learning. Evaluations have found mixed results: there are significant uncertainties about effectiveness and impact.

Uruguay was one of the few countries to implement such a programme nationally. It had no effect on mathematics and reading scores in the first two years (Melo, Machado and Miranda, 2014), possibly owing to lack of compulsory teacher training and the primary use in classrooms for Internet searches.

Peru spent over USD 200 million to distribute 900 000 computers. While computer literacy improved, abilities in reading and mathematics did not. Observers argued that

Box 3.2. **Computers in education** *(cont.)*

the programme did not encompass Internet access and was carried out in mostly rural areas, where neither teachers nor parents had the knowledge to help children engage with digital technology. By contrast, an experimental programme in Lima, which provided laptops, high-speed Internet access and eight training sessions for children on how to access education websites and search for information on sites such as Wikipedia, increased access and use of home computers, and performance on a proficiency test by 0.8 standard deviations (Beuermann et al., 2015).

Lessons learned from computer use at school

Providing digital devices does not ensure better performance (Bulman and Fairlie, 2016; Escueta et al., 2017; OECD, 2020b). PISA 2012 results showed that students with limited use of computers at school performed better at reading than students who did not use them at all; however, students who used them at a level above the OECD average had significantly poorer results (OECD, 2015d). If not used properly, computer use can have no or negative effects on outcomes.

Other studies show that the impact of computer-assisted instruction, e.g. education software, depends on whether it is used as a substitute for or complement to traditional teaching. Its effect also depends on the quality of teaching methodology that computer-assisted instruction is replacing or complementing. Use of computer-assisted instruction is more effective in improving performance in developing countries when it replaces lower-quality instruction or compensates for lack of teachers (Banerjee et al., 2007; OECD, 2020b).

There are ways to improve the outcomes of ICT use. A significant body of research suggests that teacher-guided learning – well-designed software used at school that expands course material – is among the most effective ways to help children develop skills (IDB, 2011).

Evidence indicates that children with weak adult supervision may spend more time using computers in ways that do little to boost their achievement than for homework or studying. Interventions to increase access should implement mechanisms to ensure proper use, for instance, computers preloaded with interactive educational software and apps that launch automatically to stimulate their use (IDB, 2011).

Providing training in computer labs one or two hours per week has had positive impacts on learning and employment opportunities. This may be a cheaper investment for the region, yielding relatively high returns, particularly for countries with limited resources: setting up and maintaining a school computer lab costs approximately USD 23 per student, compared with USD 217 per student for one computer per child programmes (IDB, 2011).

Teachers must have adequate technological skills to maximise skills transmission (Paniagua and Istance, 2018; Peterson et al., 2018). According to the Survey of Adult Skills, the share of teachers in OECD countries with low problem-solving skills in technology-rich environments ranged from less than 5% in Australia to 20% or more in Chile and Turkey (OECD, 2019g, 2016e).

Teachers can use massive open online courses (MOOCs) to improve their skills or as a pedagogical tool. Some US universities have collaborated with MOOC platforms to offer preparatory courses for high school students in advanced placement classes. Students following MOOCs rather than standard material tend to achieve slightly better learning results. Many MOOC participants are teachers (Seaton et al., 2014). Beyond increasing computers per student, investment in digital devices dedicated to teachers and in teacher training tends to result in higher student performance (Denoël et al., 2017). The quality of the tools, their co-ordination with other teaching practices and teacher training are essential.

Schools contribute to equity in use of ICT in LAC

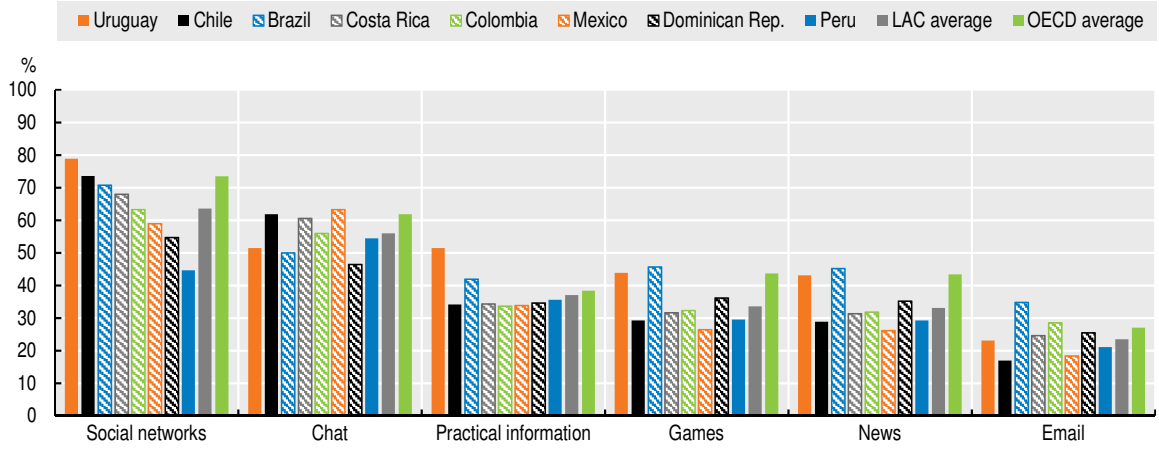
Having the needed skills and level of education can protect against the digital divide and mitigate other divides. Digital inclusion requires more than improved access to ICT tools and infrastructure; it requires a broad set of cognitive, metacognitive and digital skills to benefit from the technology. How people use the Internet and digital technologies determines their benefits. As ICT access gaps decrease, differences in use and use outcomes are becoming increasingly important, especially in education.

The digital divide commonly relates to the gap in how individuals with different socio-demographic profiles use the Internet and ICT and thus benefit from the opportunities of the digital transformation. Digital exclusion is compound and sequential; the amplification mechanism of digital exclusion suggests that the Internet is a magnifier of existing offline inequalities (van Deursen et al., 2017). Digitalisation may widen gaps if rural, socio-economically disadvantaged or low-performing students have less contact with digital education content, use the Internet for studying poorly and/or use the Internet predominantly for entertainment (OECD, 2019g).

Outside school, LAC students most commonly use ICT to engage in social networks, chat and search for information (Figure 3.21). Two in three engage in social networks and chat every day or almost every day (at least three times per week), compared with three in four in OECD countries. Similar to OECD countries, more than one in three LAC students regularly browses the Internet for practical information.

Figure 3.21. **Student ICT use outside school in selected Latin American and Caribbean countries, 2018 or latest available year**

Share of students using ICT outside school for an activity every day or almost every day (at least three times per week)



Notes: Percentages are significant for each country/region. Proportion of students using digital devices for each activity is not significantly different between the OECD area and LAC. Colombia and Peru correspond to the 2015 PISA database owing to technical availability of data at the time of elaboration.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/ and OECD (2015c), *PISA 2015 Database* (database), www.oecd.org/pisa/data/2015database/.

StatLink https://doi.org/10.1787/888934172274

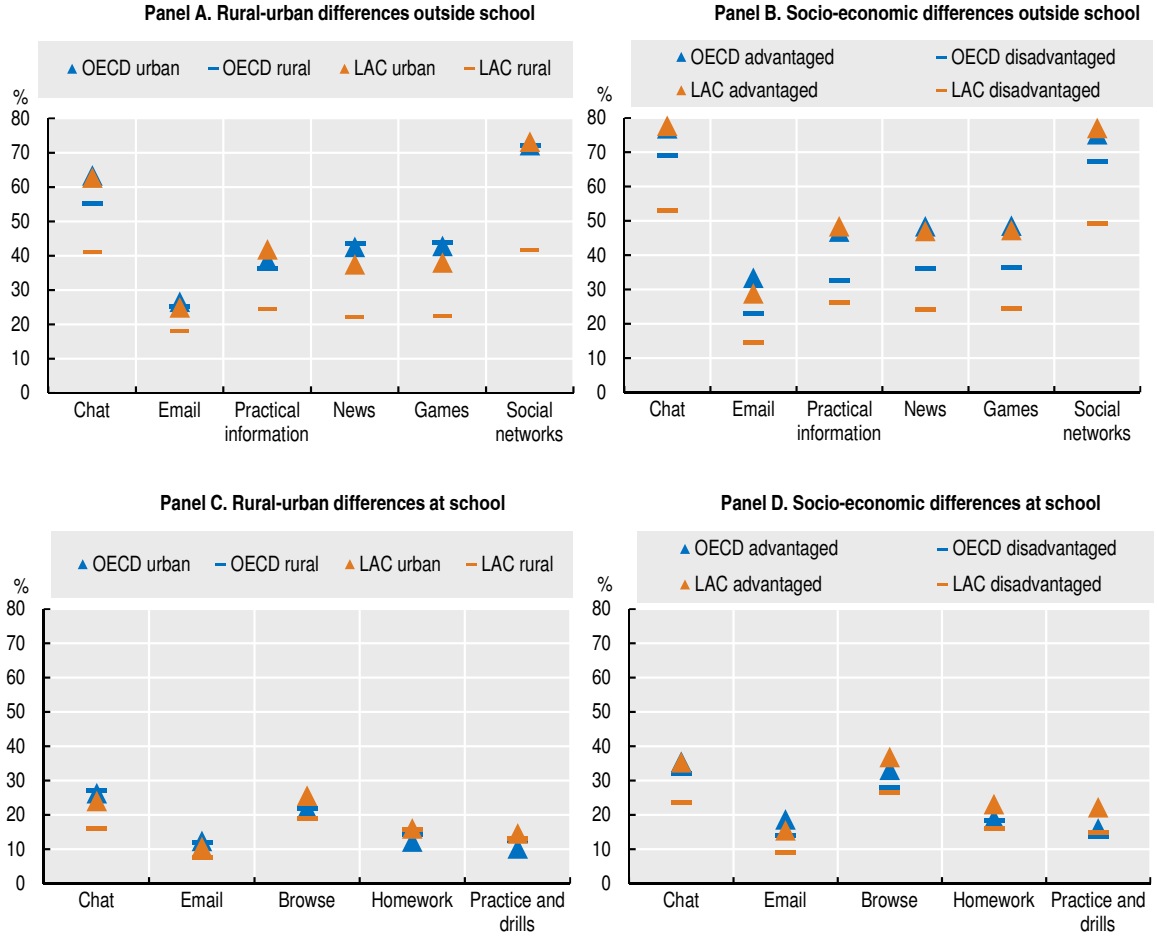
Factors that shape inequalities in digital access, such as gender, socio-economic background, labour force status, geography or skills, also shape inequalities in use (Demoussis and Giannakopoulos, 2006; Dewan and Riggins, 2005; Fairlie, 2004; Hargittai and Hsieh, 2013; Robinson, Dimaggio and Hargittai, 2003). The share of low-educated Latin Americans with no connectivity declined in the last decade. Studies show that

low-educated individuals use the Internet for recreation more than for learning, in contrast to highly educated individuals (van Deursen and van Dijk, 2014; OECD, 2019d).

Socio-economic background and skills inform student use of ICT outside school in LAC. In OECD countries, socio-economically disadvantaged students engage in social networks and chat almost as much as advantaged students but differ in getting practical information and emailing. In LAC countries, all uses differ between the two groups (Figure 3.22). Top performers tend to use ICT more frequently than low performers in both the OECD area and LAC, but the difference is more pronounced in LAC, indicating a greater digital divide in frequency of use in terms of skills characteristics.

Figure 3.22. **ICT use outside and at school by socio-demographic category, LAC and OECD averages, 2018**

Share of students using ICT outside and at school for an activity at least three times per week



Notes: Shares computed as averages of OECD and LAC countries that participated in the PISA ICT Familiarity Questionnaire. Students are considered socio-economically disadvantaged if their values on the PISA ESCS index are in the bottom 25% in their country or economy. Rural students are those whose school is located in "a village, hamlet or rural area with fewer than 3 000 people"; urban students are those whose school is located in a city of over 100 000 people. Browse refers to "browsing the Internet for schoolwork" and "downloading, uploading or browsing material from the school's website (e.g. <intranet>)". Practice and drills refers to "practising and drilling, such as for foreign language learning or mathematics". Homework refers to "doing homework on a school computer" and "using school computers for group work and communication with other students".

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink https://doi.org/10.1787/888934172293

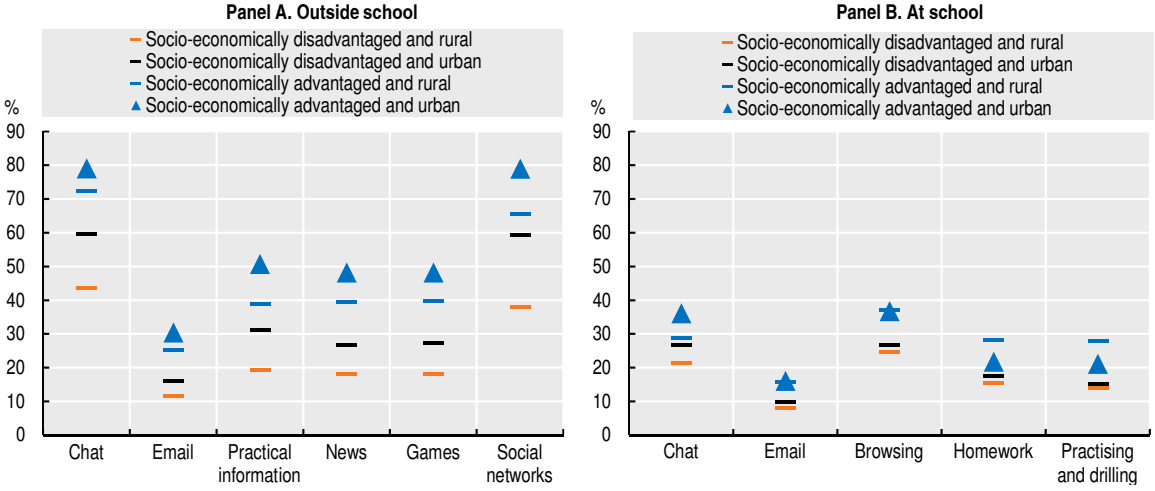
Inequalities in ICT use also relate to gender and geography. Even when differences are small, boys and girls in LAC and OECD countries use digital devices differently (see the following section). While there are marginal differences in use between rural and urban students in OECD countries, urban students in LAC engage in social networks almost 30 percentage points more and chat over 20 percentage points more than rural students.

Schools also contribute to closing the digital divide in LAC countries in terms of Internet use. Across use categories, gaps in Internet use among students with different socio-economic backgrounds were smaller at than outside school, even when differences were still significant.

Schools play a substantial role in decreasing the digital divide that will shape future skills (Figure 3.23). Yet, large variation persists across LAC schools, which policy makers need to address. Socio-economically advantaged students are 5 percentage points to 10 percentage points more likely to chat and browse the Internet at school for schoolwork than disadvantaged students (Figure 3.23, Panel B). This is probably related to Internet access at school but could be related to students having and using mobile phones at school. They are also more likely to practise and use ICT to develop digital skills (practice and drilling). Boys in LAC are more likely than girls to use the Internet at school for email, homework, and practice and drills. Territorial inequalities exacerbate socio-economic and gender inequalities in use of digital devices both at home and at school. Disadvantaged rural students are less likely to use ICT than advantaged urban students.

Figure 3.23. **ICT use outside and at school by socio-economic status and location, LAC averages, 2018**

Share of students using ICT outside and at school for an activity at least three times per week



Notes: Shares computed as averages of OECD and LAC countries that participated in the PISA ICT Familiarity Questionnaire. Students are considered socio-economically disadvantaged if their values on the PISA ESCS index are in the bottom 25% in their country or economy. Rural students are those whose school is located in "a village, hamlet or rural area with fewer than 3 000 people"; urban students are those whose school is located in a city of over 100 000 people. Browse refers to "browsing the Internet for schoolwork" and "downloading, uploading or browsing material from the school's website (e.g. <intranet>)". Practice and drills refers to "practising and drilling, such as for foreign language learning or mathematics". Homework refers to "doing homework on a school computer" and "using school computers for group work and communication with other students".

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink https://doi.org/10.1787/888934172312

How socio-economic and urban-rural divides affect ICT use is compounded when considering combined characteristics. Outside school use showed greater differences between disadvantaged rural students and advantaged urban students. Both advantaged

urban and rural students were more likely to use ICT at school, compared with their disadvantaged peers, but differences were not significant.

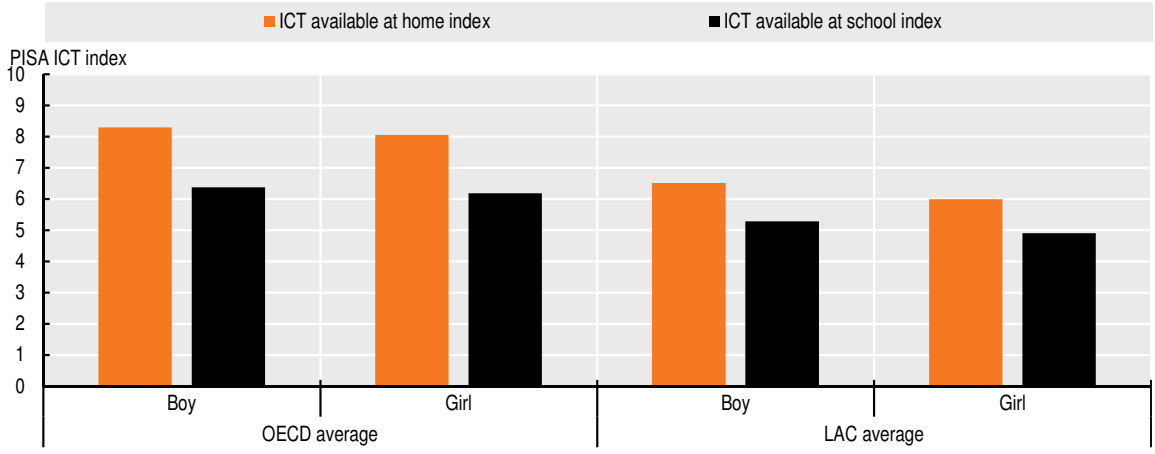
Gender differences in access and use of technologies start early

Gender is a critical dimension in many aspects of the digital transformation, especially labour markets, skills development, political participation and cyber violence (see Chapter 4). A gender perspective is relevant for developing inclusive, non-discriminatory public policies that promote women's economic and social rights, end gender stereotypes and close the digital gender divide.

Gender differences in access to technology start early in life. In both LAC and OECD countries, boys are 4 percentage points more likely than girls to start using digital devices before age 4 and 5 percentage points more likely to start between ages 4 and 6. Girls are about 5 percentage points more likely than boys to use a digital device for the first time between ages 10 and 12. Because, as shown above, early exposure is positively and significantly correlated with higher scores across PISA assessments, girls are at a disadvantage early in life.

Boys also enjoy greater ICT access than girls. The access gender gap is larger for LAC than OECD students. The difference between boys and girls in the OECD area and LAC is significant for the indexes that measure ICT access at and outside school. Girls aged 15 still have comparatively less exposure to and therefore development of digital skills (Figure 3.24).

Figure 3.24. **Student ICT access by gender, OECD and LAC averages, 2018**



Notes: The difference between boys and girls is significant at 10% in the OECD area and LAC for both indexes. The difference between the OECD area and LAC is significant for both indexes when referring to either boys or girls.

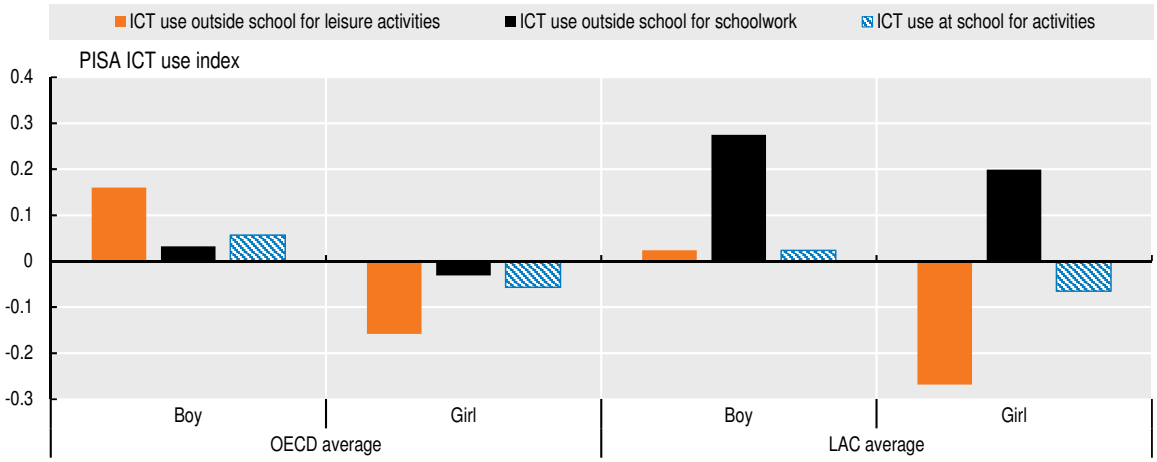
Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

StatLink https://doi.org/10.1787/888934172331

Gender differences are evident in ICT use. The PISA database derives ICT use indexes based on responses to how often digital devices are used: 1) outside school for leisure activities; 2) outside school for schoolwork; and 3) at school for any type of activity, including email, games, social networks, homework and posting work on the school website. On average, boys tend to use more ICT outside school for leisure activities in both OECD and LAC countries. Differences are less pronounced for ICT use outside school for schoolwork, since boys and girls have similar ICT use for homework (Figure 3.25).

Figure 3.25. **Student ICT use by gender, OECD and LAC averages, 2018**

Indexes are transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1



Notes: The difference between boys and girls is significant in the OECD area and LAC only for the ENTUSE (leisure activities outside school) index. The difference between the OECD area and LAC, when referring to boys and when comparing girls in the two geographical groups, is only significant for the HOMESCH schoolwork outside school index when referring to girls. Three questions in the ICT Familiarity Questionnaire ask about how often digital devices are used outside school for leisure activities (IC008), outside school for schoolwork (IC010) and at school for activities (IC011). Possible responses are "never or hardly ever", "once or twice a month", "once or twice a week", "almost every day" and "every day". The respective indexes – ENTUSE (leisure activities outside school), HOMESCH (schoolwork outside school) and USESCH (ICT use at school) – are scaled using the IRT (item response theory) scaling methodology (OECD, 2017b). Weighted likelihood estimates (WLEs; Warm, 1989) are used as individual participant scores and transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1 (OECD, 2017b). Indexes of ICT use IRT scaling methodology, with the generalised partial credit model that estimates the probability of selecting a frequency of use for each of the items that are part of each of the three scenarios: outside school for leisure activities, outside school for schoolwork and at school for activities. International item and person parameters are obtained in a single analysis based on data from all persons in all countries. For each scale, only persons with minimum three valid responses are included. Students are weighted using the final student weight, and all countries contribute equally to the estimation. After this process, weighted likelihood estimates are used as individual participant scores, where 0 suggests a low frequency of use and values approaching 5 suggest a high frequency. Last, PISA derives a variable that eases comparison, and scores are transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1. For detailed information on the construction on the indexes, see OECD (2017b).

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

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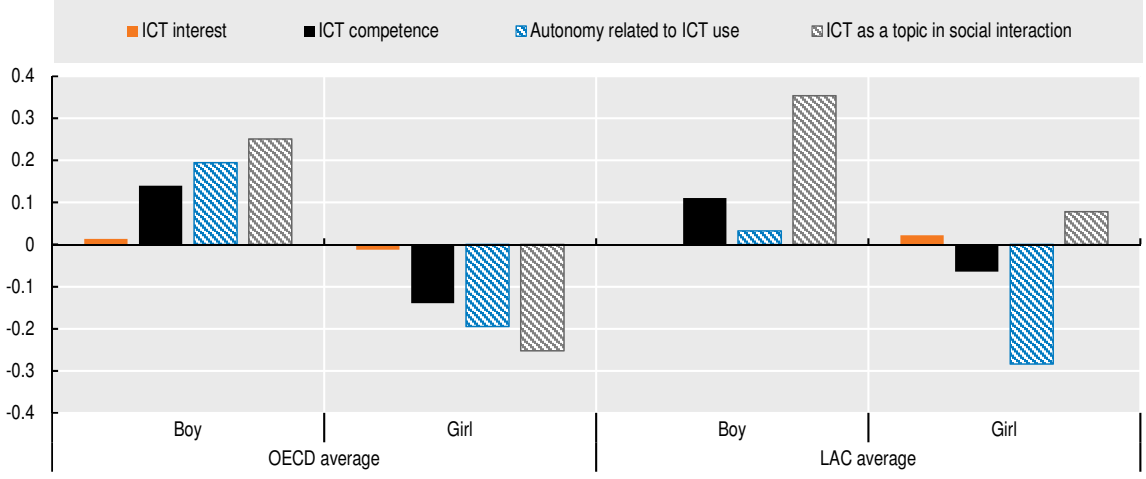
Girls have a lower estimation of their ICT skills, less autonomy using ICT and do not discuss ICT as a topic in social interaction as frequently as boys in LAC (Figure 3.26). PISA 2015 derives four variables to measure and compare students' ICT interest, perceived competence in ICT usage, perceived autonomy related to ICT usage and degree to which ICT is a topic in daily social interaction. Students responded on a scale of "strongly disagree" to "strongly agree" to statements that captured self-assessment in various situations regarding the four variables. Girls' lack of ICT use and lack of confidence when using ICT places them at a disadvantage with respect to boys and is likely to discourage them from undertaking careers in digital or ICT professions.

Gender differences affect future choices and professional development. Gender stereotypes can dissuade girls from pursuing a career in science. Schools can redress these stereotypes and help all students adopt broad perspectives, for instance, through better information on career or professional choices. Employers and educators in perceived masculine or feminine scientific fields can help eliminate stereotypes by underscoring the relationships among disciplines (OECD, 2018e, 2016e, 2015b).

Figure 3.26. **Self-perceived ICT skills by gender, OECD and LAC averages, 2018**

ICT perception indexes (interest, competence, autonomy, topic in social interaction). Indexes are transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1



Notes: The difference between boys and girls is significant at 10% in the OECD area for the four indexes and in LAC for "Perceived ICT competence", "Perceived autonomy related to ICT use" and "ICT as a topic in social interaction". The difference between the OECD area and LAC is significant for "Perceived autonomy related to ICT use" and "ICT as a topic in social interaction" when referring to boys and for "ICT as a topic in social interaction" when referring to girls. PISA 2015 included four new questions in the ICT Familiarity Questionnaire addressing students' ICT interest (IC013, INTICT), perceived competence in ICT usage (IC014, COMPICT), perceived autonomy related to ICT usage (IC015, AUTICT) and degree to which ICT is a topic in social interaction (IC016, SOIAICT). All questions use a four-point Likert answering scale, ranging from "strongly disagree" to "strongly agree". Weighted likelihood estimates (WLEs; Warm, 1989) are used as individual participant scores and transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1 (OECD, 2017b). ICT perception indexes use IRT (item response theory) scaling methodology, with the generalised partial credit model that estimates the probability of selecting one of four possible responses expressing level of agreement with each statement related to students' interest, perceived autonomy, perceived competence and ICT as a topic for social interaction for each of the items that are part of each of the four variables. International item and person parameters are obtained in a single analysis based on data from all persons in all countries. Students are weighted using the final student weight, and all countries contribute equally to the estimation. After this process, weighted likelihood estimates are used as individual participant scores, where 0 suggests strong disagreement and values approaching 4 suggest strong agreement. Last, PISA derives a variable that eases comparison, and scores are transformed into an international metric with an OECD mean of 0 and an OECD standard deviation of 1. For detailed information on the construction on the indexes, see OECD (2017b).

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

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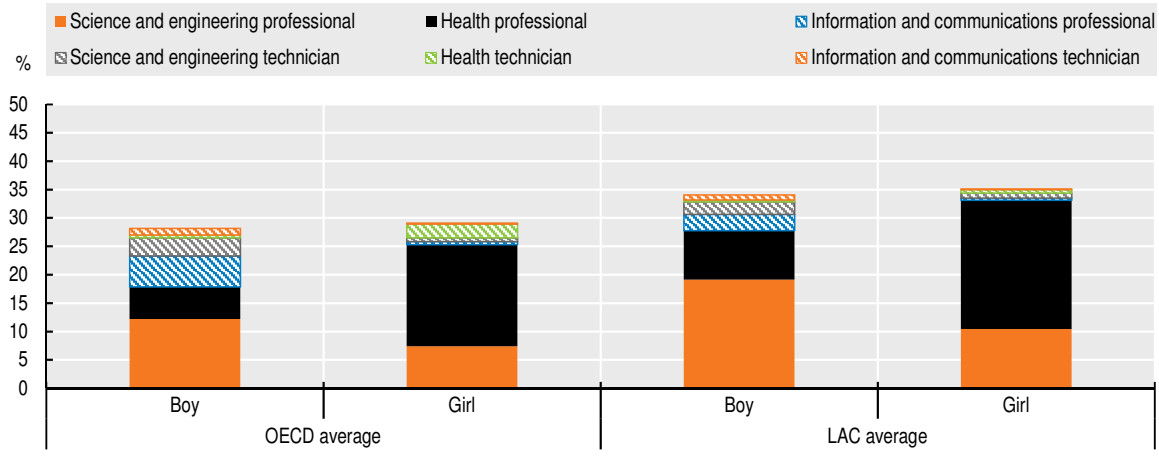
Large gender differences in student disposition towards science-related careers persist in LAC. Although a similar share of boys (34%) and girls (35%) reported that they expected to work in a science-related occupation, they tended to select different fields (Figure 3.27). Girls selected health professions more than boys; boys selected ICT, science or engineering professions more than girls. As ICT professionals are in high demand, this gender-based occupational segmentation poses a threat for LAC. The under-representation of women in ICT careers can negatively affect LAC's innovative and economic potential, since inventions arising from mixed teams are more socially and economically valuable and less likely to reproduce gender biases in technology itself (EIGE, 2018; OECD, 2018e). Low participation in ICT careers also makes women more likely to miss out on the economic benefits of the booming technology sector (EIGE, 2018).

The gender-based digital divide has multiple causes, including lack of access, lower education attainment, skills and technological literacy, and social norms. Policy interventions need to enhance access and skills but also address long-term structural biases (OECD, 2018a). Public policies need to boost women's digital education and self-confidence in digital skills to allow them to succeed and be included as equals in the

digital transformation. Policies should also combat the social norms that contribute to the gender-based digital divide, for instance, with campaigns conveying women's aptitude for science, technology, engineering and mathematics (STEM)- and ICT-related occupations, and by promoting female leadership role models and fostering mixed-gender teamwork, especially in STEM-related subjects (OECD, 2018a). Women's more active participation in the digital world, such as through online campaigns to raise awareness on gender inequality or participation in policy-making processes, may promote their full enjoyment of the benefits of digital technologies (see Chapter 4).

Figure 3.27. **Share of students who desire a career in science, technology, engineering and mathematics at age 30 by gender, OECD and LAC averages, 2018**



Notes: The difference between boys and girls is significant at 10% in the OECD area for health professional, information and communications technology professional, health technician and information and communications technician. The difference between boys and girls is significant in LAC for all occupations except health technician. The difference between LAC and the OECD area is significant at 10% for health professional when referring to boys and not significant for any occupation when referring to girls. According to the ILO Resolution Concerning Updating the International Standard Classification of Occupations, science career includes: science and engineering professionals; health professionals; information and communications technology professionals; science and engineering technicians and associate professionals; health technicians and associate professionals; and information and communications technology technicians and associate professionals.

Source: Own calculations based on OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

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Digitalisation and the coronavirus (Covid-19): The widening divide

The coronavirus (Covid-19) crisis highlights the importance of digital transformation, which has ensured some level of continuity for firms, workers, students and citizens. Broader telework could make labour markets more inclusive by making work more accessible to people with disabilities and other traditionally excluded groups. Yet, in light of policy responses, the digital divide becomes an even greater concern: a fraction of workers, students and consumers have the digital tools and skills to benefit from their advantages.

Absent strong policy actions, the crisis may exacerbate socio-economic and geographical disparities in LAC. Lack of access to basic public services and quality housing make it hard for poor and vulnerable households to comply with social distancing measures. Some 21% of the LAC population live in slums, informal settlements or inadequate housing with more than three people sharing a room and with difficult access to basic services, such as potable water (Oxfam, 2020). These conditions hamper adherence to basic health and

safety measures, such as hand washing and isolating people with symptoms. Limited Internet access and lack of appropriate spaces hinder e-learning and telework.

Decreased economic activity will negatively affect labour markets, increasing unemployment by 5.4 percentage points (ECLAC, 2020a) and affecting job quality in a region with 58% informality (OECD, 2020c). Effects will likely affect poor workers disproportionally, widening inequalities, with an estimated 7.1 percentage point increase in the poverty rate in 2020, affecting 37.3% of the population (ECLAC, 2020a).

Closure of businesses, especially those involving personal interactions, and quarantine measures are likely to affect disproportionally the poorest workers (living on less than USD 5.5 per capita per day [PPP 2011]) and vulnerable workers (living on USD 5.5-13.0 per capita per day [PPP 2011]). Vulnerable workers are frequently informal, have low-quality jobs with low social protection and face higher income volatility (OECD et al., 2019), making them more prone to macro and household shocks. Job losses globally will be enormous. The LAC region faces the potential loss of 17 million formal jobs and a potential increase in informality to 62% (Altamirano Montoya, Azuara Herrera and González, 2020).

Inequality arising from the pandemic is first and foremost evident in the ability to work from home (Birdsall and Lustig, 2020). In fact, the percentage of jobs that can migrate to telework is positively related to the level of GDP per capita (Dingel and Neiman, 2020) and lower degrees of informality. The sectoral composition of the labour market, as well as the limited access to ICT and insufficient digital skills for some workers affect the possibility to telework (ECLAC, 2020b).

Most poor and vulnerable workers in LAC perform manual tasks and work in sectors notably more affected by the coronavirus (Covid-19) crisis, such as retail, restaurants, hotels, services, manufacturing, transport and construction. Some 42% of workers in social services and 62% in retail commerce and sales, restaurants and hotels are informal (Altamirano Montoya, Azuara Herrera and González, 2020). Workers in these sectors have the lowest probabilities of being able to telework, ranging from less than 5% in hotels and restaurants to around 15% for wholesale and retail trade (ECLAC, 2020b). Owing to the characteristics of informal and low-quality jobs, these workers are more exposed to infection and have less access to quality health care. The risk of slipping back into poverty is considerable, and it is harder for these workers to comply with lockdown measures, given that their jobs entail human interaction and most have limited savings to face extended inactivity (ECLAC/ILO, 2020). Supporting the most vulnerable, those in poverty and informal workers will be decisive in counteracting the impact of the coronavirus (Covid-19) on inequalities (OECD, 2020c).

Despite LAC's progress in ICT access, poor and vulnerable workers are especially excluded from the benefits of ICT. Even if their jobs could be performed remotely, on average, only around 15% of poor workers and 25% of vulnerable workers in LAC have access to an Internet-connected computer to enable working from home. By contrast, 50% of middle-class workers (living on USD 13-70 per capita day [PPP 2011]) and 81% of the most affluent workers (living on over USD 70 per capita per day [PPP 2011]) have the required ICT. Moreover, as seen, very few workers have strong digital skills, including computer knowledge and problem-solving skills in technology-rich environments (Figure 3.11).

Increasing connectivity and offering training programmes can help workers more rapidly adapt to telework. Hardships for those unable to work remotely also need to be addressed. Economic recovery should go hand in hand with policies that prioritise workplace health and safety. Workplace conditions, social distancing in facilities and

commuting should be taken into account in designing protocols to return to work (ECLAC/ILO, 2020).

Female workers are more exposed to the material hardships associated with the coronavirus (Covid-19) economic fallout. In general, women are likely to be more vulnerable than men to any crisis-driven loss of income. Women's incomes and wealth are, on average, lower than men's, and their poverty rates are higher. Women may also find securing employment and income following lay-off more difficult because of greater caring obligations. Some 10% of working women in the region are domestic employees, including caring and cleaning duties, most under no formal contract (Oxfam, 2020). Industries in which women workers are over-represented, such as travel, tourism, accommodation services, food and beverage service and retail, have been hardest hit by the crisis. Although telework reduces some immediate economic impacts of social distancing measures, it is available to a small share of workers in these industries, some of whom have additional care responsibilities and costs due to school closure and vulnerable family members (OECD, 2020d).

The coronavirus (Covid-19) crisis is changing the world of work and may have long-lasting impacts on the future of jobs. The role of digital transformation in lives will be more evident if changes to deal with the pandemic persist. Telework, remote learning and other strategies observed during lockdowns reinforce the need to: improve communication infrastructure and skills; help employers, employees and university students better prepare; and increase systems' resilience (OECD, 2020e). Governments should support firms, especially small and medium-sized enterprises, own-account workers and employees, to develop telework and e-commerce capacities quickly, and elaborate suitable policies (OECD, 2020f).

Negative effects of the crisis will also depend on the speed with which societies and governments adapt to new forms of work, such as jobs in gig and platform economies, zero-hour and part-time contracts and telework. Sectors most affected by the crisis employ a large proportion of non-standard workers (part-time, self-employed and fixed-term contract workers). Many have less access to social protection and health benefits, and are more likely to lose their jobs (OECD, 2020g). Policy measures should set conditions for appropriate company actions and to prevent long-lasting distributional effects. A more flexible labour market that absorbs new forms of work, with social security systems and occupational health and safety regulations, is urgently needed.

Policies should enhance consumer awareness about purchasing goods and services and accessing public services on line. Accessing health, banking and local authority services via digital technologies can be more efficient, while complying with social distancing. Service availability, affordability and digital skills limit adoption of digital technologies and Internet use in many countries. Lack of awareness and lack of ICT skills most affect rural households and older adults (Galperin, 2017), i.e. those especially vulnerable to the virus and who could most benefit from doing everyday activities remotely.

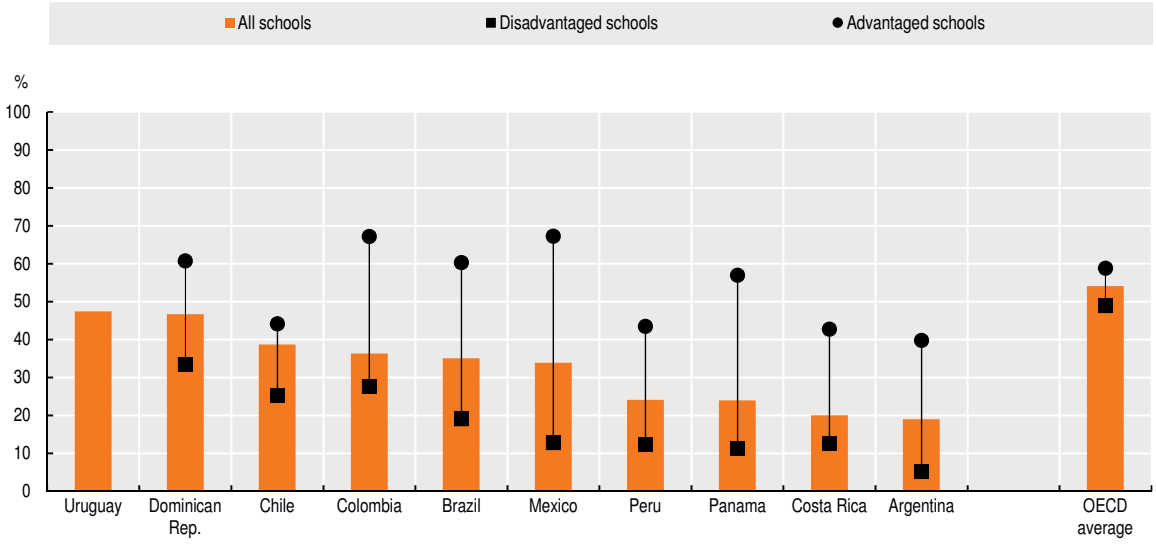
The pandemic may amplify inequalities in education. With schools closed in almost all LAC countries, online learning became critical (UNICEF, 2020). In a matter of days, principals and teachers transitioned to co-ordinating virtual and broadcast classes, designing remote material and organising school feeding programme delivery (Basto-Aguirre, Cerutti and Nieto-Parra, 2020). Despite these efforts, LAC school systems have limited capacity to deliver quality remote learning: not all households are equipped with the necessary technology; not all parents are prepared to take on teaching duties alongside trying to keep or find a job. Suspension of in-person classes may most affect students in low-income countries and from disadvantaged socio-economic backgrounds. School closure limits learning and may lead to losses in earnings and labour productivity

(Psacharopoulos et al., 2020). The extent of the impacts on human capital accumulation and future earnings will depend on government responses.

Only a few schools in Latin America were sufficiently prepared for digital learning before the pandemic. Students aged 15 attending advantaged schools in the region are more likely to have access to an effective online learning support platform, compared with those attending disadvantaged schools (Figure 3.28). Thus, unpreparedness may amplify socio-economic gaps in education.

Figure 3.28. **Availability of an effective online learning support platform by school socio-economic status in selected Latin American countries, 2018**

Percentage of students in schools whose principals agreed or strongly agreed that an effective online learning support platform was available, PISA 2018



Note: Socio-economically disadvantaged (advantaged) schools are those in which the average socio-economic status of students is in the bottom (top) quarter of the PISA ESCS among all schools in the country/economy. Countries/economies are ranked in descending order of percentage of schools with an effective online learning support platform. The difference between disadvantaged and advantaged schools in Uruguay is not statistically significant.

Source: OECD (2018d), *PISA 2018 Database* (database), www.oecd.org/pisa/data/2018database/.

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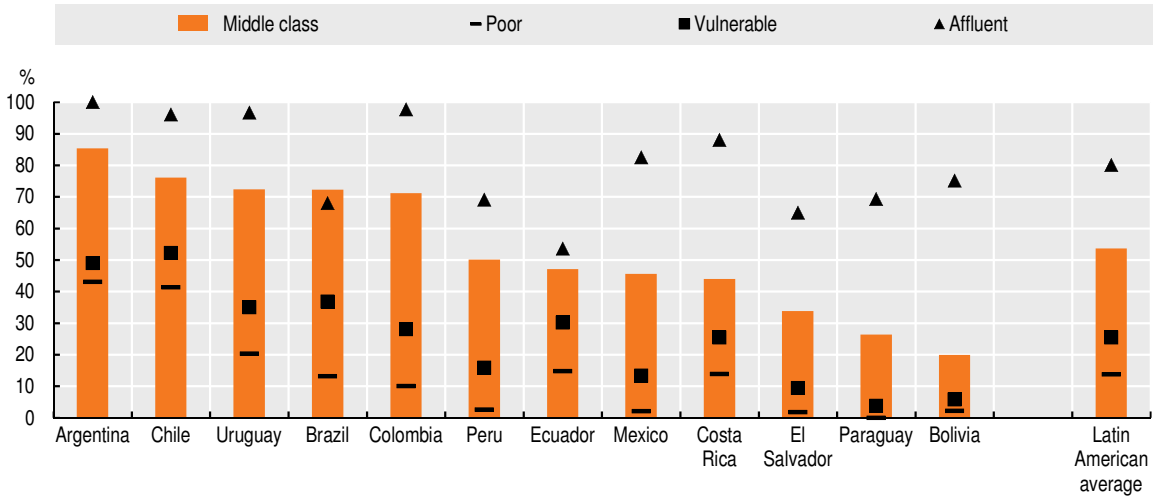
Moreover, technological tools are only as effective as their use. On average, 58% of 15-year-olds in the region attended schools whose principals considered that teachers had the necessary technical and pedagogical skills to integrate digital devices into the curricula. This highlights the vast training needs that lie ahead for education systems. There was a significant discrepancy in digital teaching capacity between socio-economically advantaged and disadvantaged schools. In Colombia, three in four advantaged schools reported being prepared, compared with fewer than half of disadvantaged schools. Schools can, therefore, reinforce rather than temper students' relative disadvantage (OECD, 2020h). Almost half of LAC countries provided guidance or training on engaging with students remotely. One in three provided guidance on communicating with students, even when they did not provide training on remote teaching, but only 18% provided both guidance and training (Vargas, 2020).

Household readiness is equally relevant. As with telework, studying remotely is difficult to impossible for students from vulnerable and poor households. Computer and Internet access at home are prerequisites for online learning. Some 34% of primary, 41% of secondary and 68% of tertiary education students have access to an Internet-connected

computer. Access is especially low for students from poor households. For instance, less than 14% of poor students in primary education have a computer connected to Internet at home, compared to more than 80% of affluent students with the same education level (Figure 3.29) (Basto-Aguirre, Cerutti and Nieto-Parra, 2020). Access to a place to study may also influence remote education outcomes. In countries including Mexico, one in four students have no quiet place to study at home; the region's average is more than one in five (OECD, 2020h).

Figure 3.29. **Share of students enrolled in primary education with an Internet-connected computer at home by income group, 2018 or latest available year**



Note: The regional average is a simple average. Poor are those living with less than USD 5.5 per capita per day (PPP 2011). Vulnerable, those living with USD 5.5 to USD 13 per capita per day (PPP 2011). Middle-class, those living with USD 13 to USD 70 per capita day (PPP 2011). And, affluent are those living with more than USD 70 per capita per day (PPP 2011).

Source: Basto-Aguirre, Cerutti and Nieto-Parra (2020).

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Learning gaps between advantaged and disadvantaged students were large before the pandemic. In Brazil and Uruguay, the most disadvantaged students aged 15 trailed their most advantaged peers by the equivalent of four school years in science (OECD, 2018d). Disadvantaged students tend to experience larger learning losses when out of school (Alexander, Entwisle and Olson, 2001; Quinn et al., 2016). On average, across subjects and grades, disadvantaged students lose about three more months of learning than middle-income students (Busso and Camacho Munoz, 2020; Cooper et al., 1996; Evans and Yuan, 2018). In particular, disadvantaged children tend to lose mathematics and reading knowledge, compared with their advantaged peers. Access to school and learning materials at home partially explains the difference. The coronavirus (Covid-19) may extend these outcomes, with advantaged schools, families and students better equipped, trained and positioned to mitigate the effects of school closure. Although the pandemic's effects on education are not measurable yet, advantaged students, usually among the top performers, might continue learning almost as if schools were open, while disadvantaged students, usually among the worst performers, might fall further behind (Iqbal et al., 2020).

To overcome both school closure and lack of connectivity, and prevent the deepening of education inequalities during the pandemic, LAC school systems drew on their experiences in reaching remote areas and mass media education broadcasting. To reduce inequalities, it is not enough to ensure that all students have access to ICT infrastructure. Investments must also address teacher training in adopting digital devices as part of

their practice, and strengthen the cognitive and digital skills that allow students to make the most of the advantages offered by the digital transformation. The coronavirus (Covid-19) crisis could be an opportunity to implement policy responses that accelerate transformations in education systems, with long-lasting positive effects that help close socio-economic gaps in education quality and skills. At the same time, to prevent gaps from widening, systems are incorporating other media channels, such as radio and television, and combining them with online platforms, social media and traditional print materials to support students and households lacking the necessary communication infrastructure (Basto-Aguirre, Cerutti and Nieto-Parra, 2020).

Increasing connectivity, infrastructure for learning and alternatives for education provision to remote areas are key to mitigating negative effects. Besides addressing the urgent need to provide remote learning, governments must strategise for a successful return to class (OECD, 2020i).

The coronavirus (Covid-19) crisis shed light on the fact that Internet and ICT access and use are basic necessities for equality of opportunity. Digital technology promises workers continued access to sustained income, students to high-quality learning and consumers to basic services. To ensure inequalities are not amplified, countries need to provide not only ICT access, facilities, equipment and content but the foundational, cognitive and digital skills that enable workers, students and consumers to benefit equally.

Conclusion

Digitalisation is transforming the way people work, consume, communicate and learn, and how families, societies and businesses function. New technologies are bringing many opportunities for better social, political and economic inclusion. To make the most of this new context, people need to be resilient and mobile and adapt to the new demands of a digital world at home, work and school. Governments, the private sector and citizens should work together to integrate individuals into society better with digital tools that improve services, information and jobs.

More people are connected to the Internet than ever before in LAC, but gaps persist, and new ones may emerge. Access to and use of the Internet has become more equitable than other public services, such as secondary education or pensions. Still, less than 4 in 10 households with per capita monthly income in the lowest quintile do not use Internet, compared to nearly 8 in 10 in the highest quintile. A striking gap remains in how people with low and high education levels use the Internet. Social and economic inclusion depends on both access and digital skills.

New technologies bring labour market opportunities and challenges. Based on occupational estimates, almost two in ten jobs are at high risk of automation in LAC countries. Furthermore, by taking into consideration the replacement of tasks within occupations, on average, 25% of jobs in Chile, Ecuador, Mexico and Peru are at high risk of automation, and 35% may experience substantial changes in tasks and how they are carried out. Policies to support the transition of workers in declining industries to new employment, and moving towards universal social protection, are key. Social protection should be reshaped to protect workers and promote inclusion in a changing world of work, including ensuring more neutral treatment of various forms of work to prevent arbitrage among them, extending the reach of existing social protection systems to new forms of work, and boosting portability of entitlements among social insurance programmes intended for various labour market groups (OECD, 2019b).

Countries can enable the digital transformation and improve citizens' lives by promoting the necessary infrastructure and skills to reap the opportunities of digitalisation.

Accessibility and quality of mobile data and Internet connection remain major issues in many LAC countries. However, improving connectivity is only the first step in making the most of digital technologies and opportunities (OECD, 2019c). Until now, policies to boost the benefits of digitalisation have paid more attention to increasing access and connectivity than to quality of experience or use. Governments must identify and address foundational and digital skills gaps that might widen the digital divide through labour market interventions and education policies. Countries need to develop comprehensive skills strategies that mirror their productive strategies and include early and lifelong education in cognitive, metacognitive, technical and digital skills for all.

To navigate the transition to a digital world of work and thrive in it, individuals need not only digital skills but also a broad mix of skills, including cognitive and socio-emotional skills (OECD, 2019a). Latin American countries covered by the Survey of Adult Skills and PISA lag in digital and basic skills and access to digital tools, intimating that a large share of the population may not have the skills required to face and benefit from the digital transformation. For workers whose jobs are being reshaped by the digital transformation, digital resources expand opportunities to acquire knowledge and develop skills flexibly (OECD, 2020b).

Developing digital skills early and throughout the life cycle is essential to closing gaps. A higher proportion of women than men with fewer skills had no computer experience. There are also gaps between the rich and more educated and the more vulnerable and less educated. At all levels of education and training, new technologies offer learning opportunities. New technologies in education can support the development of 21st century skills. Teachers can play a central role in making the digital transformation inclusive by integrating digital technologies into classrooms and ensuring that ICT has a positive effect on learning. This requires high-quality, comprehensive and appropriate teacher training. Providing disadvantaged schools and students with greater access to ICT is not enough; they require programmes that develop the necessary skills.

Crises generally widen inequalities. Measures to contain the coronavirus (Covid-19) exposed the digital divides in LAC – the gap between adopters and those who lag – among companies, individuals and countries. Throughout the crisis, digital transformation has proven essential to continue everyday activities and preserve jobs. Digital technologies have played an important role in mitigating income shock for households, workers and enterprises in socio-economically privileged positions. Families, workers and students with Internet and ICT access continued to conduct business almost as usual, sustain incomes and learn, while those disconnected from digitalisation were left even farther behind. Fewer than half of Latin Americans had enough experience using computers and digital tools for basic professional tasks, effectively excluding them from remote activities. Tackling digital divides may produce better and more productive jobs, improve inclusiveness and access to public services, and create societies better equipped to face the crises that come with an increasingly globalised economy.

The coronavirus (Covid-19) crisis made inclusive digital transformation a top priority, to temper negative effects and accelerate inclusive economic recovery. The need to embrace digital transformation beneficial to all is a main lesson of the crisis and may be an opportunity for countries to prioritise it in their DAs (see Chapter 4).

Societies that aspire to equality of opportunity must enable everyone to reach their full potential. Digital technology promises great progress in this direction. However, to avoid amplifying inherited inequalities and ensure that technology benefits all, countries should extend both access and skills among schools, students, households and workers. Policy actions should respond quickly and effectively articulate digital transformation processes as key enablers of social welfare.

Annex 3.A1 : Selected data at country level on Internet access and ICT use

Figure 3.A1.1. **Distribution of Internet access and use, and other services by income decile in selected Latin American countries, 2017 or latest available year**

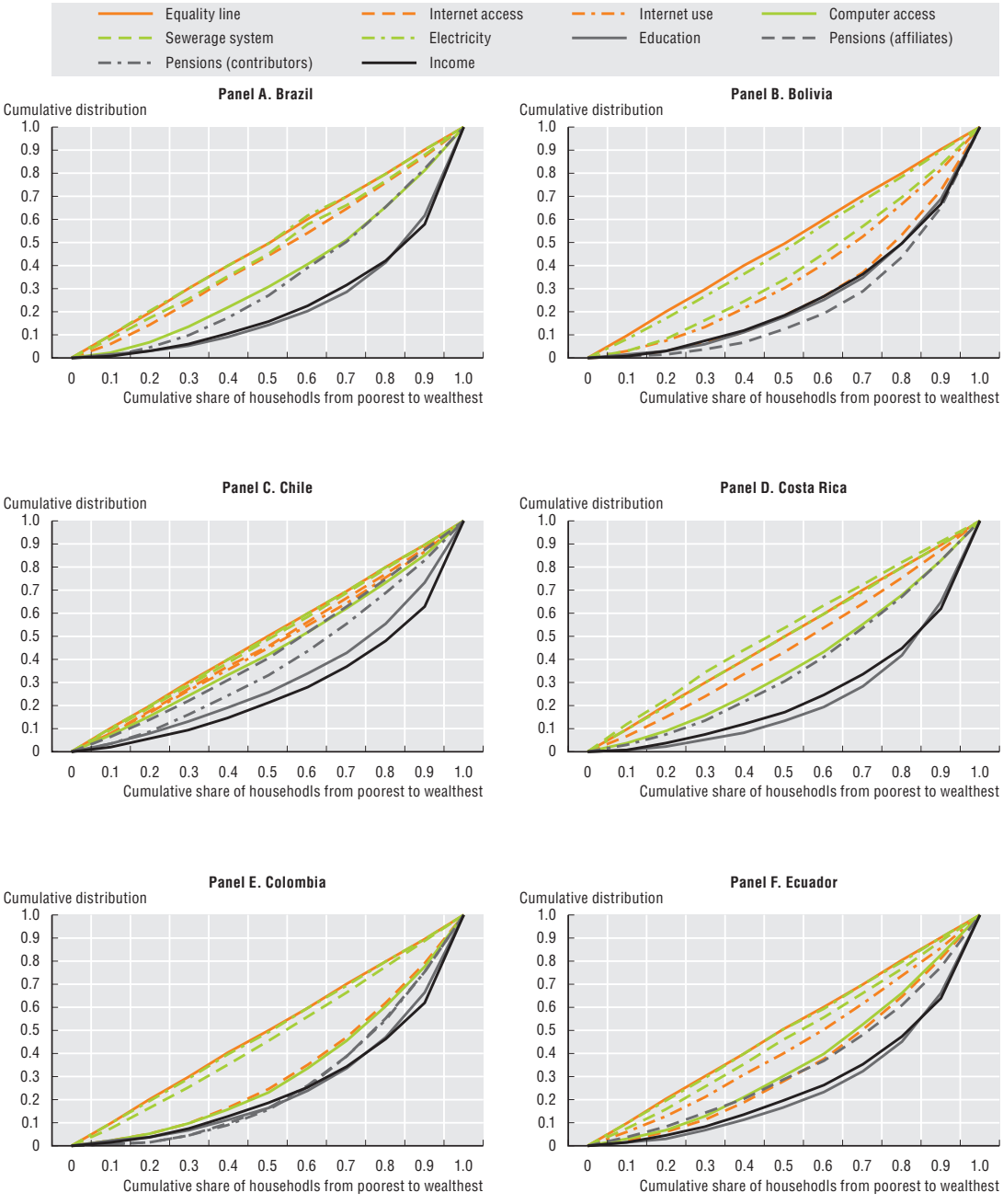
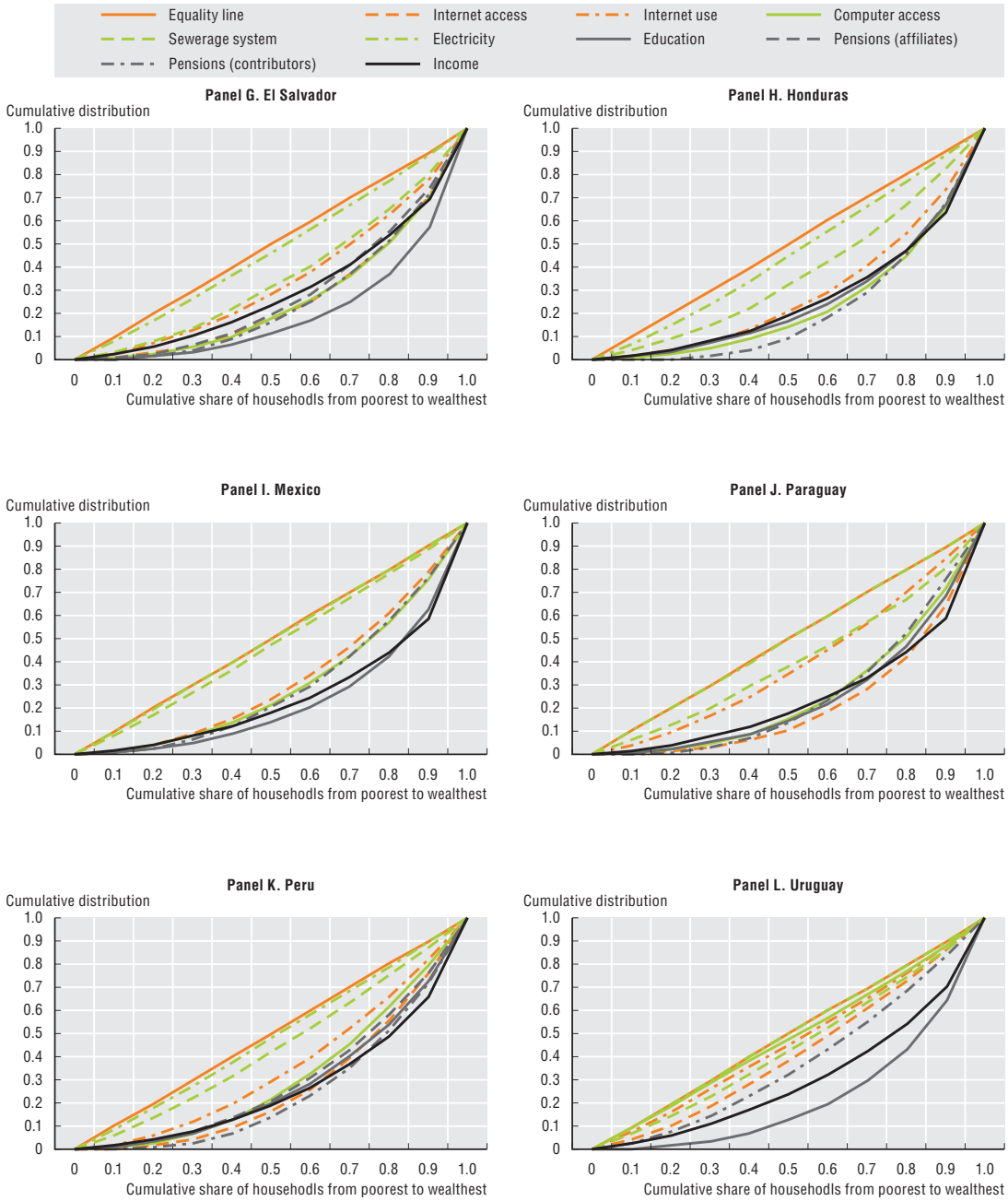


Figure 3.A1.1. **Distribution of Internet access and use, and other services by income decile in selected Latin American countries, 2017 or latest available year** *(cont.)*



Notes: Simple average by decile for selected LAC countries. X-axis = income decile. Y-axis = cumulative percentage of people with Internet and computer access in their households; cumulative percentage of people reporting Internet use in the previous 3 or 12 months, depending on household survey question; cumulative percentage of people in a household with sewerage or electricity; and cumulative percentage of people aged 20 or older with at least secondary education. Calculations based on 2017 household surveys or latest available year: 2016 for Bolivia, Honduras and Mexico. Start age of Internet use varies by country: El Salvador and Paraguay measure from age 10; Bolivia, Chile, Ecuador and Honduras from age 5; Peru and Uruguay from age 6. Previous Internet use period, from survey date, is the previous 3 months for Bolivia, Honduras, Paraguay and Uruguay, and the previous 12 months for Chile, Ecuador and El Salvador. Other variables include all ages. Brazil, Chile, Costa Rica, Ecuador, El Salvador, Paraguay and Uruguay include mobile Internet in Internet access. Bolivia, Colombia, Mexico and Peru do not specify whether mobile Internet is included. Bolivia, Brazil, Chile, Costa Rica, Ecuador, Paraguay and Uruguay include laptops and tablets in computer access. Colombia, El Salvador, Mexico and Peru do not specify whether laptops or tablets are included.

Source: Own calculations based on ORBA/ECLAC (2019), *Household Survey Data Bank* (database), www.cepal.org/es/observatorio-regional-de-banda-ancha.

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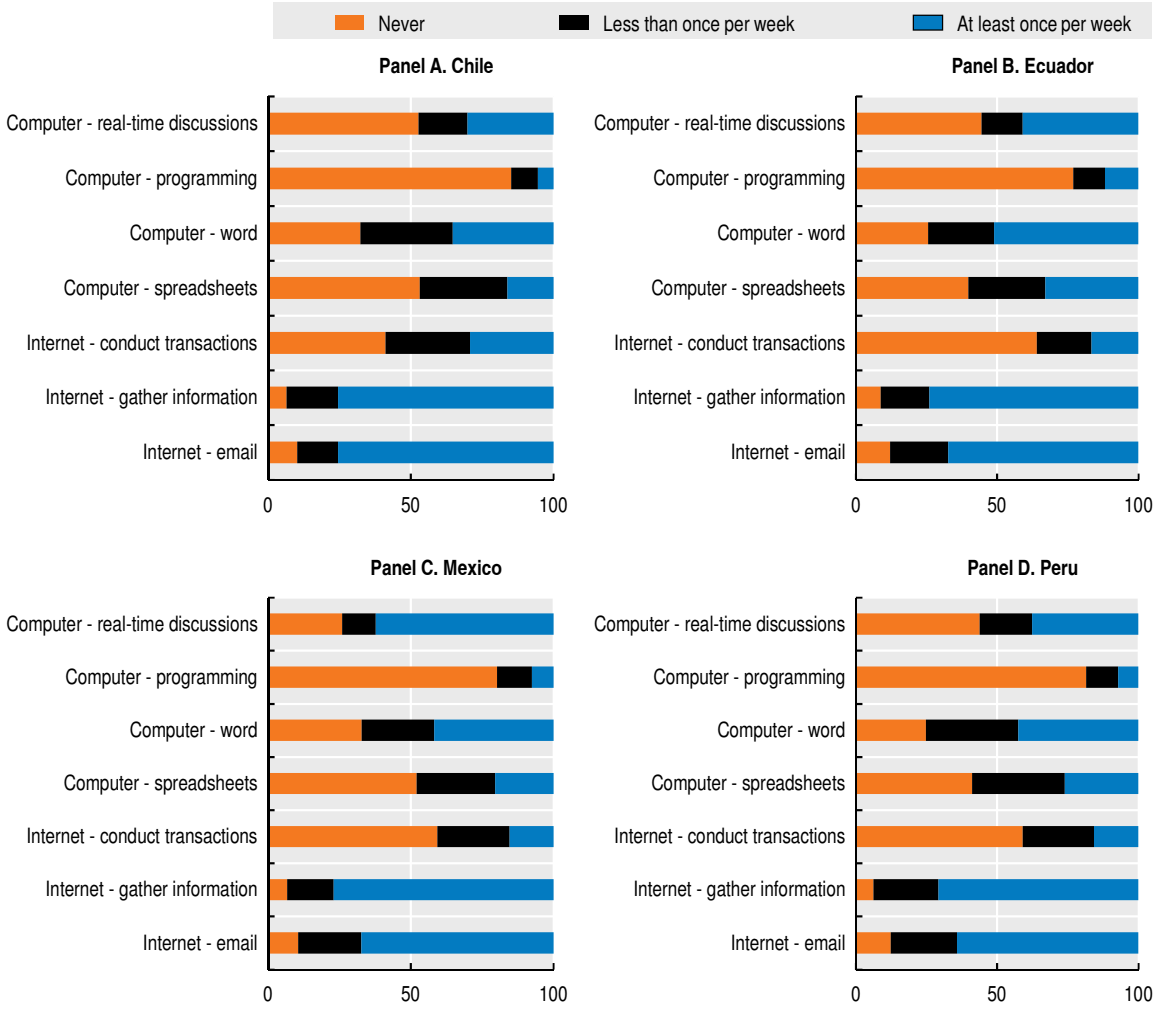
Figure 3.A1.2. **ICT use by activity in selected Latin American countries**

Share of people performing activity by frequency (%)



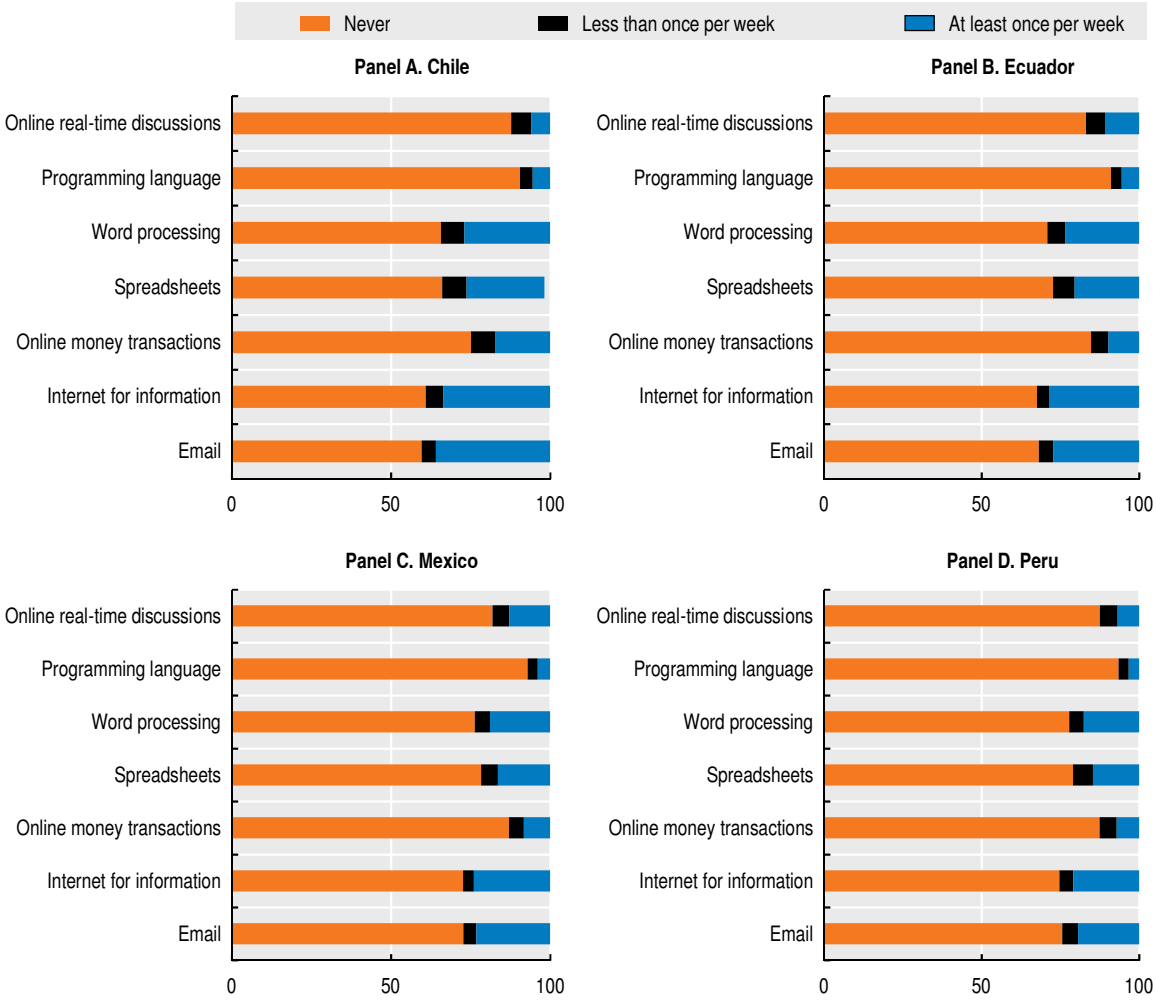
Note: Latin American average is a simple average including Chile, Ecuador, Mexico and Peru. Chile participated in PIAAC Round 2 and the other LAC countries (Mexico, Peru, Ecuador) in Round 3.

Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

StatLink https://doi.org/10.1787/888934172464

Figure 3.A1.3. **ICT use at work by activity in selected Latin American countries**

Share of workers performing activity by frequency (%)



Note: "Never" includes workers who have never used a computer or who do not use ICT in their occupations. Chile participated in PIAAC Round 2 and the other LAC countries (Mexico, Peru, Ecuador) in Round 3.

Source: Own calculations based on OECD/PIAAC (2018), *Survey of Adult Skills* (database), www.oecd.org/skills/piaac/data/.

StatLink https://doi.org/10.1787/888934172483

Notes

1. Internet users are calculated based on estimates and survey data corresponding to the proportion of individuals using the Internet. The number should reflect the total population of the country at least 5 years old and older where possible.
2. The index of use of ICT skills at work is a derived variable in the PIAAC. The background questionnaire collects a range of information on respondents' reading- and numeracy-related activities, ICT use at work and in everyday life, and generic skills required in their work. The index attempts to summarise how frequently certain activities are performed at work. Respondents are asked about the extent to which they use ICT (email, Internet, spreadsheets, word processing, programming, online transactions, online communications [conference calls, chats]) and asked to rate the frequency with which they engage in each activity on a scale of "never" to "every day". The index is then rescaled using the generalised partial credit model. See The Survey of Adult Skills: Reader's Companion (OECD, 2019e). This information is collected through the background questionnaire of the Survey of Adult Skills, which asks about the use of literacy, numeracy, ICT skills and other skills at work and in everyday life. Questions regarding ICT activities (computer use, email, Internet for information, Internet for

transactions, spreadsheets, word processing, computer programming, Internet for real-time communications) attempt to measure overall level of ICT skills use in terms of frequency and complexity. Indexes of use of other skills include numeracy, writing, reading, planning and influencing. The main characteristic of the items is the ordering behind the structure of possible answers: consecutive alternatives indicate a higher frequency of performing a task detailed in a given item, ranging from 0 (never) to 4 (daily). The PIAAC uses the generalised partial credit model, an item response theory (IRT) model resulting in a continuous one-dimensional scale that explains the covariance among item responses: people with a higher level on the derived scale have a higher probability of frequently performing the task. Individuals who report never performing any of the tasks included in each IRT scale are excluded from the scales. The items used to calculate the scales related to ICT skills use at work and at home are only posed to people who report having used a computer before. IRT-derived indices are continuous variables, which should be interpreted as representing the level of use of the underlying skills and which, for easier comparisons, have been standardised to have a mean equal to 2 and a standard deviation equal to 1 across the pooled sample of respondents in all countries/economies (appropriately weighted). This results in indices for which at least 90% of the observations lay between 0 and 4 whereby values approaching 0 suggest a low frequency of use and values approaching 4 suggest a high frequency. For detailed information on the construction of the indices, see OECD (2019d, 2019e).

3. This chapter uses data from the school, student and optional ICT Familiarity Questionnaires of PISA 2012, 2015 and 2018. Of the ten Latin American countries that participated in PISA 2018, Argentina, Colombia and Peru did not administer the ICT Familiarity Questionnaire. See OECD (2017b, 2016d, 2016e). When not indicated otherwise, the LAC average includes all countries that participated in each PISA round, excluding those with no available data for the ICT variables.
4. ICT availability indexes are derived variables of the PISA ICT Familiarity Questionnaire (OECD, 2017b). They are based on the sum of technologies available at home and at school. At home, these include desktop computer, portable laptop or notebook, tablet, Internet connection, video game console, mobile phone, smartphone, portable music player, printer, USB (memory) stick and e-book reader. At school, they include desktop computer, portable laptop or notebook, tablet, Internet-connected school computer, wireless Internet connection, storage space for school-related data, USB stick, e-book reader, data projector and interactive whiteboard.

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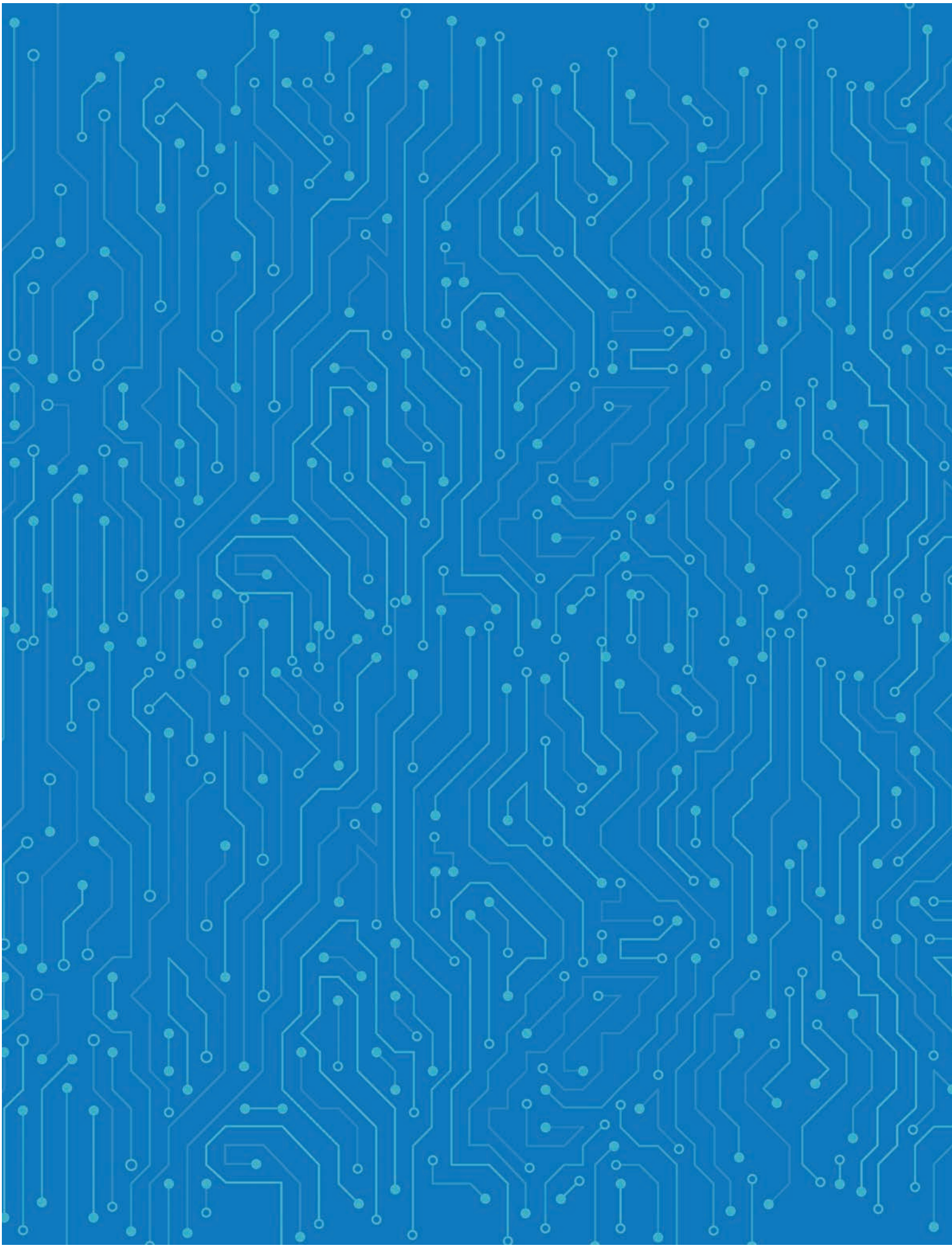


Chapter 4

Rethinking public institutions in the digital era

Rising levels of mistrust in public institutions and dissatisfaction with public services in Latin America and the Caribbean illustrate a weakening social contract, which can be further eroded by the impact of coronavirus (Covid-19). The digital transformation represents a unique opportunity to improve the function and service quality of public institutions. While emerging institutional risks must be taken into account, moving towards digital governments can help public institutions become more trustworthy, efficient, inclusive and innovative. The digital transformation affects a range of public policies, which need to be included in a comprehensive framework, such as national development strategies, to guarantee coherence and synergies and make the most of new technologies. Connecting digital strategies to national development plans is crucial to align digitalisation efforts with broader, long-term development objectives.

Digital technologies can transform public institutions and help them address their main challenges

The transition towards digital governments can help public institutions become more credible, inclusive, efficient and innovative

Open government can make public institutions more credible by improving transparency, access to information and citizen participation

In 2020, LAC countries had **53** open government action plans **38** implemented and **15** in progress

Digital technologies, such as e-learning and e-health, can support more inclusive public services, and involvement of citizens in the decision-making process

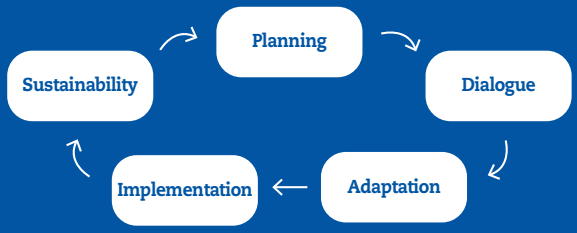
Service automation can make institutions more efficient

It takes, on average, 5.4 hours to complete a public transaction in LAC, with wide differences across countries:

From less than 3 hours in Chile

to more than 11 in Bolivia

Digital tools can support innovative approaches to public policy, using new sources of data, thus improving the policy-making process



To reap its full potential, the digital transformation should be addressed in a comprehensive manner within LAC's development strategies

Digital security, privacy regulation, and safe, secure and transparent management of data are important to ensure public trust in digital technologies

National development plans (NDPs) and digital agendas are key strategic tools for planning and co-ordinating the digital transformation

Among 16 NDPs analysed, most include policies for expanding access and use of digital technologies, as well as for increasing investment in communication infrastructure. Policies for dealing with the future of work are also gaining relevance in NDPs

Introduction

The expansion of the middle class in Latin America and the Caribbean (LAC) since the beginning of the century has come with rising social aspirations. The coronavirus (Covid-19) pandemic is likely to increase demands for stronger public institutions and better quality public services. Institutions are failing to respond to these rising aspirations, despite improvements in public governance in past years. Across most LAC countries, distrust and low satisfaction are deepening, and social discontent is growing. Citizens see less value in fulfilling social obligations, such as paying taxes, as illustrated by low levels of tax morale, undermining revenue to finance better public services and respond to social demands (OECD, 2019a). This creates a vicious circle in LAC that can be understood as an "institutional trap", which involves a circular, self-reinforcing dynamic that limits capacity to transition to greater development (OECD et al., 2019). The extent to which the coronavirus (Covid-19) pandemic deepens social discontent and changes citizens' aspirations is yet to be seen, but public institutions have been under unprecedented pressure and will need to find ways to respond to evolving social demands and extraordinary policy challenges.

In this context, the digital transformation presents new challenges, but also significant opportunities to strengthen the social contract between citizens and the state, and better respond to rapidly changing public demands.

First, the digital transformation has resulted in rising expectations on the part of digital citizens regarding the quality of public services and the integrity, transparency and responsiveness of public institutions. The exponential growth of smartphones and daily streaming of Big Data are changing the way Latin Americans live, especially in urban areas. The growing middle class and young citizens are the most digitally savvy and demanding (Santiso, 2017). Provision by top private digital service providers of seamless user experiences creates greater demands from citizens, representing a challenge for the public sector. Without designing and implementing appropriate public policies, unmet expectations could reinforce the divide between citizens and public institutions.

Second, technological progress demands innovative policy responses to address new regulatory challenges. Regulating the digital transformation to mitigate its harmful impacts and promote its benefits for all is a key aspect of the policy agenda. Regulations are crucial to safeguarding public trust in the context of the digital transformation. Emerging policy domains, including digital security, data privacy, protection and governance, and ethical considerations, are increasingly relevant.

Third, new technologies and data analytics can transform governments. Responding to emerging challenges and embracing new opportunities require a redesign of public institutions. Latin American governments have the potential to become more trustworthy, efficient, inclusive and innovative by tapping into the new possibilities offered by technological progress. Doing so could help restore confidence in public institutions and improve the quality and reach of public services.

Fourth, making the most of the digital transformation requires an ambitious agenda and a co-ordinated and comprehensive approach. LAC governments need to mainstream the digital transformation in national development plans (NDPs) and digital agendas/strategies (DAs). On the other hand, digital technologies are also part of the solution. Digital tools (e.g. videoconferences, online consultations) facilitate multi-stakeholder involvement in the construction of national development strategies, thus setting the basis for a truly inclusive new social contract.

Fifth, the digital economy is an extension of the material economy. Dramatic technology-driven changes in patterns of consumption and production require policy design and regulatory frameworks that create the conditions for governments, consumers, producers and citizens to enlist new capabilities, generate value and become relevant actors in the digital economy (ECLAC, 2016).

The coronavirus (Covid-19) crisis makes the digital transformation of governments more urgent and a top priority of NDPs. Closure of public administration buildings has revealed the importance of end-to-end digital services and interoperable systems. While data have become key inputs, especially for public health, they have also raised the relevance of digital security and data protection policies.

The three sections of this chapter analyse the challenges and opportunities the digital transformation presents for public institutions, and consider avenues to rethink and adapt institutional frameworks for the digital era. The first section, "Governing the digital transformation", describes the main challenges and opportunities of the digital transformation regarding public trust, including adequate digital security, data protection and governance, and new ethical considerations. The second, "The digital transformation of governments", analyses how digital technologies can promote more trustworthy, efficient, inclusive and innovative states. The final section, "The digital agenda in national development strategies", analyses how LAC countries have included the digital transformation in NDPs and DAs, and how their priorities address the region's development traps.

Governing the digital transformation

The profound transformations brought about by technological progress challenge the adequacy of the current national and international institutional set-up. New risks and opportunities lie ahead; the rules of the game must adapt to make the digital transformation a driver of progress and greater well-being for all. This section considers the regulatory aspects shaping the digital transformation and areas that affect citizen trust in digital technologies, including digital security, data protection and governance, and new ethical considerations, for instance concerning artificial intelligence (AI) or misinformation and fake news. It also deals with what can be defined as the evolution of human rights in the digital era, i.e. "digital rights", such as the right to personal data protection, transparency, information on AI and the option to opt out (OECD, 2019b). Further digital rights, such as digital communication with governments, application of the once-only principle, open data and proactive service delivery are analysed in the following section.

Regulatory frameworks must support a fair and equitable digital transformation

Governments face new regulatory challenges in ensuring that the opportunities and benefits of the digital transformation can be realised by all (OECD, 2019c). Regulatory frameworks must strike a balance between fostering the digital transformation and preserving secure and affordable access to digital technologies. Five steps can help achieve this objective.

First, regulatory frameworks must promote competition and investment arising from the increasing convergence of networks and services in the digital economy (e.g. seamless provision of digital services across networks). Competition is key to promoting innovation and enabling all consumers to benefit at competitive rates. Independent agencies are needed to address dominance issues or impose wholesale regulations when necessary to lower barriers to new entrants (OECD, 2019c). Some reforms in LAC, such as Mexico's 2013 telecommunication reform, highlight the importance of strong competition, strong

regulatory frameworks and support for investment, particularly in remote and rural areas (OECD, 2017a; OECD, 2019c). An independent regulator is essential to public confidence in the integrity of regulatory decisions (OECD, 2019d, 2014a).

Second, a stable and predictable regulatory framework fosters long-term investment in communication infrastructure and digital innovation. In a sector where return on investment is often measured in decades, guaranteeing regulatory stability, transparency and legal certainty helps firms prepare business plans and ultimately facilitates investment (OECD, 2012). Strong institutions boost investor confidence and encourage investment in communication infrastructure.

Third, the regulatory framework must help protect consumers, particularly in online transactions involving personal data. Lack of adequate protection may deter e-commerce and uptake of new products. Fostering access to data and data portability, as well as issues related to data ownership, should be a priority of regulations, ensuring that accumulation of data from incumbents does not create barriers to entry for newcomers, thereby slowing down innovation and reducing competition (OECD, 2019c).

Fourth, innovation-friendly regulations enable the growth of new industries and digitally intensive firms. Digital innovation frequently takes place outside existing frameworks. Regulations should therefore be flexible: accomplishing the legitimate goals of regulation without discouraging innovation and missing out on the benefits of the digital transformation. One policy response, "regulatory sandboxes", provides flexibility in the form of a limited regulatory waiver, usually to facilitate experimentation and testing (OECD, 2019c). Colombia's digital transformation and AI strategy proposed "regulatory sandbeaches" (Republic of Colombia, 2019). Encouraging and realising innovation requires technologically neutral regulations that guarantee fair competition among developing technologies (OECD, 2003).

Fifth, in establishing new regulations, stakeholder responsibilities must be clear, avoiding overlap and giving institutions tools to enforce decisions. There should be a clear separation between policy formulation and regulatory functions. Implementing systematic measurement frameworks to monitor the growth of broadband and digital services is critical to inform policy and regulatory decisions. Stakeholder involvement and peer and third-party independent reviews should be encouraged to identify improvements to the regulatory framework. Organisation for Economic Co-operation and Development (OECD) peer reviews of telecommunication markets in Colombia (OECD, 2014b) and Mexico are examples of this approach (OECD, 2012; OECD, 2017a).

At the international level, there is a need to update multilateral digital taxation and trade rules. The digitalisation of the economy brings about new tax challenges. There is ongoing global negotiation within the OECD to reach a global agreement so that multinational enterprises conducting sustained and significant business in places where they may not have a physical presence – a typical feature of digital firms – can be taxed in such jurisdictions (see Chapter 5). Cross-border data flows are another relevant area. Data underpin the digital transformation and affect the trade environment. Governments increasingly seek to regulate cross-border data transfer to protect privacy when data are stored or processed abroad or require data to be stored locally (OECD, 2019c).

At the regional level, in many instances, regulatory frameworks in LAC continue to operate in silos. Regional co-operation arrangements, sharing of regulatory experiences, deployment of regional infrastructures, cross-border data flows and lowering the cost of international connectivity and roaming should be encouraged (OECD, 2019c) (see Chapter 5).

Digital security is key to make the digital transformation work for all

Digital security incidents risk causing social and economic harm if not addressed. They can cause disruption of operations and essential public services, direct financial loss, lawsuits, reputational damage, loss of competitiveness (e.g. through the disclosure of trade secrets), privacy harm and consumer distrust (OECD, 2015a).[1]

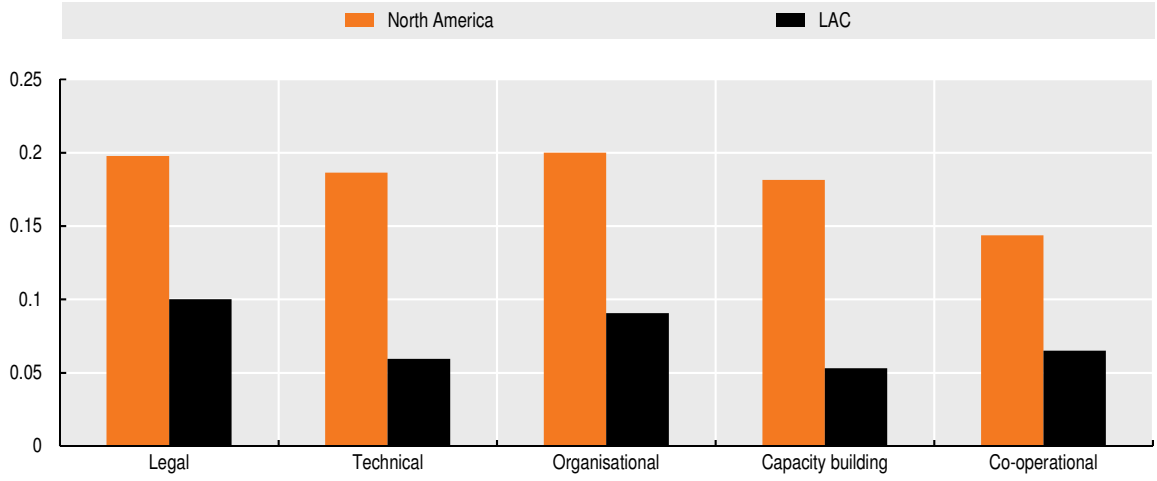
Digital security risks increased during the coronavirus (Covid-19) crisis. Cybercriminals count on the likelihood that individuals and organisations more easily fall for scams or pay ransoms in periods of stress, in particular those lacking good digital security practices or facing organisational disruptions. These growing risks strengthen the need for sufficient safeguards to protect sensitive sectors from digital security incidents. As critical infrastructure and essential services sectors – both private and public – become increasingly digital dependent, the need for comprehensive and holistic national strategies for digital security, developed in consultation with all stakeholders, becomes more urgent.

Recent examples highlight the importance of digital security incidents from a socio-economic perspective. The 2017 NotPetya digital security attack, which affected several countries and global companies, caused the temporary shutdown of the production, research and commercial operations of the big pharma enterprise Merck. In November 2019, ransomware forced Pemex (state-owned Mexican Petroleum) to shut down computers across Mexico; USD 5 million in bitcoin were demanded to end the attack. While the attack reportedly only affected the payments system, it could have endangered the entire country's energy security (Barrera and Satter, 2019). These examples show that digital security risk should be treated as an economic and social challenge, rather than only as a specific technical or national security issue.

Most LAC countries are moving towards a strategic, long-term vision for digital security (OECD/IDB, 2016). In 2019, 13 Latin American countries had a national digital security strategy (IDB/OEA, 2020), but policies had a limited understanding of the economic and social dimensions of digital security, and tended to focus on criminal and technical aspects or on national security. They also showed a limited level of stakeholder co-ordination across government and business sectors. Such co-ordination is an important aspect of the digital transformation, as critical services across finance, energy and transport sectors are increasingly offered by start-ups that provide innovative payment systems or are subcontracted to small and medium-sized enterprises (SMEs) in essential service value chains. Ensuring sufficient digital security risk management across all sectors and actors, including SMEs, makes co-operation and multi-stakeholder dialogue all the more important (OECD, 2019c).

The greatest efforts related to digital security in LAC have taken place on the legal front, but other key dimensions are still lagging. LAC shows the lowest commitment to digital security after Africa, according to the United Nations (UN) Global Cybersecurity Index (ITU, 2019), which measures five dimensions: legal, technical, organisational, capacity building and international co-operation. The index combines 25 indicators in a single measure, ranging from 0 (no cybersecurity efforts) to 1. Uruguay alone shows a relatively high level of cybersecurity, scoring 0.68 and ranking 51 of 175 countries. The rest of the region scores medium or low. Progress in legislation has been more significant: 30 countries have cybercrime legislation and cybersecurity regulations, and 10 have norms for containing mass emails (spam). Regional efforts have also concentrated on developing digital security strategies, but efforts in other dimensions lag (Figure 4.1).

Figure 4.1. **Five pillars of the United Nations International Telecommunication Union Global Cybersecurity Index, 2018**



Notes: LAC is a simple average of 31 countries in the region, excluding Haiti and Dominica. North America is a simple average of the United States and Canada.

Source: ITU (2019), *Global Cybersecurity Index* (database), www.itu.int/en/ITU-D/Cybersecurity/Pages/global-cybersecurity-index.aspx.

StatLink https://doi.org/10.1787/888934172502

Data are increasingly relevant assets: Privacy, governance and value

The digital economy is characterised by a growing number of entities collecting vast amounts of personal data. These include online retailers, digital platforms, financial service providers and governments. This data-rich environment, together with the emergence of more sophisticated tools for analysis, makes it possible to infer sensitive information. Misuse of this information may undermine individuals' personal privacy, including their autonomy, equality and free speech (Buenadicha Sánchez et al., 2019; OECD, 2016a).

During the coronavirus (Covid-19) crisis, many governments turned to digital technologies and advanced analytics (e.g. contact tracing, biometrics and geolocated data from mobile apps) to collect, process and share data for effective front-line responses to the spread. These technologies can be useful, as they provide critical information to improve the effectiveness of policies. However, left unchecked, they can also be used for extensive collection and sharing of personal data, mass surveillance, limiting individual freedoms and challenging democratic governance. Few LAC countries have frameworks to support these extraordinary measures in ways that are fast, secure, trustworthy, scalable and in compliance with existing privacy and data protection regulations. Privacy enforcement authorities (PEAs) play a key role in applying new or existing privacy and data protection frameworks. For instance, Argentina's PEA, the National Access to Public Information Agency, released general guidance about the application of privacy and data protection laws in the crisis for data controllers and processors. Measures adopted should be proportionate and limited to the duration of the emergency (OECD, 2020a, 2020b).

Incorporating ethical reflections on data management and use in regulations and codes of conduct is therefore a key policy issue. Ethical management of data encompasses: 1) respect for the data and privacy of individuals and organisations; 2) respect for the right to anonymity; 3) the need for informed consent in data collection (informing as to the purpose and ensuring consent to use of data for this purpose); and 4) a general need for transparency (Brito, 2017; Buenadicha Sánchez et al., 2019; Hand, 2018; Mittelstadt and

Floridi, 2016). The OECD *Guidelines on the Protection of Privacy and Transborder Flows of Personal Data*, updated in 2013, continue to represent international consensus on general guidance concerning the collection and management of personal information (OECD, 2013a).

Regulations for data protection have evolved significantly recently, bringing important changes in LAC. The European Union (EU) General Data Protection Regulation (GDPR) has strongly influenced regulatory frameworks in LAC. It sets high standards for regulating the digitalisation of the economy. It includes any organisation that collects, controls, processes or uses the personal data of data subjects who are in the EU, regardless of the organisation's location (see Chapter 5). In August 2018, Brazil passed the *Lei Geral de Proteção de Dados*, a new general data protection law that will come into force in 2021. Chile's new framework is under legislative discussion. Argentina and Uruguay have updated legislation for compliance with the GDPR.

The United States (US) data protection privileges privacy and data security, and some US framework rules apply to entities outside its territory handling the personal data of American citizens. The Asia-Pacific Economic Co-operation Forum Privacy Framework, which focuses on avoiding barriers to trade information flows in LAC, is another important reference. It has been influential in developing data protection frameworks in Mexico, Colombia and Peru (Lehuedé, 2019).

Progress in regulatory frameworks for data protection in LAC is mixed. Most countries have data protection frameworks in place. Despite common features, these vary significantly (Table 4.1). Most differences may be explained by the date of adoption and, to some degree, the influence of the different regulatory frameworks mentioned above. In turn, the adoption of uncoordinated national rules is one of the main challenges to the transfer of personal data between jurisdictions. The resulting web of permissions, consents and restrictions could affect economic activity. International harmonisation initiatives in the region should be supported (Lehuedé, 2019). For instance, the European Commission's 2020 "Shaping Europe's digital future" envisions the creation of a common market for data (European Commission, 2020).

Table 4.1. **Legal frameworks for data protection, selected Latin American and Caribbean countries, 2019**

	Argentina	Brazil*	Chile*	Colombia	Mexico	Peru	Uruguay
Definitions of personal data and sensitive personal data	✓	Only personal	✓	✓	✓	✓	✓
Extraterritoriality	✓	✓	×	✓	✓	×	✓
Consent requirements	✓	✓	✓	✓	✓	✓	✓
Rights of individuals	✓	✓	✓	✓	✓	✓	✓
Restrictions on international data transfers	✓	×	×	✓	×	×	✓
Restrictions on data transfers to data processors	✓	✓	✓	✓	✓	✓	✓
Sanctions	✓	✓	✓	✓	✓	✓	✓
Mandatory notification of breaches to authority and/or data subjects	×	×	×	To authority	✓	×	✓
Data protection authority	✓	×	×	✓	✓	✓	✓

* Brazil adopted these measures under a new law that will enter into force in 2021. Chile included some of these measures in the bill of law in Congress in 2020.

Note: The following are considered rights of individuals: information, access, correction, deletion, destruction and habeas data.

Source: Lehuedé (2019), "Corporate governance and data protection in Latin America and the Caribbean", http://hdl.handle.net/11362/44629.

Regulation models also influence adequacy schemes, which regulate authorisations for international transfers of personal data. The European Commission determines whether a non-EU country offers adequate data protection.[2] Currently, Argentina and Uruguay in LAC provide an "adequate level of data protection" for cross-border data transfers (Table 4.2). In those cases, transfers of personal data to data processors are allowed, and data controllers and processors share liabilities for data breaches (European Commission, 2019a).

Table 4.2. **Cross-border information flows: Adequacy schemes, selected Latin American and Caribbean countries, 2019**

From: To:	Argentina	Brazil	Chile	Colombia	Mexico	Peru	Uruguay
Argentina	–	✓	✓	✓	✓	✓	✓
Brazil	×	–	✓	×	✓	✓	×
Chile	×	✓	–	×	✓	✓	×
Colombia	×	✓	✓	–	✓	✓	×
Mexico	×	✓	✓	✓	–	✓	×
Peru	×	✓	✓	✓	✓	–	×
Uruguay	✓	✓	✓	✓	✓	✓	–

Note: Adequacy schemes regulate authorisations for international transfers of personal data.
Source: Lehuedé (2019), "Corporate governance and data protection in Latin America and the Caribbean", http://hdl.handle.net/11362/44629.

More accurate and granular data are feeding into the world of research, demanding additional privacy and protection precautions. New forms of data, especially personal data from Internet usage and commercial transaction information, tracking systems and Internet of things (IoT) data and government information, have the potential to revolutionise research and provide new social and economic insights. However, they come with new ethical challenges and a responsibility to ensure public confidence in their correct use for research (Metcalf and Crawford, 2016; Mittelstadt and Floridi, 2016). In 2013, the OECD recommended the development of a code of conduct framework covering the use for research of new forms of personal data. This recommendation stressed the need to strike a balance between the social value of research and the protection of individual well-being and rights, including to privacy (OECD, 2016a). The European Union requires organisations and universities applying for public research and development (R&D) financing under Horizon 2020 to address 11 ethical concerns and give explanations and monitoring guarantees for the most sensitive projects (European Commission, 2019b; Buenadicha Sánchez et al., 2019). Mexico has a checklist to help scientists guarantee ethical protocols and the *Guía nacional para la integración y el funcionamiento de los comités de ética en investigación* (National guide for the integration and functioning of ethics committees in research).

Defining data responsibility and ownership is a complex and critical issue. While intellectual property rights protection can incentivise R&D investment, it risks restricting access to data derived from publicly funded research. While challenging, disentangling data types may be helpful for regulatory purposes.

Data access and data sharing are estimated to generate social and economic benefits worth between 0.1% and 1.5% of gross domestic product (GDP) in the case of public-sector data, and between 1% and 2.5% of GDP (up to 4% in some studies) when including private-sector data. The estimated magnitude of the effects depends on the scope and degree of openness of the data (OECD, 2019e). Business models relying on personal data as key inputs are increasingly common (OECD, 2013b). Considering data have become the main factors of production in the digital economy and thus competitive assets, regulation

should ensure that data are not used and held in anti-competitive ways, and allow actors fair access to data.

The digital transformation raises new ethical issues

Artificial intelligence needs to be fair, secure and transparent

As AI applications are adopted around the world, their use can raise questions and challenges related to human values, fairness, human determination, privacy, safety and accountability, among others. This underlines the need to progress towards more robust, safe, secure and transparent AI systems with clear accountability mechanisms (OECD, 2019f). Ethical considerations should acknowledge the potential for discriminatory biases in the functioning of modern technologies. This is especially important given the increasing use of AI and machine learning in decision making in public institutions, for example for the provision of public services. Data can be imperfect as a result of flawed decisions by those collecting them. They can also be insufficient, erroneous, biased or outdated (Buenadicha Sánchez et al., 2019). Job-matching algorithms may reproduce historical inequities and prejudices against skin colour or gender, for instance. An experiment found that women were less likely than men to receive Google Ad Services ads for high-paying jobs. The algorithm targeting ads may be trained on data in which women have lower paying jobs (Datta, Tschantz and Datta, 2015). Lack of diversity in the tech sector may perpetuate these biases: LinkedIn and World Economic Forum (WEF) information suggests that only 22% of AI professionals are women (UNDP, 2019).

Transparency about the use of AI and how AI systems operate is therefore key. Regulation in this respect has progressed recently, with several LAC countries adhering to international standards. The GDPR includes the right against automatised profiling, which allows data subjects to ask to be excluded from automated decision-making processes. It also includes the right to explicability, i.e. individuals affected by an algorithmic decision have the right to be informed of the logic applied and the importance and consequences of the logic on the individual. OECD countries adopted the OECD Recommendation of the Council on Artificial Intelligence (OECD AI Principles) in May 2019 to promote innovative, trustworthy AI that respects human rights and democratic values (OECD, 2019f). The Principles complement existing OECD standards for privacy, digital security risk management and responsible business conduct. In LAC, Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru adhere to the Principles. The OECD also launched an AI Policy Observatory in February 2020 (Box 4.1).

Box 4.1. The OECD AI Policy Observatory

The OECD AI Policy Observatory aims to help countries encourage, nurture and monitor the responsible development of trustworthy AI systems for the benefit of society. Building on the OECD AI Principles, the Observatory combines resources from across OECD countries with those of partners from all stakeholder groups to facilitate dialogue and provide multidisciplinary, evidence-based policy analysis on AI.

The Observatory provides resources on AI public policy topics, AI policies and initiatives, trends and data, and practical guidance on implementing the Principles. Countries and other stakeholders share and update a live database of AI policies and initiatives, including AI policies from seven LAC countries, enabling interactive comparison of key elements. The database is a centre for policy-oriented evidence, debate and guidance for governments, supported by strong partnerships with a wide spectrum of external actors (OECD, 2020c).

Beyond transparency, policies that promote trustworthy AI systems include those that: encourage investment in responsible AI R&D; enable a digital ecosystem where privacy is not compromised by broader access to data; enable SMEs to thrive; support competition, while safeguarding intellectual property; and equip people with the skills necessary to facilitate transitions as jobs evolve (OECD, 2019f). Beyond helping implement OECD AI Principles, the OECD Network of Experts on AI, a multi-stakeholder, multidisciplinary group, informs the development of a repository of non-government stakeholder and intergovernmental initiatives, including private standards, voluntary programmes, professional guidelines or codes of conduct, best practices, principles, public-private partnerships and certification programmes.

More than 20 countries have national AI strategies, and LAC is catching up. Mexico was among the first ten countries, and the first in LAC, to develop an AI strategy in 2018. Colombia's 2019 National Policy on Digital Transformation and AI commits to creating an AI market, with priority given to market-creating innovations, an ethical framework and level of experimentation. In Brazil, online public consultations are expected to deliver inputs for the development of a Brazilian AI Strategy aimed at maximising benefits for the country. Argentina is developing a national plan to foster AI development in line with the ethical and legal principles framed in the Argentina Digital Agenda 2030 and as one of the national challenges in the Innovative Argentina Strategy 2030. Chile's Ministry of Science, Technology, Knowledge and Innovation has a working plan to launch an AI Strategy and Action Plan in 2020. Its priorities include reaching consensus on ethics, standards, cybersecurity and regulations (OECD, 2020d). Uruguay is in the process of approving the final draft of its *Estrategia Nacional de Inteligencia Artificial para el Gobierno Digital* (National Strategy of Artificial Intelligence for the Digital Government) after online public consultation between April and June 2019 (Agesic, 2019).

The risks of mass misinformation: Fake news

Digital technologies now shape daily life, making it easier to communicate and to access and share social and political information. The shift from traditional information channels (e.g. newspapers, radio, television) to digital ones (e.g. social media, websites, private messaging apps) increases exposure to misinformation and so-called fake news. In particular, especially in times of panic or stress (e.g. Covid-19 crisis, election times), our critical skills are impaired and we are less likely to discern between reliable and sensational content. While the impact of misinformation on democratic outcomes is yet to be proven, there appears to be a negative relationship between level of exposure and trust in government (OECD, 2019g). As digital channels gain relevance across LAC countries, policy makers should attempt to stem the proliferation of fake news and empower citizens with critical-thinking tools to evaluate the information they encounter.

The enhanced facility and rapidity with which fake news can spread represent critical challenges posed by new technologies. Digital technologies allow for complex data analyses that can be used to shape information and target it to socio-economic groups or geographical areas to influence opinion. The potential impacts on, for instance, electoral processes raise numerous ethical questions. Similarly, the spread of false information on coronavirus (Covid-19) can negatively affect public health. Digital platforms facilitate the creation of homogeneous social networks that act as echo chambers or filter bubbles, insulating users from contrary perspectives. They allow fake news to reach mass audiences and encourage social polarisation (Lazer et al., 2018; Marwick and Lewis, 2017; Tucker et al., 2018; Wardle and Derakhshan, 2017).

Fake news can be used to discredit authorities or be used by authorities to preserve the status quo or by interest groups to shift public opinion. Aside from facilitating the dissemination of partisan or fake news via algorithmic ranking, digital platforms allow

for political campaigning and advertising based on microtargeting and psychographic profiling that enlist user data harvested from social media (Neudert and Marchal, 2019). Big Data analytics add a new layer to the fake news phenomenon, as they enable targeting of political messages based on individual wants and needs, as the Cambridge Analytica scandal showed.

On the other hand, recent scandals concerning the massive reach and impact of fake news have made citizens question the reliability of information on social media. In 2019, 53% of the LAC population believed that false information was spread frequently or very frequently to influence elections (Pring and Vrushi, 2019). Three in four believed as much in Brazil, where confidence in news overall decreased by 11 percentage points in 2019 over the previous year (Reuters Institute for the Study of Journalism, 2019).

The limited evidence suggests that the impact of fake news on public opinion is large, at least in terms of number of people exposed. In the month preceding the 2016 US election, Americans were exposed to between one and three fake news stories (Allcott and Gentzkow, 2017). Similarly, of the around 126 000 tweets investigated in 2006-17, falsehoods diffused significantly faster, deeper and more broadly than truths, with the effects being more pronounced for false political news than for false news on terrorism, natural disasters, sciences, urban legends or financial information (Vasoughi, Roy and Aral, 2018). Studies tend to focus on the number of individuals who shared or interacted with fake news; quantifying the number affected by it is less evident and could be significantly greater (Lazer et al., 2018).

Policy makers have a responsibility to ensure that citizens have access to true and reliable information (OECD, 2017b). Taking action against fake news is critical to improving trust in public institutions, especially in LAC, where trust in social media as a channel for news is above the world average, although it has fallen in all countries surveyed, except Argentina: in 2019, trust in social media news was highest in Mexico (39% of respondents), followed by Chile (32%), Argentina (32%) and Brazil (31%), compared with a 23% world average. Social media is the preferred way to access online news for 42% of respondents in Chile, followed by search engines (21%) and directly from news websites or apps (19%). Similar trends are observed in Brazil (Reuters Institute for the Study of Journalism, 2019).[3]

Media regulation and media literacy are the two main interventions used to tackle the problem. Media regulation consists of structural changes aimed at preventing exposure. Platforms have taken steps in this direction. WhatsApp introduced a limit on message forwarding to five chats at once to prevent spam. Facebook made changes to its algorithm and, together with Twitter, now publishes a transparency report on the number of malicious activities observed on the platform. Twitter reported having verified 14 million to 20 million accounts under suspicion of malicious or spam activity per month between January and June 2019 (Twitter, 2019).

The shift from social media platforms, such as Facebook, to private messaging apps, such as WhatsApp and Facebook Messenger, to access online news may hamper the fight against fake news. Some 53% of Brazilians surveyed reported using WhatsApp to access news,[4] and 58% of WhatsApp users in Brazil reported using groups to interact with people they did not know.[5] The respective figures were 9% and 12% in the United Kingdom, and 6% and 27% in Australia (Reuters Institute for the Study of Journalism, 2019).

Media literacy is a complementary intervention empowering individuals with skills and tools to evaluate the news they encounter, including through fact-checking and news-verification initiatives (Lazer et al., 2018). Such initiatives have surged in LAC, in some instances via journalism in the run-up to elections, e.g. *Chequeado* and *Reverso* in Argentina, *Agencia Lupa* and *Comprova* in Brazil, Colombiacheck, *Ecuador Chequea*, *VerificadoMX* in Mexico and *Verificado.uy* in Uruguay. Governments have encouraged other media literacy

initiatives, such as *Gobierno Aclara* in Costa Rica and *#VerdadElecciones2019* in Colombia. More recently, initiatives have emerged to fight misinformation about the coronavirus (Covid-19) crisis. In Colombia, the UN Centre for Information put in place strategic partnerships with local radio stations and news agencies to monitor fake news. It also manages the *Voces Unidas* radio station, which answers questions or doubts about the virus in both Spanish and indigenous languages (UN, 2020a).

The non-territoriality and global scope of fake news indicates a need for exploring networks of co-operation at the regional and international levels, sharing best practices on countering disinformation and organising co-ordinated responses. The Rapid Alert System, established as part of the EU Action Plan against Disinformation, is an example of international co-operation (European Commission, 2019c). Developed ahead of the 2019 European Parliament elections, the Action Plan was a comprehensive effort to tackle fake news at the state level. It aimed to: improve detection, analysis and exposure of disinformation; strengthen co-operation and joint responses to threats via a dedicated Rapid Alert System; enhance collaboration with online platforms and industry to tackle disinformation; and raise awareness and improve social resilience (European Commission, 2018). The European Union also developed the Code of Practice on Disinformation, a voluntary, self-regulatory set of standards to fight disinformation signed by platforms, leading social networks and the advertising industry.

The digital transformation of governments

From e-governments to digital governments in LAC: Where are we?

Incorporation of digital technologies to transform public institutions is evolving rapidly. Three main stages can be identified (Figure 4.2). Analogue government was based on analogue procedures. E-government consists in "the use by the governments of information and communication technologies (ICTs), and particularly the Internet, as a tool to achieve better government" (OECD, 2014c). E-government makes more content and information available on line, but there is little interaction with citizens, and management practices remain hierarchical.

Digital government is defined as "the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value. It relies on a digital government ecosystem comprised of socio-economic actors of the country which support the production of and access to data, services and content through interactions with the government" (OECD, 2014c). Progress towards the digital transformation of government entails a radical shift in public sector culture with respect to participation, policy making, public service delivery and collaboration. The OECD Digital Government Framework outlines six dimensions of a digital government: digital by design, user-driven, government as a platform, open by default, data-driven and proactive. Whereas e-government had a technology focus, digital government is about embedding a digital culture throughout the practice of government that focuses on meeting users' needs by re-engineering and redesigning services and processes. Technology is a background enabler, woven into the ongoing activity of improving government, rather than the driver of transformation (digital by design) (OECD, 2019h).

New technologies have changed expectations of engagement with government. Digital technologies enable new forms of stakeholder participation, occasioning a shift from citizen-centric approaches, whereby government anticipates citizen and business needs, to citizen-driven approaches, whereby citizens and businesses identify and respond to needs in partnership with government (OECD, 2014c). In such public administrations (user-driven), government is no longer a service provider, but a platform

for the co-creation of public value (government as a platform) enabled by the disclosure of data in open formats (open by default) (OECD, 2019h).

Using the full potential of new digital technologies and data in the design, delivery and monitoring of public services and policies can transform governments. A truly data-driven public sector should: 1) recognise data as a key strategic asset, define its value and measure its impact; 2) reflect active efforts to remove barriers to managing, sharing and re-using data; 3) apply data to transform the design, delivery and monitoring of public policies and services; 4) value efforts to publish data openly and the use of data between and within public sector organisations; and 5) understand the data rights of citizens in terms of ethical behaviours, transparency of usage, protection of privacy and security of data (OECD, 2019b). In turn, the automatic processing of data allows governments to anticipate and respond quickly to emerging public issues or needs, rather than react (proactive) (OECD, 2019h).

Figure 4.2. **Progression towards digital government**

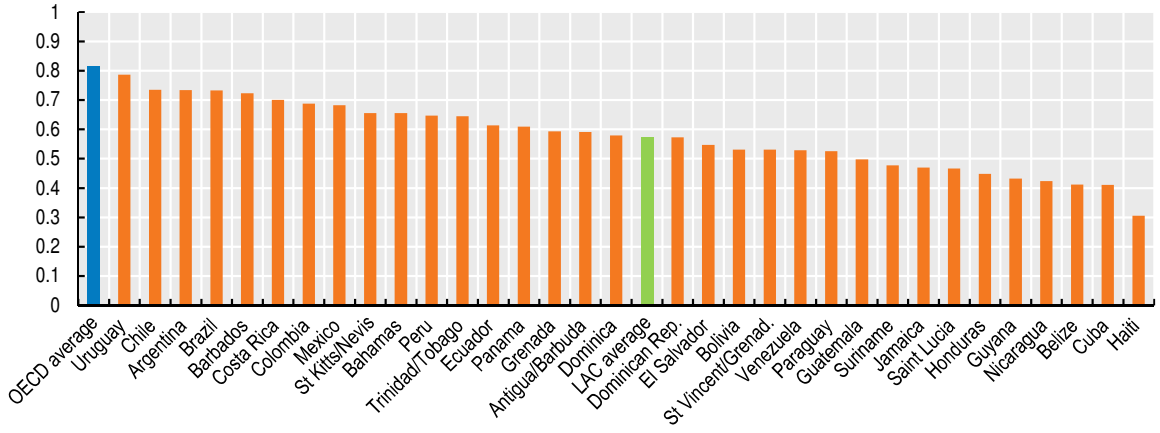
Source: OECD (2014c), *Recommendation of the Council on Digital Government Strategies*, www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf.

LAC countries are at various stages of the digital transformation of their governments. While it does not capture all the dimensions of a fully digital government, the UN E-Government Development Index (EGDI) is a comprehensive measure of e-government development world wide and an internationally recognised benchmark for comparing countries' efforts. It is based on measures of online services, communication infrastructure and human capital. In LAC, Argentina, Brazil, Chile and Uruguay stood among the top 50 performers of the 193 countries surveyed in EGDI 2018, performing slightly below the OECD average. Belize, Cuba, Haiti and Nicaragua were among the worst LAC performers (Figure 4.3; UN, 2019). In-depth country analysis on the state of the digital transformation of governments in LAC can be found in the *OECD Digital Government Studies* series covering Argentina, Brazil, Chile, Colombia, Mexico, Panama and Peru.

The greatest challenges for LAC countries are in the dimensions of telecommunications infrastructure and human capital, according to the evolution of the EGDI sub-indices between 2014 and 2018. The dimension of online services showed a moderate advance in the period (Figure 4.4). This highlights the difficulty of changing structural variables, such as human capital and infrastructure. The design and implementation of e-government strategies has been a main factor in the advancement of online service provision in LAC countries.

The shift from e-governments to digital governments has not yet taken place in statistical systems. At present, there is no measure of digital government able to capture all of its dimensions. Various scattered indicators show that Chile, Mexico and Uruguay are advancing rapidly in the provision of online government services (Figure 4.9), and

Figure 4.3. **United Nations E-Government Development Index, Latin America and the Caribbean, 2018**



Notes: The UN E-government Development Index (EGDI) is a composite index of the Online Service Index (OSI), Telecommunications Infrastructure Index (TII) and Human Capital Index (HCI). The OSI assesses the scope and quality of online public services on the country's national website; the TII measures the status of the development of telecommunications infrastructure; the HCI captures the status of human capital. It ranges from 0 (least developed) to 1 (most developed). Simple averages for the OECD and LAC.

Source: UN (2019), *UN e-Government Knowledge Database* (database), https://publicadministration.un.org/egovkb/en-us/Data-Center.

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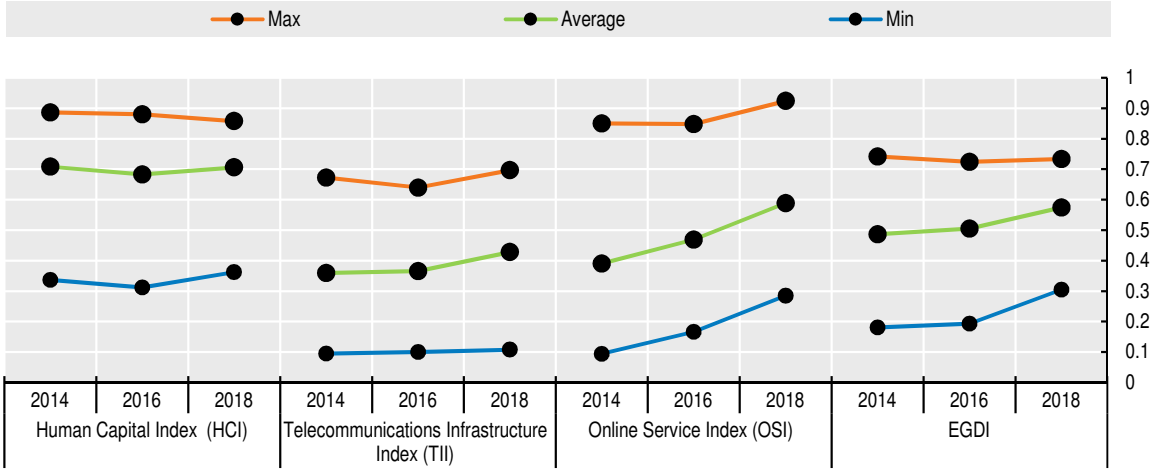
Figure 4.4. **United Nations E-Government Development Index, by component, Latin America and the Caribbean, 2014, 2016 and 2018**

Maximum, minimum and average values



Notes: Simple averages used. LAC includes Antigua/Barbuda, Argentina, Bahamas, Belize, Bolivia, Brazil, Barbados, Costa Rica, Colombia, Chile, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, St Kitts/Nevis, Panama, Paraguay, Peru, St Vincent/Grenad., Suriname, Saint Lucia, Trinidad/Tobago, Uruguay and Venezuela.

Source: Own elaboration based on UN (2019), *UN e-Government Knowledge Database* (database), https://publicadministration.un.org/egovkb/en-us/Data-Center.

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Colombia is making progress in open government data (OGD) policies (Figure 4.12). However, neither of these measures yields a comprehensive picture of the state of the digital transformation of governments. The OECD is currently developing a new generation of Digital Government Indicators (Box 4.2).

Box 4.2. **Measuring digital government maturity**

Most international measurements still focus on government use of technologies to support the digitisation of existing processes, procedures and services (e-government) rather than on the characteristics that make a government fully digital. The OECD developed a set of Digital Government Indicators encompassing the six dimensions of a digital government (digital by design, user-driven, government as a platform, open by default, data-driven and proactive), which can be used as a maturity index, enabling governments to assess progress in each dimension.

This project is a first attempt to measure the digital transformation of the public sector. It is the result of a collaboration between the OECD Digital Government Unit of the Public Governance Directorate and the OECD Working Party of Senior Digital Government Officials (E-Leaders). It builds on the theoretical framework of the 2014 Recommendation of the Council on Digital Government Strategies and resulting peer reviews. The index will not only provide a tool for benchmarking across countries, but also a basis for monitoring their efforts to implement the Recommendation (OECD, 2019i).

Moving towards more credible, efficient, inclusive and innovative public institutions

The digital transformation represents a unique opportunity to transform public institutions deeply and adapt them to rising social aspirations. In a rapidly changing world, development processes demand agile public institutions that are ready to meet emerging challenges and embrace new opportunities. The Latin American context has been characterised by a growing divide between citizens and institutions, leading to an institutional trap that acts as a vicious circle of low trust, declining willingness to pay taxes and, consequently, low public resources to finance good-quality public services and meet citizen demands (OECD et al., 2019). This section explores opportunities offered by the digital transformation to move towards public institutions in LAC that are more credible, effective, inclusive and innovative.

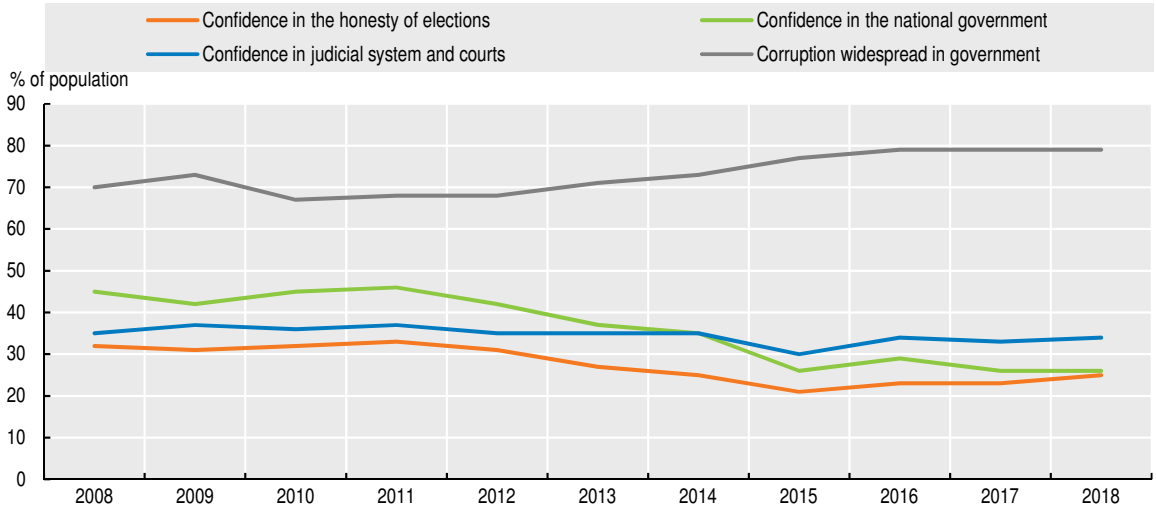
Although not the focus of this section, infrastructure development and investment in civil servants' digital skills are two essential prerequisites to ensure a successful digital transformation of governments. Infrastructure development must close the digital divide, so all citizens can equally access public services on line and engage with government and each other digitally. Digital literacy and culture in public administration are essential to make the most of digital technologies and respond to new challenges (see Chapter 3). Beyond user skills with digital technologies (e.g. email, word processing, spreadsheets, workflow apps) and soft and hard digital skills in public-sector professions (e.g. data analysts), complementary digital skills are increasingly required for public functions profoundly transformed by digitalisation (e.g. tax collection, government communications, citizen services management, planning) (OECD, 2019j). Digital management and leadership skills are also necessary for acknowledging the opportunities, benefits and risks of using digital technologies in the public sector (OECD, 2017c).

Towards more credible public institutions

Trust in public and democratic institutions has declined in LAC in recent years. In 2018, 26% of the population had confidence in the national government vs. 45% in 2008, 21% in Congress (vs. 32%), 24% in the judiciary (vs. 28%) and 13% in political parties (vs. 21%) (Figure 4.5). Perception of democracy has also undergone significant erosion (Figure 4.6).

Widespread perception of corruption is a main driver of mistrust in public institutions. In 2018, 79% of the LAC population believed corruption was widespread in government (Figure 4.5). Some 53% thought corruption increased between the end of 2018 and the end of 2019 (Pring and Vrushi, 2019). This deepens public perception that economic and political elites exert a strong influence on policy decisions for private gain. Some 79% believed the country was governed by, and for the benefit of, a few (Figure 4.6).

Figure 4.5. **Confidence in public institutions and perception of corruption, Latin America and the Caribbean, 2008-18**



Note: Weighted average.

Source: Own elaboration based on Gallup (2019), *Gallup World Poll* (database), www.gallup.com/analytics/232838/world-poll.aspx and Latinobarómetro (2018), *Latinobarómetro Survey* (database), www.latinobarometro.org/lat.jsp.

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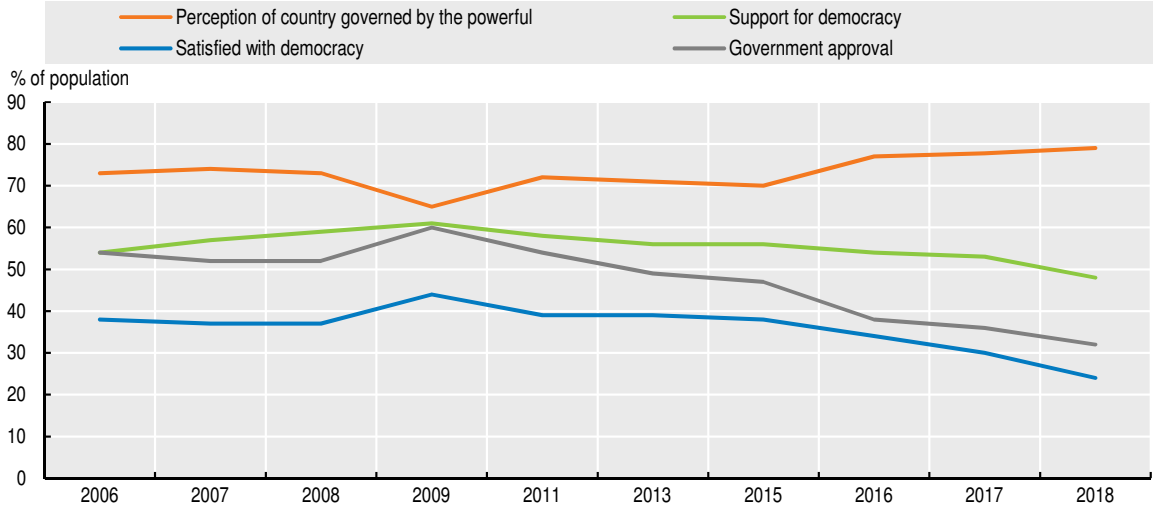
Figure 4.6. **Sentiment towards democracy and government approval, Latin America and the Caribbean, 2006-18**



Note: Simple average.

Source: Own elaboration based on Latinobarómetro (2018), *Latinobarómetro Survey* (database), www.latinobarometro.org/lat.jsp.

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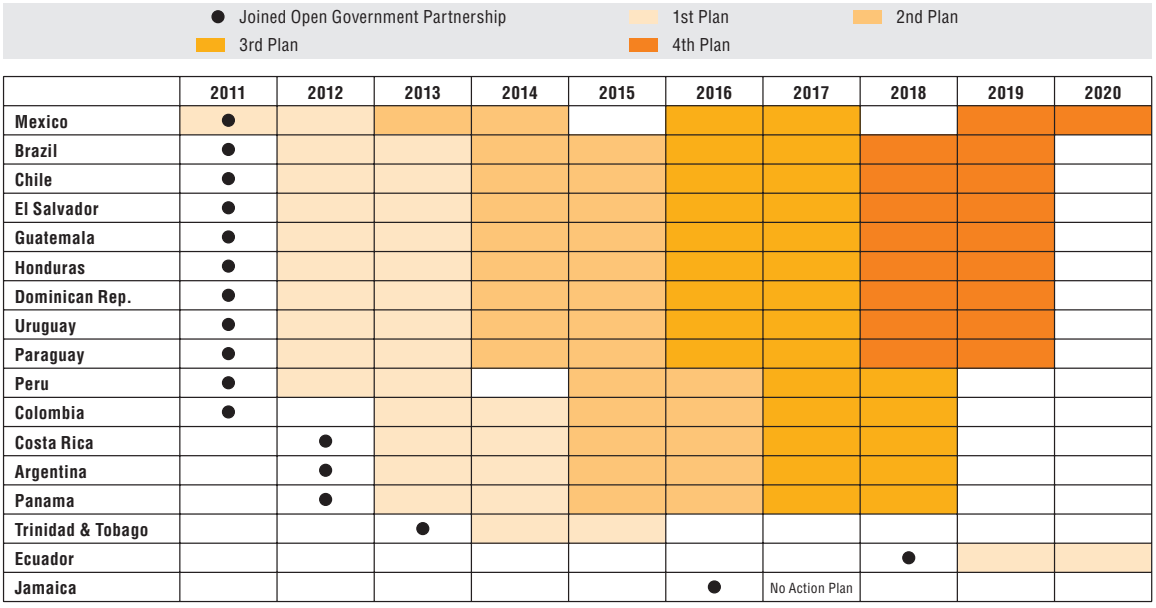
Trust is a cornerstone of public governance and fundamental to the success of public policies. Many policies depend on the co-operation and compliance of citizens, while many others assume the public will behave in a way that translates policies into effective action (OECD/CAF/ECLAC, 2018).

Open government, as a paradigm of public management, can contribute to addressing these challenges, emphasising the importance of transparency, access to information, collaboration and citizen participation (Naser, Ramírez-Alujas and Rosales, 2017). LAC countries have demonstrated commitment to open government (Figure 4.7): by January 2020, there were 53 action plans in the region – 38 already implemented and 15 in progress. Moreover, 1 116 action commitments were added, reflecting the relevance of open innovation as a modality of collaboration with citizens for the co-creation of solutions.

Figure 4.7. **Open government action plans, selected Latin American and Caribbean countries**



Source: ECLAC (2020), *Regional Observatory on Planning for Development in Latin America and the Caribbean*, https://observatorioplanificacion.cepal.org/en/opengov.

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Access to information is a fundamental aspect of open government, and OGD is a natural evolution of the proactive publication of public information. Open data have thus become a central component of open government plans. Increased data availability opens up new possibilities to increase the trustworthiness of public institutions. The potential of OGD strategies to improve democratic governance is large, as open data availability supports a culture of transparency, accountability and access to public information. OGD puts large amounts of information in the hands of citizens, civil society and international organisations, which can then play an oversight role and act as watchdogs and whistle-blowers in cases of corruption or malpractice. The availability of budget and public finance data was critical in uncovering large-scale corruption scandals in the region, such as the Panama Papers or the Odebrecht corruption network (Santiso and Roseth, 2017).

Digital technologies can improve areas particularly susceptible to corruption, including public contracts, infrastructure investments and transfers from national to

subnational authorities. While there is room for improvement, LAC has seen progress in these areas. *MapaInversiones* is a regional Inter-American Development Bank (IDB) initiative to support countries in creating digital platforms for data visualisation. Its main objective is to improve the transparency and efficiency of public investment. The platforms can be used by citizens to exert social control over the use of public funds, by the private sector to prioritise investment, and by policy makers to strengthen planning, design and implementation of public policies (Kahn, Baron and Vieyra, 2018). Colombia, Costa Rica, the Dominican Republic, Jamaica, Paraguay and Peru have implemented such platforms. In Colombia, the *MapaRegalías* platform, which shows the origin and destination of financial resources obtained from the exploitation of natural resources, has helped identify numerous irregularities (Santiso, 2018). Since its launch, the implementation efficiency of projects financed with royalties increased by 8%, on average (Lauletta et al., 2019).

The creation of central purchasing bodies as centres of procurement expertise, and the development of e-procurement solutions, are transforming traditional practices in LAC. *ChileCompra* and *Colombia Compra Eficiente* are two e-procurement platforms providing transparent information on public contracts, for instance. In addition to improving transparency in public management, the data generated by e-procurement platforms can be re-used for anti-corruption purposes through Big Data and machine learning techniques. The OCEANO system, developed by Colombia's General Comptroller, cross-checks information derived from the e-procurement system, administered by *Colombia Compra Eficiente*, with the business and social register to detect corruption networks (Cetina, 2020). Brazil's Observatory for Public Expenditure tracks and cross-checks procurement expenditure data with other government databases to identify atypical scenarios that, while not *a priori* evidence of irregularities, warrant further examination. The platform revealed fraud in Brazil's largest social welfare programme, *Bolsa Família*.

Blockchain is another emerging technology that can support the integrity of public institutions and prevent corruption. Blockchain allows for recording assets, transferring value and tracking transactions in a decentralised manner, ensuring data transparency, integrity and traceability. It eliminates the need for intermediaries, cuts red tape and reduces the risk of arbitrary discretion.

Social media and online audio-visual mediums can help build trust in the management of crises. As seen during the coronavirus (Covid-19) pandemic, conflicting government messages make it hard for the public to know how serious the risks are and what to do. Disinformation and fake news can exacerbate the trend and create panic and confusion (De La Garza, 2020). Governments should ensure that clear, trustworthy information channels reach the greatest number. Social media can provide an important platform to inform citizens about risks, the evolution of the crisis and the measures adopted to counter it. Examples include digital awareness-raising campaigns and daily briefs shared on official government social media accounts. This channel can be especially effective in LAC, given the high use of social media. News verification initiatives can also help counter the spread of fake news (see the section "The risks of mass misinformation"). The UN launched *Verified*, a platform to increase the volume and reach of trusted, accurate information on the crisis (UN, 2020b).

Social media and search engines can also help governments better manage crises by highlighting, surfacing and prioritising content from authoritative sources (Donovan, 2020; OECD, 2020e). Social media algorithms usually promote the most engaging content, risking heightening the spread of sensational fake news. However, during the coronavirus (Covid-19) pandemic, digital platforms pinned informative government websites to the top of their coronavirus (Covid-19) search results. For instance, Google tweaked its

algorithm so that the top search results provided a panoramic overview of the outbreak, information on symptoms, preventive tips and links to national government and World Health Organization (WHO) websites. Other initiatives included co-operation with fact-checkers and health authorities to flag and remove disinformation, and granting free advertising spaces to health authorities to disseminate critical information on Covid-19 on-line (OECD, 2020e).

Digital technologies also pose new challenges for institutional trust. The increasing interconnectedness favoured by technological advances may create new paradigms of social progress. Easier comparison with progress in LAC countries at higher levels of development may inflate aspirations among younger generations, leading to frustration with public institutions if there is a perception that these are not delivering (Nieto-Parra, Pezzini and Vázquez, 2019). Widespread access to information can also be a source of vulnerability for trust in public institutions, insofar as the Internet is used to spread propaganda and fake news and misinform citizens. Fighting fake news is complex, but initiatives are emerging to counter its pervasive impact on public trust (see the section "Governing the digital transformation"). Moreover, the Internet can affect political attitudes and, in certain circumstances, decrease public confidence in government (Guriev, Melnikov and Zhuravskaya, 2019).

Towards more efficient public institutions

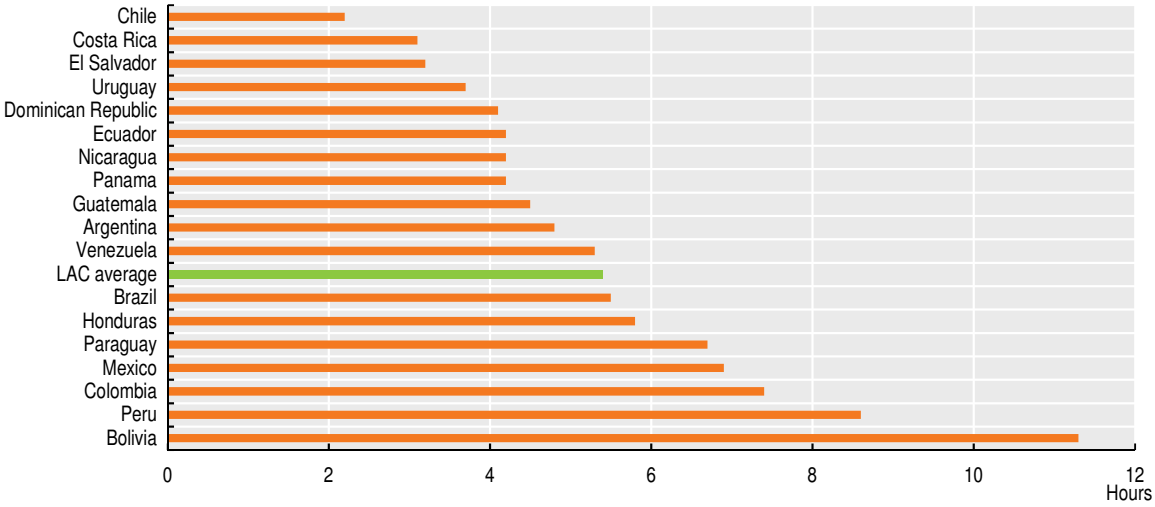
As governments face significant public spending constraints and struggle to meet growing expectations, digital technologies can help make public services more efficient by cutting transaction times and administrative costs.

LAC's complex bureaucracy is best exemplified by the average time it takes to carry out a government transaction, such as getting a birth certificate, paying a fine or obtaining a licence. It takes 5.4 hours, on average, to complete a public transaction in LAC, although variation among countries is high, ranging from more than 11 hours in Bolivia to less than 3 in Chile (Figure 4.8). A high proportion of transactions require three or more interactions with officials, resulting in high transaction costs for citizens, who have to dedicate time and money to dealing with institutions, and for governments, which have to invest financial resources in dealing with citizens face-to-face, reviewing documents and responding to queries. Digital tools can help reduce this burden, for instance the London Borough of Barking and Dagenham reduced processing time by 30 days and saved GBP 617 000 per year by digitalising benefit claims (Local Government Association, 2014).

Transaction times and administrative costs could be reduced through bureaucratic simplification and automation using technologies. Establishing a digital channel for processing transactions would eliminate in-person time and cost for citizens. Establishing interoperable automated systems among government institutions would further reduce and simplify steps to complete a transaction. Such transformation depends on interinstitutional co-ordination among government bodies. The OECD Recommendation of the Council on Digital Government Strategies called for "providing the institution formally responsible for digital government co-ordination with the mechanism to align overall strategic choices on investments in digital technologies" (OECD, 2014c).

Administrative reforms in LAC countries mainly focus on whether regulations can be simplified or eliminated.[6] For instance, the Dominican Republic launched RD+ Simple, a website to report on burdensome regulations or administrative processes. Argentina developed a similar website. Yet, only half of the ten countries surveyed (Argentina, Colombia, Costa Rica, Mexico and Peru) had undertaken administrative simplification at the regional and municipal levels, with little progress shown since 2015-16 (OECD, 2020f).

Figure 4.8. **Hours to complete a government transaction, selected Latin American and Caribbean countries**



Source: Roseth, Reyes and Santiso (2018), *Wait No More: Citizens, Red Tape and Digital Government*, https://publications.iadb.org/publications/english/document/Wait-No-More-Citizens-Red-Tape-and-Digital-Government.pdf; calculations based on Latinobarómetro (2017), *Latinobarómetro Survey* (database), www.latinobarometro.org/lat.jsp.

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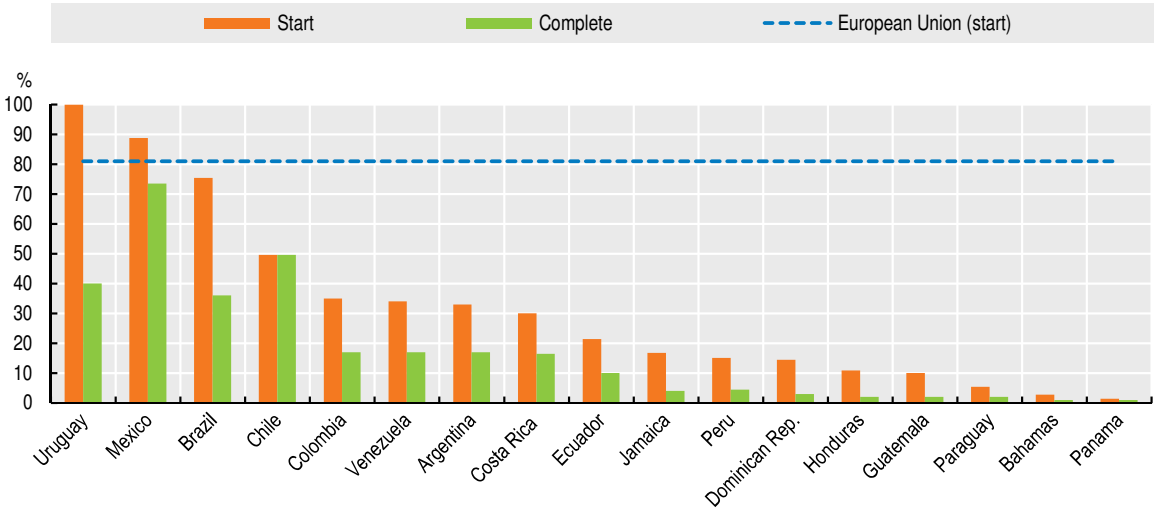
With respect to automation, use of digital transactions in LAC is heterogeneous, but remains rare in the majority of countries. This is usually because: 1) transactions are not available on line; 2) the public cannot access online transactions (e.g. due to lack of broadband access, identification or debit card); and 3) the experience with available, accessible online transactions is unsatisfactory (Roseth, Reyes and Santiso, 2018). Mexico and Chile are the only LAC countries in which more than half of government transactions can be started and completed on line (Figure 4.9). An inclusive digital transformation should not forget the physical service delivery channel, as it remains important in many LAC countries, especially for older and less digitally savvy citizens, and those without Internet access.

During service transformation, service design is a critical discipline that helps governments: 1) understand a user's journey from first attempt at solving a problem to final resolution (from end to end rather than within organisational siloes of provision); 2) address citizen-facing experiences and back office processes (external to internal and vice versa) as a continuum rather than two separate models; and 3) create consistency of access and experience between and across channels (omni-channel) rather than adopt different solutions for different channels (multi-channel) (OECD, forthcoming).

The six-year project, initiated in 2012, to transform the justice system in Panama is an example of successful service design and implementation. The collaboration between the National Authority for Government Innovation and several stakeholders focused on both digital elements and physical infrastructure problems and analogue interactions, addressing the end-to-end experience. Paper is no longer involved, and the justice system has reduced time investment by 96% (OECD, 2019j). The digital transformation of Colombia's Attorney/Inspector General's Office (PGN) is another promising initiative. Through a digital filing project, it is expected that all PGN cases will be fully operational at all PGN offices using: 1) optimised workflows that facilitate direct interaction between officials and citizens via digital channels; 2) digital document processing, content management and user services; and 3) access to information from legacy systems. Yet, despite virtuous exceptions, the justice system remains one of the least digitalised sectors of public administration in LAC.

Figure 4.9. **Government transactions that can be started and completed on line, selected Latin American and Caribbean countries**



Notes: Start indicates the share of government transactions that can be started on line. Complete indicates the number of government transactions that can be carried out and finalised on line. Figures are based on each national authority's definition of "transactional service". Calculations for Mexico consider only transactional services (2 708 services) rather than the total number of entries in the National Catalogue of Transactions and Services, which includes official information and government transactions.

Source: Roseth, Reyes and Santiso (2018), *Wait No More: Citizens, Red Tape and Digital Government*, https://publications.iadb.org/publications/english/document/Wait-No-More-Citizens-Red-Tape-and-Digital-Government.pdf.

StatLink https://doi.org/10.1787/888934172635

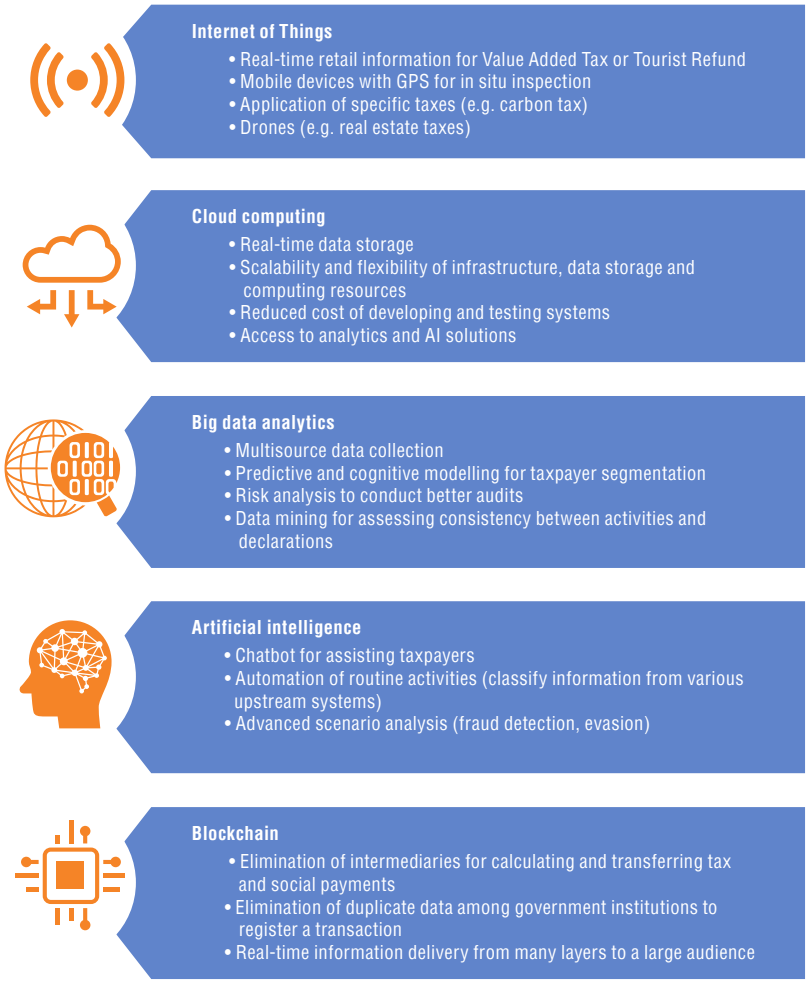
In addition to simplification, automation and service design, adoption of interoperable systems among public administrations is key to more efficient governments. Integrating data systems from different government bodies requires significant digitalisation of databases that share reporting standards and identifiers. Automated cross-checks of tax, wealth, social and payroll data could result in more effective targeting of social transfers and detection of tax evasion (Izquierdo, Pessino and Vuletin, 2018). By integrating information on beneficiaries of various programmes, Iraq's Social Safety Net Information System allowed the Ministry of Labour and Social Affairs to identify households receiving multiple benefits to which they were not entitled. Exclusions resulted in savings of USD 18 million in the system's budget for Baghdad alone. Estonia and Korea are the most advanced in system integration, but Argentina's national fiscal and social system of identification (SINTyS), Chile's integrated system for social information (SIIS) and Brazil's *Cadastro Único* have achieved remarkable levels (Barca and Chirchir, 2014).

Uruguay's national electronic health record (EHR), *Historia Clínica Electrónica Nacional*, features similar integration. While providers manage their own systems, shared data standards make information interoperable. Patients can receive personalised health care anywhere in the country because their records, including medical visits, examination results and mobile consultations, are shared across providers on a platform (Bastias-Butler and Ulrich, 2019).

The digital transformation of tax administration can positively affect process efficiency and service delivery (OECD, 2019k). Digital technologies open up new ways to collect, store, manage and analyse tax information. Income tax filing is one of the most diffused online government services globally (UN, 2019). Latin America leads the way in e-invoicing, which electronically records and automatically transfers commercial transactions to tax authorities. E-invoicing helps fight tax evasion by providing real-time

information and making cross-referencing tax filings easier (Barreix and Zambrano, 2018; Bellon et al., 2019). Chile was the first to adopt e-invoicing in 2003, followed by Argentina, Brazil, Ecuador, Mexico, Peru, Uruguay and other LAC countries. Ecuador has gradually introduced e-invoicing since 2013. In 2016, taxpayers who already emitted e-invoices reported 24% more taxable sales than those not yet included in the programme, up from 17% in 2015 (Ramírez Álvarez, Oliva and Andino, 2018). Other digital technologies, such as the IoT, cloud computing, Big Data analytics, AI and Blockchain, offer new opportunities to increase the efficiency of tax administration (Figure 4.10).

Figure 4.10. **Digital technologies and their application in tax administration in LAC**



Source: Own elaboration based on ECLAC (2018), *Datos, algoritmos y políticas: La redefinición del mundo digital* (LC/CMSI.6/4), Santiago, https://repositorio.cepal.org/bitstream/handle/11362/43477/7/S1800053_es.pdf.

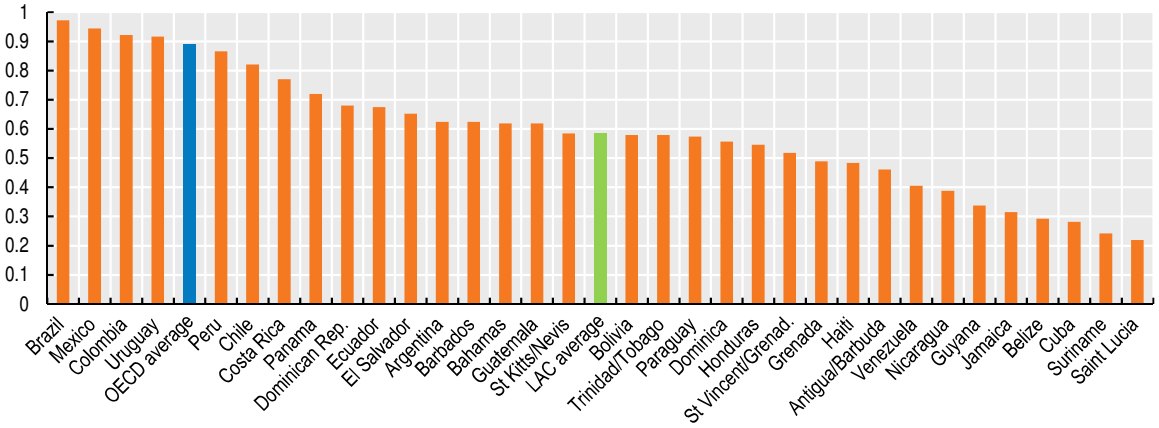
Towards more inclusive public institutions

The digital transformation can make public institutions more inclusive by facilitating interaction with stakeholders (e-consultation) and citizen engagement in decision making (e-decision making). Digital platforms can be a low-cost means for governments to interact with stakeholders in policy design, monitoring and implementation. The digital transformation can help governments provide more inclusive public services, making public institutions more accessible and citizen centred. Using digital technologies, public

institutions can develop policies that are better targeted and put citizen experience at the centre of their design.

According to the 2018 UN E-Participation Index, which includes measures of e-information sharing, e-consultation and e-decision making, the performance of Brazil, Colombia, Mexico and Uruguay was above the OECD average, while other countries lagged far behind (Figure 4.11).

Figure 4.11. **UN E-Participation Index, selected countries relative to LAC average and OECD average, 2018**



Notes: The UN E-Participation Index focuses on government use of online services in providing public information (e-information sharing), interacting with stakeholders (e-consultation) and engaging citizens and stakeholders in decision making (e-decision making). The purpose of this measure is to offer insight into how countries use online tools to promote citizen and citizen-government interactions for the benefit of all. It ranges from 0 (least participative) to 1 (most participative).

Source: UN (2019), *UN e-Government Knowledge Database* (database), https://publicadministration.un.org/egovkb/en-us/Data-Center.

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Digital technologies are opening up innovative channels for stakeholder engagement at various stages of the policy-making process. In 2018, the city of Montevideo set up the Montevideo Decide platform to foster and facilitate citizen participation in public matters through debates, proposals and participatory budgets. One of the more innovative features is a space for citizens to make proposals to the city and choose the winning option(s), to which the city then commits. Chile's *Vota Inteligente* was a similar open and participatory platform aimed at transmitting proposals to electoral candidates in the 2017 elections. Brazil's Promise Tracker allows citizens to track authorities' compliance with their commitments and promotes spaces of dialogue between citizens and authorities to find shared solutions to pressing challenges. Citizens can also increase their participation in legislative processes through CrowdLaw, which uses technology to tap the knowledge, creativity and expertise of citizens to improve the law-making process. Communication is a critical aspect of successful public policies. Digital technologies offer many opportunities for true public engagement and strengthening the impact of government communications (Box 4.3).

The digital transformation of governments can also support inclusive public services by reaching remote and disadvantaged segments of society that have difficultly accessing services. Digital technologies have expanded the reach of public education, for instance. Among other developments, e-learning alternatives have undergone an extraordinary transformation in recent years. Massive open online courses have the potential to democratise education by expanding access and providing many with opportunities

for flexible career paths more closely aligned with labour market needs (OECD, 2015b). E-health delivery systems, such as remote consultations, portals and wearable devices, open up new options for on-demand non-emergency health care that covers more patients at lower cost. These digital modalities may allow a refocussing of health-care services on prevention and early diagnoses (Pombo, Gupta and Stankovic, 2018). One-and-a-half years after implementation of the online service, Peru had carried out 6 800 telemammographies and diagnosed 39 cases of breast cancer in areas with no radiologists (Peru Ministry of Health, 2018).

Box 4.3. **Digital government communications: From broadcasting to true public engagement**

Government communications are an indispensable tool for public institutions to build trust, boost taxpayer morale and encourage public participation. Digitalisation brings unprecedented opportunities for government communications.

Social media provides a relatively inexpensive way to reach millions of citizens. Governments can build support for policy and demonstrate progress with engaging online formats (e.g. video, digital storytelling, data visualisations), promote behavioural change and encourage citizens to join national and local efforts to achieve sustainable development.

The most innovative institutions treat online media not as new broadcasting channels but as multiway processes, creating platforms where citizens can shape debate and communicate their own messages.

Digitalisation also provides governments with a precious information source. With data analytics and online consultations, they can better anticipate public debate, understand audience segments and develop more engaging and effective messaging (OECD, 2020g).

These digital solutions played a crucial role during the coronavirus (Covid-19) crisis. Schools adapted content and went digital to ensure continuity (see Chapter 3). Doctors provided e-consultations to mitigate emergency room overcrowding and viral spread. Recent events have laid the groundwork for an emerging e-health services market that could be developed beyond national borders (Blyde, 2020), similar to e-learning. Low culture and language barriers in LAC could generate important economies of scale for e-health and e-learning providers. However, if complementary investments are not made to ensure equal access to communication infrastructure and skills, these digital services may benefit a small part of the population, exacerbating inequalities in the region (Basto-Aguirre, Cerutti and Nieto-Parra, 2020).

Towards more innovative public institutions

The digital transformation can help governments be more innovative in all stages of policy making, thereby improving the quality of public policies. Digital technologies, combined with data, can be drivers of innovation in public administration by supporting better informed and targeted public policies and services.

Technology, and the digitalisation of societies and governments, generate massive amounts of data. Timely and sufficiently granular data offer opportunities for evidence-based decision making, with digital technologies supporting the policy cycle. Harnessing this potential requires a shift in public administration from an information-centred approach to an innovative, data-driven approach that incorporates digital technologies and data into policy design, delivery and evaluation.

Digital technologies and data promote this approach in various ways. They allow tracking of rapidly changing or previously under-recorded phenomena, such as pollution, financial activity or disease outbreak. Improved data availability, sharing and visualisation help policy makers tailor and differentiate policy design by geographical area, policy setting or socio-economic group (Huichalaf, 2017). Big Data and advanced econometric techniques supported by more granular data allow for greater policy experimentation and evaluation. Last, digital tools facilitate real-time data collection and exchange among both public and private actors, allowing governments to predict and respond proactively to emerging trends or risks (OECD, 2019l). The coronavirus (Covid-19) pandemic illustrates the use of digital technologies and data for innovative policy making. The OECD Country Policy Tracker is a visual platform created to monitor and compare coronavirus-related measures (OECD, 2020h). Korea was among the first to use a smartphone app to deliver test results, track adherence to quarantine and map the geographical distribution and evolution of contagion (Kim, 2020). More countries have adopted a contact-tracing tool, one being Go.Data, developed by WHO and Global Outbreak Alert and Response Network partners to collect case and contact data, and visualise disease transmission (WHO, 2020).

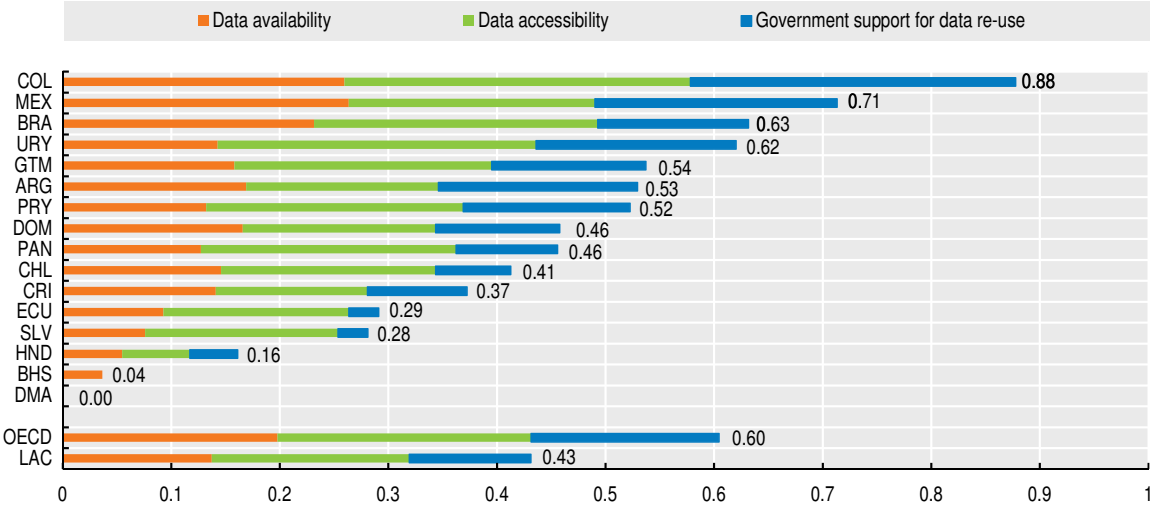
Innovative policy making can be fostered by making data openly available, but also usable and re-usable. OGD policies must be complemented with efforts to make the data re-usable so that they can feed into public administration policy cycles and help firms and individuals make more informed decisions (van Ooijen, Ubaldi and Welby, 2019). The OECD/IDB Open, Useful and Re-usable data (OURdata) Index 2019 measured government commitment to OGD policies, ranging from 0 (lowest) to 1 (highest). LAC countries scored 0.43 in 2019, compared with an OECD average of 0.60. OGD levels are very heterogeneous in LAC: Colombia (0.88), Mexico (0.71) and Brazil (0.63) are leaders, while Caribbean countries, such as the Bahamas (0.04) and Dominica (0.00), are not yet implementing OGD policies (Figure 4.12).

Data availability (Pillar 1 of the OURdata Index), which measures the extent to which central/federal governments promote OGD, shows that, except for Brazil, Colombia and Mexico, LAC is underperforming, compared with the OECD: 10 of the 16 LAC countries surveyed have formal requirements to ensure publication of transparency data. LAC shows better performance in data accessibility (Pillar 2), which measures how OGD are released: 13 of 16 countries, including Costa Rica, the Dominican Republic and Guatemala, provide all or most of the data in machine-readable format on their central portals, and 12, including Argentina, Brazil and Chile, provide all or most of the associated metadata. Except for Brazil, Colombia and Mexico, LAC countries most lag in government support for data re-use (Pillar 3). In particular, countries could better monitor the impact of OGD, since the LAC average score in this sub-category is 0.07, compared with 0.14 for the OECD (Figure 4.12) (OECD, 2020f).

Innovative governments should explore the potential of public-private collaboration in the exchange of data to inform public policies. Search engine data can provide invaluable information that complements traditional socio-economic and institutional data. In contrast to traditional citizen surveys or macroeconomic indicators, such as GDP growth, inflation or unemployment rates, data generated by Internet searches can inform public policies with readily available, anonymous, high-frequency data. For instance, the frequency of Google Trends searches for terms related to government corruption, public services complaints and insecurity have a statistically significant negative association with government approval in the region, after controlling for traditional macro variables (Montoya et al., 2020) (Figure 4.13). Many examples illustrate the potential of public-private collaboration to address policy issues (Socías, 2017). Throughout the coronavirus (Covid-19) pandemic and 2014 Ebola crisis, mobile phone data were used to map regional population movements, identify areas at increased risk of outbreak and determine where to focus preventive and healthcare measures (OECD, 2019l). The same type of data can be

used to track migration phenomena (Frias-Martinez et al., 2019; Isaacman, Frias-Martinez and Frias-Martinez, 2018) or map poverty, as done in Guatemala (Benjamins et al., 2017; Hernandez et al., 2017). The IDB used Waze traffic data to measure the impact of a Buenos Aires bridge on traffic congestion (Yañez-Pagans and Sánchez, 2019).

Figure 4.12. **OECD Open, Useful and Re-usable Data Index, selected Latin American and Caribbean countries, 2019**



Notes: The OECD OURdata Index on open government data (OGD) assesses government efforts to implement open data in three areas: data availability on the national portal, data accessibility on the national portal, and government support for innovative re-use of public data and stakeholder engagement. The composite index ranges from 0 (lowest) to 1 (highest). The score for each indicator corresponds to an unweighted simple average of each sub-indicator. The index does not measure the impact of OGD on socio-economic outcomes, but rather the work governments do to provide sufficient conditions to enable and stimulate their re-use. The index is based on the OECD analytical methodology described by Lafortune and Ubaldi (2018), which also maps the principles of the International Open Data Charter. Data for Argentina, Chile, Colombia and Mexico were collected through the 2018 OECD Open Government Data Survey. Honduras established a central OGD portal in mid-2019, after the survey was conducted. In Brazil, since July 2019, the Office of the Comptroller General has been responsible for OGD policies; there have therefore been changes in implementation.

Source: OECD (2020f), *Government at a Glance: Latin America and the Caribbean 2020*, https://doi.org/10.1787/13130fbb-en.

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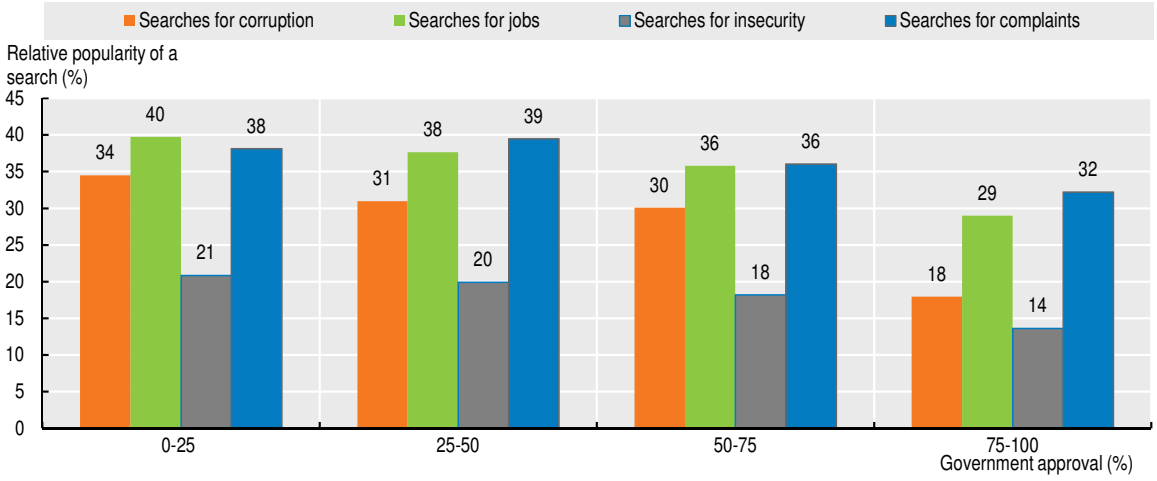
To support public sector innovation, it is essential to invest in civil servant skills, including technical skills, as well as a range of softer behavioural and cognitive skills, such as creative thinking and communication. When supported and motivated, front-line staff and middle managers can play a role in bringing forward innovative ideas and working them through at every stage. People management is therefore an important lever to sustain public sector innovation and a key area where countries should focus efforts to raise their innovative potential. In 2014, Chile set up the *Laboratorio de Gobierno*, a multidisciplinary institution to catalyse citizen-centred public-sector innovation that focuses on developing innovation capabilities and supporting innovative projects in public institutions. Its promising *Experimenta* programme encourages a learning-by-doing approach and helps civil servants address concrete institutional challenges with a citizen-centric, collaborative approach (OECD, 2017d).

Governments should take a bolder stance in favour of innovation, including by supporting innovative initiatives outside the public sector. Part of this strategy should be support for GovTechs (SMEs and start-ups dedicated to developing digital technology solutions for public administrations). While large companies dominate the market for public administration technology solutions, which generates around USD 400 billion per year world wide, creative entrepreneurs have emerged in LAC (Santiso, 2019).

Figure 4.13. **Google search popularity and government approval, Latin America and the Caribbean, 2006-15**



Note: Based on 18 LAC countries, simple average.

Source: Montoya et al. (2020), "Using Google data to understand government approval in Latin America".

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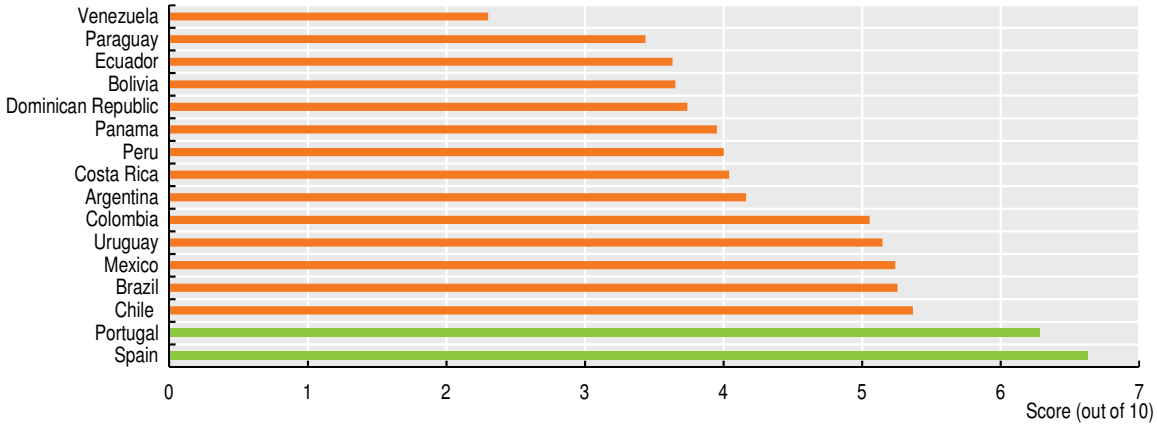
The maturity of GovTech ecosystems across LAC countries is heterogeneous. The Corporación Andina de Fomento (Andean Development Corporation [CAF]) GovTech Index 2020 is the first attempt to measure the development of GovTech ecosystems in the region. Its three pillars assess the start-up industry, government policies to promote the GovTech ecosystem, and the quality and efficiency of procurement systems. The start-up pillar has the lowest score across the region. This is mainly explained by the low availability of the venture capital needed for funding start-ups and scaling up. Portugal and Spain display greater average maturity than their Latin American counterparts (Figure 4.14).

Figure 4.14. **CAF GovTech Index, selected Latin American and Caribbean and European countries, 2020**



Notes: The CAF GovTech Index 2020 measures the maturity of GovTech ecosystems based on 28 indicators across 7 dimensions, which, on aggregate, form 3 equally weighted pillars: start-up industry, government policies and procurement systems. It ranges from 0 (least developed) to 10 (most developed).

Source: Zapata et al. (2020), *The GovTech Index 2020: Unlocking the Potential of GovTech Ecosystems in Latin America, Spain and Portugal*, http://scioteca.caf.com/handle/123456789/1580.

StatLink https://doi.org/10.1787/888934172711

Among successful LAC GovTech initiatives, *Visor Urbano* is a platform for managing online transactions related to business licences and construction permits of the Government of Guadalajara, Mexico. It has helped fight corruption, supported evidence-based policy making and saved citizens time and money (Zapata and Gerbasi, 2019a).

MuniDigital®, a platform focused on improving municipal services management by collecting accessible, up-to-date data, is currently employed by 40 municipalities and institutions in 10 Argentinian provinces. Government and citizen savings were attributed to, among other effects, improved administrative efficiency and reduced costs related to infrastructure maintenance and public transport, which helped lower environmental costs (Zapata and Gerbasi, 2019b).

Government-GovTech collaboration presents challenges that should be addressed. Fixed, long-term contracts with technology companies prevent public administrations from engaging with newer entrants. The public procurement process is also long and complex: the search for the cheapest solutions and the duration of decision making can result in contracting firms that are competitive, but not innovative (Ortiz, 2018). Regulatory frameworks should focus on lowering entry barriers for innovative start-ups. Colombia's *Compra Publica para la Innovación* applies an innovation criterion in procurement to find alternative solutions that satisfy public needs. Brazil and Chile are also making public procurement rules more flexible (Santiso, 2019). Innovation requires upfront and long-term financing (Mazzucato and MacFarlane, 2018). The longer maturation times of companies catering to the public sector deter venture capital funds. The public sector could play a key role in establishing funds for supporting these emerging start-ups. Denmark, Israel, Lithuania, Poland, Portugal and the United Kingdom have taken steps in this direction. Mexico is testing this approach through *Reto México*.

Digital technologies and new forms of data open up new opportunities for all levels of government, including cities, which is particularly relevant in highly urbanised LAC. Incorporating digital technologies can transform public service provision and quality of life (smart cities). Citizens' regular interactions with local public administration (e.g. carrying out transactions at local government offices, voting in the constituency or using public transport) influence their perception of public institutions, making investment in digital technologies at the local level critical to improving their well-being and satisfaction with government.

Public institutions and cities can benefit from the digital transformation in terms of credibility, efficiency, inclusiveness and innovation. Data-driven innovation can increase efficiency and promote integration of urban systems. For instance, smart grids can be connected to electric vehicles and home devices to manage energy supply and demand more efficiently. Civic technology can foster citizen engagement by facilitating access to information and providing spaces for expression of opinion, public consultation and online voting. Moreover, digital innovation at the local level often has lower costs and requires less capital expenditure, allowing smaller firms to compete with dominant incumbents in a disruptive ecosystem (OECD, 2019m). Pinhão Valley, the innovation ecosystem of Curitiba, Brazil, includes multiple actors, such as universities, accelerators, incubators, investment funds, start-ups, cultural and creative movements, and civil society.

Measuring the use and impact on citizen development of technologies in cities is important to guide investment in ICT and make public policies more effective. In Colombia, cities were ranked as smart cities according to three criteria: ICT infrastructure; socio-economic, institutional and environmental context; and the relationship between ICT and progress in various dimensions of well-being. The municipalities of Armenia, Bogota D.C., Envigado, Pereira and Medellín performed best (Gallego et al., forthcoming).

The digital agenda in national development strategies

The digital transformation, with its developmental potential, unlocks new opportunities and brings about diverse development challenges that should be integrated into development planning. Previous chapters and the sections "Governing the digital transformation" and "The digital transformation of governments" highlight opportunities and challenges associated with the digital era. To navigate these changes effectively, policy actions must be co-ordinated and take a long-term perspective.

A number of increasingly relevant challenges prevent LAC countries from moving to the next stage of development. Development traps, as described in *Latin American Economic Outlook 2019: Development in Transition*, refer to low productivity, social vulnerability, institutional weaknesses and environmental risks in the current development model (OECD et al., 2019). These traps underscore the importance of development planning in realising a clear, coherent vision of progress for the region. In particular, decreasing levels of confidence in institutions highlight the need for a new social contract that must be the result of a participative, multi-stakeholder process where citizens and firms have a voice. Digital technologies can support the construction of inclusive development strategies by opening innovative channels for stakeholder participation (e.g. videoconferences, online consultations).

NDPs are a vital policy instrument to embrace the opportunities of the digital transformation and overcome persisting challenges. Well-designed NDPs apply a coherent, long-term vision to increasingly complex and interconnected problems. They can also address development challenges in a clear and comprehensive manner, i.e. involving all government institutions at all levels (national, regional, municipal) over time. NDP effectiveness can be measured in six dimensions: 1) clear goals and indicators to define priorities, allocate financial resources, monitor progress and identify gaps; 2) a solid legal framework to give the plan authoritative power; 3) a link with the national budget, allowing concrete assessment of policy feasibility; 4) inclusion of a subnational dimension and public participation in the creation of the plan, giving it greater legitimacy; 5) a specialised agency responsible for formulating NDP matters in terms of commitment and expertise; and 6) monitoring and evaluation, which are fundamental for assessing implementation and enabling learning, prioritisation and policy improvement over time.

Development planning in LAC countries has improved significantly (Chimhowu, Hulme and Munro, 2019). However, the digital era requires integrating the digital transformation as a key and cross-cutting pillar of NDPs and further developing specific agendas for digitalisation. The coronavirus (Covid-19) crisis underscored the importance of advancement in the digital transformation. In particular, it shed light on the persistent digital divide, evident in the unequal distribution of Internet access and use, and digital skills across the LAC population, which can reinforce existing inequalities (OECD, 2020i). DAs within NDPs should become top priority.

This section analyses how the digital transformation is mainstreamed in LAC NDPs, looking at the relative importance of various digital topics and how digital technologies relate to the four development traps. It then reviews DAs and identifies key areas for their success.

Mainstreaming the digital transformation in national development plans

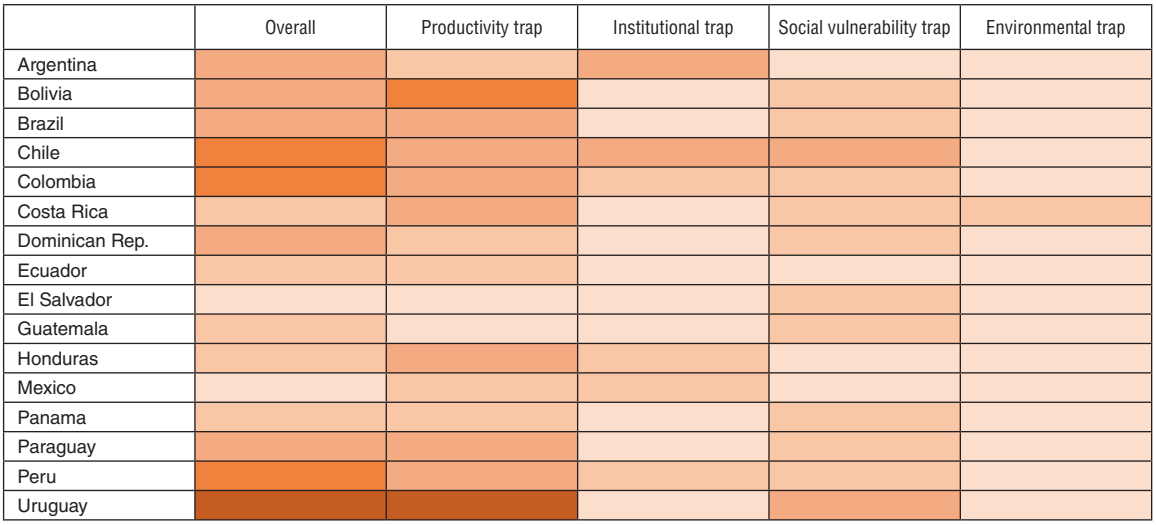
Attention to digital-related policies in LAC NDPs is mixed. There is potential to integrate the digital transformation more fully in most plans. The digital transformation in NDPs is more frequently linked to productivity-enhancing policies and less to social, institutional and environmental issues (Figure 4.15). These results emerge from a text-mining analysis

that identified and classified the NDPs of 16 Latin American countries by assessing the frequency of digital-related keywords and analysing their connection to the four development traps or to a set of topics relevant to the digital transformation of a country (see Annex 4.A1 for detailed methodology and Annex 4.A2 for a list of NDPs analysed). Communication infrastructure, Internet access and use as well as the future of work are prominent topics, while those related to the digital economy or digital governments are relatively under-represented (Figure 4.16).

The link between the digital transformation and the four development traps in LAC NDPs

LAC NDPs show heterogeneous incorporation of digital-related issues. They have a relatively larger presence in the NDPs of Chile, Colombia, Peru and Uruguay (Figure 4.15). Chile's NPD cites the digital revolution and the changes needed in the economic, social and institutional structure as a main government commitment. Colombia's NDP dedicates a pillar, or Pact, to the digital transformation (*Pacto por la transformación digital de Colombia*). Peru's NDP has a chapter on the development of skills for innovation, adoption and transfer of technological improvements. Uruguay's NDP singles out technological revolution as a main global trend and the strategic importance of ICT for the productive transformation of the economy.

Figure 4.15. **Intensity of digital dimensions in national development plans, by development trap, selected Latin American and Caribbean countries, 2019**



Notes: The darker the colour, the higher the intensity of the digital transformation. To obtain the table, each NDP policy was linked to a development trap, then the relative frequency of the words "computational", "digital", "digitalisation", "electronic", "informatics", "intelligent", "Internet", "online", "technology", "technologic", "virtual", and all their derivations, was calculated for each trap. Analysis was conducted in Portuguese for Brazil's NDP and in Spanish for all others. See Annex 4.A1 for detailed methodology.

Source: Own elaboration based on latest NDPs (end of 2019).

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LAC NDPs focus relatively more on digital policies connected with the productivity trap. Concern for investment in communication infrastructure is particularly widespread. The challenge of expanding broadband network deployment throughout the country, including remote and rural areas, is well represented. Only a few NDPs reference the potential of, for instance, the Fintech sector to provide more inclusive financing to SMEs. Colombia focuses on adapting the regulatory framework to emerging financial technologies, in line with principles promoted by the Pacific Alliance. Peru aims to implement a legislative proposal on the regulation of financial services by 2021 and to

create a Fintech Regulatory Platform by 2025. Honduras emphasises the development of digital financial services to improve financial inclusion. Uruguay addresses the important topic of automation and robotisation of production processes and use of Big Data to increase agri-food productivity and enhance product traceability.

The connection between the digital transformation and the social vulnerability trap receives relatively less attention, and policies tend to focus exclusively on strengthening scientific and information technology skills in schools. Digitalisation in the education and health sectors, e.g. through distance learning or e-health services, remains largely unexplored. Some NDPs include policy frameworks to improve connectivity in schools and boost inclusiveness. Chile's Government Plan 2018-22 proposes a virtual academy, *Conectados con el Futuro* (Connected with the future), offering free science and technology classes to all citizens. The Dominican Republic, Paraguay and Peru advance similar policies. Colombia's NDP includes proposals to develop a digital platform for families with child education recommendations. NDPs also include proposals for equipping schools with Internet connection and computers, as with El Salvador's *Niñez y juventud del futuro: una niña, un niño, una computadora* (Infancy and youth of the future: A girl, a boy, a computer). Uruguay's NDP aims to facilitate and democratise access to new technologies to ensure that all citizens benefit from basic e-health services.

Concerning the link between the digital transformation and the institutional trap, most NDPs recognise the importance of adopting digital tools for the modernisation of public administration (e-government), but proposals are mixed regarding to the reorganisation of the public sector apparatus in order to integrate strategic thinking about digital technologies from the outset (digital government). The NDPs of Argentina, Chile, Colombia and Peru have the most advanced recommendations for the modernisation of government. Argentina proposes a digital ballot (*Boleta Única Electrónica*) to make elections more transparent, digitalisation of customs (also proposed by Peru) and *País Digital* (Digital Country Plan) to promote Internet use by provincial and municipal governments. Brazil and Colombia aim to introduce digital platforms to improve interactions among government, citizens and firms. Chile aims to improve police management with safe systems of electronic reporting and mobile apps for emergencies and crime. Colombia and Peru plan to introduce a model of digital justice, with support for electronic procedures in most judicial actions.

The links between the digital transformation and the environmental trap are least evident in the plans. Brazil proposes to use technologies for remote sensing of deforestation, land use and forest fires, and for the diffusion of the information. Costa Rica proposes installing smart meters in the national electrical system as part of its national decarbonisation plan and creating a digital platform to accelerate environmental transactions, processes and permits. Uruguay plans to promote R&D on technologies for environmental control, monitoring and management. Countries should adopt new digital technologies to monitor pollution and species conservation. Advancements in image processing, when used in conjunction with machine learning, can be useful for conservation policy by allowing tracking of wildlife populations and monitoring biodiversity loss (OECD, 2019l). These methods were used to carry out the first census of the Grévy's zebra in Kenya (Berger-Wolf et al., 2016).

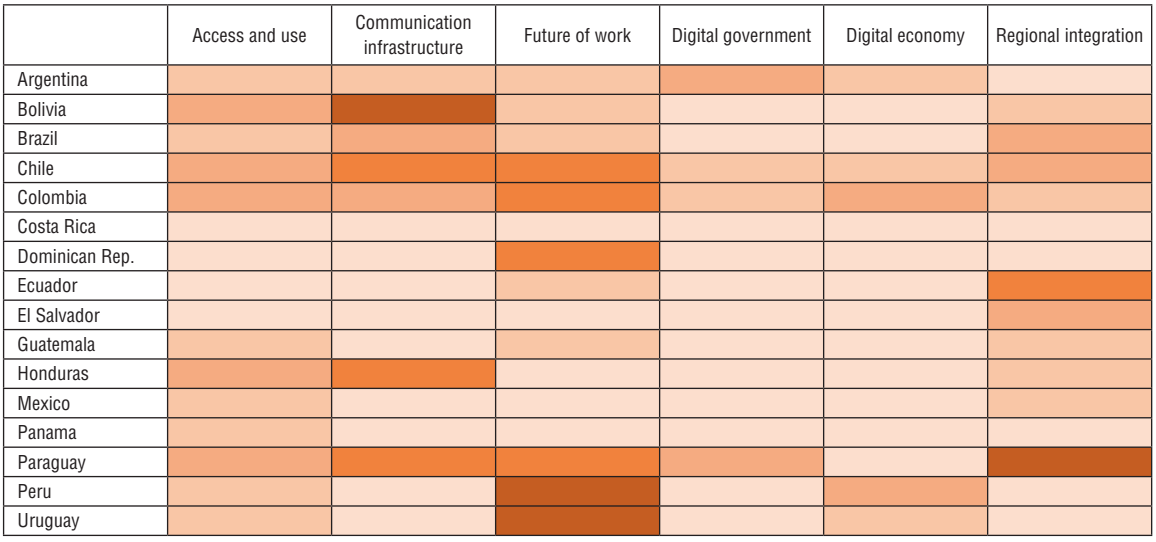
Key digital-related topics across NDPs

The digital transformation manifests in many areas where policy making is important. To determine the main digital-related areas included in LAC NDPs, a text mining exercise assessed the relative frequency of the following policy items: access to and use of the Internet and digital technologies; communication infrastructure; digital economy; digital

government; regional integration; and the future of work (see Annex 4.A1 for detailed methodology and Annex 4.A2 for a list of NDPs analysed).

Overall, a broad range of policy areas reference the digital transformation. Countries do not focus on a single area, although they may emphasise an aspect. For instance, Paraguay privileges regional integration, while Peru and Uruguay emphasise the future of work (Figure 4.16).

Figure 4.16. **Intensity of digital dimensions in national development plans, selected Latin American and Caribbean countries, 2019**



Note: The figure was obtained by compiling a list of keywords for each topic; intensity of topic was calculated based on relative frequency. See Annex 4.A1 for detailed methodology.

Source: Own elaboration based on latest national NDPs (end of 2019).

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The majority of NDPs include expansion of access and use of digital technologies to close the digital divide and ensure universal Internet coverage. Internet access is included among basic household services, together with water, electricity and telephone, in the majority of plans. Some countries, including Brazil, Chile and Colombia, propose nation-wide Wi-Fi access hot spots to ensure the digital inclusion of all citizens.

Policies seeking to expand communication infrastructure are fundamental for an inclusive digital transformation. The majority of countries have programmes to ensure universal broadband, although priorities depend on the state of communication infrastructure development. Those with low levels of Internet access, such as Honduras, focus on expanding network coverage and extending the number of broadband subscriptions. Higher income countries, such as Colombia and Costa Rica, aim to upgrade existing infrastructure and migrate to 4G and 5G networks, the latter in the coming years. Uruguay plans to strengthen the connectivity of IoT applications, as fixed and mobile broadband are relatively well developed.

Regarding the impact of digitalisation on labour markets and adapting to a new world of work, countries emphasise skills upgrading over encouraging new, more flexible working arrangements or transforming labour market institutions. Uruguay's plan provides a gender perspective on the risks of automation and the possible increase in wage inequality. It stresses the importance of ending education segregation and encouraging female participation in science and technology curricula. It also seeks to ensure the right

to lifelong learning and universal social protection and security for all workers in order to mitigate changes in the future of work. Teleworking remains relatively underanalysed, apart from proposals in Chile's plan to enhance work-life balance, in Colombia's plan to promote employment equality and favour female labour market participation, and in Peru's plan to approve a new teleworking law by 2021.

Proposals for the application of digital technologies to accelerate internal public administration processes and adopt open data policies are widespread; however, apart from Argentina, Brazil, Chile, Colombia, Mexico and Uruguay, no country mentions the complementary extension of digital security regulations. The creation of digital one-stop shops for carrying out government transactions is gaining traction. Argentina's *Ventanilla Única Digital y Presencial* proposes to unify all channels for accessing social services and sending transfers. *Chile sin Papeleo 2025* and *Chile Atiende Online* are important in achieving sufficient capacity to have all government procedures on line by 2025. Colombia has a similar aim for 2030. Peru will implement *Ventanilla Única Digital Minero Energética*, a digital one-stop shop to manage permits and authorisations for mining and energy sector investors, by 2021.

Attention to the development of the digital economy remains low, with few proposals to foster e-commerce, open banking or financial technology companies. Chile's *Pymes Digitales* (Digital SMEs) supports access to connectivity and provides training through digital platforms. As part of its Pacific Alliance commitments, Chile will also create a roadmap for firms' participation in e-commerce, the massification of payment and the certification of electronic origin. Colombia, beyond promoting e-commerce, plans an advanced manufacturing programme to develop technologies associated with industry 4.0, including the industrial IoT, Big Data, AI, robotics, 3D printing, nanotechnology and augmented and virtual reality. Panama aims to implement an online payment system as part of its law on e-government (*Panamá en Línea*). Uruguay is looking at e-commerce to increase meat exports and at the creative industry's role in the development of a digital economy.

Regional integration is important for the majority of countries surveyed, but most focus on energy, border and commercial integration. Few countries advocate for digital integration in their NDPs as part of their broader objective to develop an innovative, competitive economy.

The prevalence of digital issues in NDPs indicates gaps and opportunities to benefit further from the digital transformation. However, NDP analysis results bear careful interpretation. Lack of a policy area can indicate that it is not a top priority, that it is covered by existing policies or that the objective has been achieved. For instance, Uruguay does not mention digital government, but progress in this area to date, and the existence of a DA and a digital government plan, may explain the omission.

National digital agendas/strategies: Comprehensive action to exploit the benefits of new technologies

Since the mid-1990s, LAC governments have increasingly devoted efforts and resources to DAs or ICT strategies, generating a series of comprehensive policies and initiatives (see Chapter 6 for the case of Caribbean countries). Brazil, Chile and Colombia were among the pioneers, formulating ambitious ICT strategies. Several countries, including Chile, Colombia and Uruguay, have since consolidated policies and institutions, and developed third- or fourth-generation DAs (ECLAC, 2016). Most LAC countries now have a DA (Table 4.3).

Table 4.3. **National digital agendas/strategies in selected Latin American and Caribbean countries**

	Digital agenda/ strategy	Objectives	Institution
Argentina	Agenda Digital 2030	Digital education; infrastructure; connectivity; creation of a legal framework for data processing; efficient government; cybersecurity; economic development; and proactivity in the digital transformation at the international level	Special Temporary Unit for the Digital Agenda of Argentina, under the Government Secretariat of Modernisation
Bolivia	Agenda Digital 2025	Biodiversity and technology; digital and knowledge economy; digital arts and communication; open government; technology for life; gender and inclusiveness; and security and infrastructure	Agency of Electronic Government and Information and Communication Technologies, under the supervision of the Ministry of the Presidency
Brazil	Estratégia Brasileira para a Transformação Digital (E-Digital) (2018)	By thematic axis: 1) enablers (infrastructure and access to ICT; communication, R&D and innovation; confidence in the digital environment; digital education; and international dimension); and 2) digital transformation of the economy, citizens and government	Ministry of Science, Technology, Innovations and Communications
Chile	Chile Digital para Tod@s Agenda Digital 2020	Rights for digital development; digital connectivity; digital government; digital economy; and digital skills	Presidency of the Republic, with advice from the Committee of Ministers for Digital Development
Colombia	El Futuro Digital es de Todos ICT Plan 2018-22	ICT environment; digital social inclusion; empowerment of citizens and households in a digital environment; and digital sectoral transformations	Ministry of Information and Communication Technologies
Costa Rica	Estrategia de Transformación Digital del Bicentenario 2018-22	Digital transformation of public institutions and society with a focus on people, transparency, efficiency, productivity, good governance and world leadership	Ministry of Science, Technology and Telecommunications
Dominican Republic	Digital Agenda of Dominican Republic 2016-20	Infrastructure and access; e-government and digital services; skills development; productive development and innovation; and facilitating environment	National Commission of the Knowledge and Information Society, presided by the Dominican Institute of Telecommunications
Ecuador	Política Ecuador Digital	Connectivity; efficiency and security of information; and innovation and competitiveness	Ministry of Telecommunications
Guatemala	Agenda Nación Digital 2016-32	Education; health; security; development; and transparency	x
Honduras	Agenda Digital Honduras 2014-18	Digital connectivity with equity; digital government strategies; human capital and ICT; and development of a legislative and institutional framework for ICT	Technical Secretary of Planning and External Co-operation
Mexico	Estrategia Digital Nacional 2013-18	Government transformation; digital economy; quality education; universal and effective health; and public security	Presidency of the Republic, Digital National Strategy Co-ordinator
Panama	El Camino a un Ciudadano Digital Agenda Digital 2020	Equity and social inclusion; democratic strengthening; transformation of the state; infrastructure development; knowledge-based economic development; education through ICT; knowledge generation, research development and innovation; and territorial and international action	National Authority for Government Innovation
Paraguay	Agenda Digital	Connectivity; digital government; digital economy; and institutional strengthening and cybersecurity	Ministry of Information and Communication Technologies
Peru	Agenda Digital al Bicentenario 2021	Integrity; competitiveness; link with citizens; trust; innovation	Multisector Commission for the Monitoring and Evaluation of the Development Plan of the Information Society, under the direction of the Presidency of the Council of Ministers
Uruguay	Transforming with equity Agenda Digital 2020	Digital skills development for inclusion; innovation for social well-being; infrastructure investment; digital economy; smart management of environmental information and of emergencies; and connected and smart government	Agency for Electronic Government and Knowledge and Information Society, dependent on the Presidency of the Republic

Note: x = not applicable.

Source: Own elaboration based on sources from Katz (2009), *El Papel de las TIC en el Desarrollo: Propuesta de America Latina a los Retos Economicos Actuales*; OECD/IDB (2016), *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit*, https://doi.org/10.1787/9789264251823-en; and DAs in LAC countries.

Various countries, including Argentina, Brazil, Ecuador and Paraguay, approved DAs in 2018-19. After a long consultation process with more than 30 public institutions, Brazil approved the *Estratégia Brasileira para a Transformação Digital* (*E-Digital*) (Brazilian Digital Transformation Strategy) in 2018. Ecuador adopted the Digital Ecuador policy in 2019 and is currently preparing its new DA. Paraguay recently adopted an ambitious DA, in addition to creating a Ministry of Information and Communication Technologies in 2018.

Chile, Colombia, Costa Rica, the Dominican Republic and Panama have ongoing policy frameworks on digital issues, while other LAC countries, including Mexico, have yet to update their frameworks, partly owing to political change in the region.

DAs are cross-sectoral and aim to address various policy objectives involved in the digital transformation of economies and societies. Most DAs in LAC prioritise or include objectives related to infrastructure and access to ICT, broadband deployment, digital skills development, legal framework, digital government, ICT in schools and productivity-enhancing policies mainly aimed at the adoption of digital technologies by SMEs, promoting the IT industry, e-commerce and digital entrepreneurship. E-health and, especially, environmental policies are less often mentioned. An increasing number of DAs indicate the importance of international co-operation as a strategic component of their policy agendas (see Chapter 5). This section focuses on DAs, but many countries in LAC have separate digital government strategies focused on the digital transformation of government institutions: Brazil has the E-Digital DA and the Digital Governance Strategy (2020-22), for instance (OECD, 2018).

DAs in LAC countries encompass a broad range of policies, involving not only ICT ministries, but also other government institutions, such as those in charge of finance, education, industry and public administration (Figure 4.17). Effective co-ordination among government bodies is essential for the implementation of a coherent DA: policy makers can misunderstand data governance as the exclusive responsibility of IT departments, but a comprehensive data governance framework must ensure proper data management throughout their life cycle, i.e. across various departments (OECD, 2019b). The digital transformation calls for policies and practices that address issues in a holistic, coherent manner across sectors (OECD, 2019n, 2019o; Quintanilla, 2017). Responding to technological disruption requires a certain degree of institutional disruption, i.e. changing the traditional organisation of government with respect to digital policies.

There are examples of inter-institutional co-ordination around DAs in LAC, but very few countries have consolidated them. Uruguay's Honorary Advisory Council for the Information Society meets periodically to evaluate DA implementation.

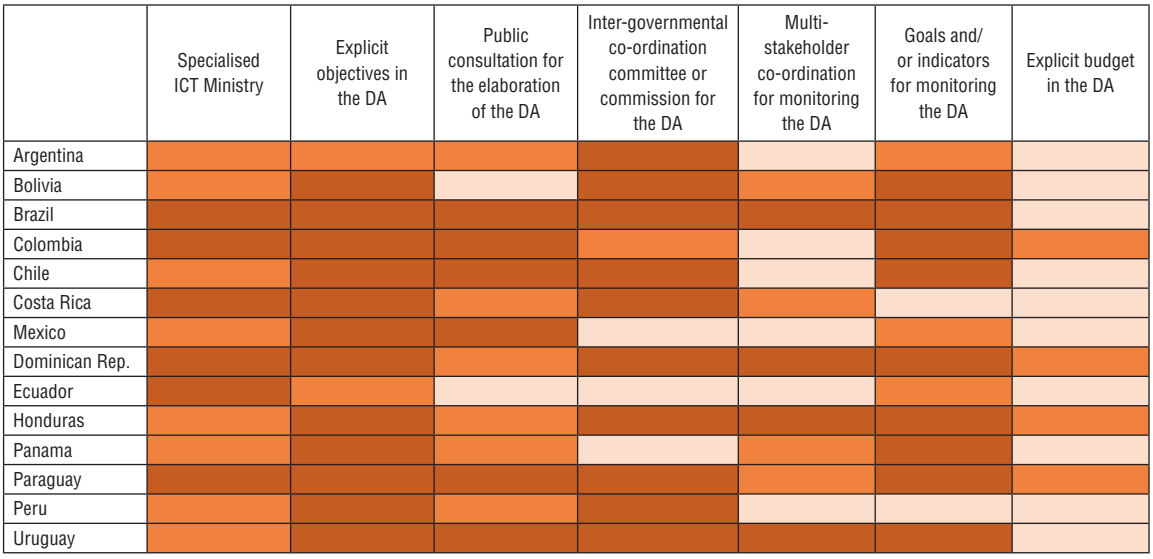
The digital transformation is not only driven by governments, but also businesses, people and other non-government stakeholders. To ensure that strategies are inclusive and useful for all, it is important to include all levels of government and all stakeholders. Multi-stakeholder dialogue can help identify obstacles, exchange best practices and open up opportunities for self-regulation, stakeholder-led standard setting and public-private partnerships. Digital technologies increasingly facilitate such engagement through, for instance, web-based consultations (OECD, 2019o). LAC countries acknowledge the importance of multi-stakeholder engagement in DA elaboration, but few have an institutional design that seeks co-ordination with the private sector and civil society for implementation and monitoring.

Clear responsibility and adequate implementation power are crucial for the success of DAs. A high-level body leading the strategy can be particularly helpful in co-ordinating a swift digital transformation (OECD, 2019i, 2019n). Approaches to governing DAs vary across countries, both in the OECD and in LAC. OECD countries follow two models.

The first is characterised by high-level leadership and centralised responsibility for strategic co-ordination above the ministerial level, e.g. by a head of government or equally important figure. This is the case in the Slovak Republic, where the Prime Minister holds a strong mandate for digital issues, including drafting of the strategy, which is executed through a dedicated co-ordination office. In other countries, including Estonia, Korea and Luxembourg, as well as Chile and Peru in LAC, the Prime Minister (or the Presidency) is responsible for certain functions, such as strategic co-ordination, but ministries play an important role, for instance, in providing inputs for strategy development and in implementation (OECD, 2019o).

The second approach allocates responsibility for DA co-ordination to a lead ministry. In several OECD countries, including Belgium, Japan, Poland, Portugal and Slovenia, the lead ministry is exclusively dedicated to digital affairs. In various LAC countries, including Brazil, Colombia, Costa Rica, Ecuador and Paraguay, ministries of ICT or science and technology are in charge of DAs. In Bolivia, Panama and Uruguay, among other countries, a special agency under the control of the Presidency of the Republic oversees the DA (Figure 4.17).

Figure 4.17. **Institutional characteristics of national digital agendas, selected Latin American and Caribbean countries, 2020**



Note: Colour intensity indicates the intensity with which the DA includes the characteristic in its institutional design.
Source: Own elaboration based on latest national DAs (January 2020).
StatLink https://doi.org/10.1787/888934172768

An effective oversight framework is important for monitoring implementation and carrying out evaluation of DAs. These activities should enable learning, prioritisation and improvement of policies over time (OECD, 2019o). Many OECD governments have developed measurable targets within specific time frames. On average, monitoring started in 2013. Some countries monitor implementation with a supranational index, such as the EU Digital Economy and Society Index; others, such as Germany and Mexico, developed their own aggregate digitalisation indexes (OECD, 2017e). The OECD's *Going Digital Toolkit* helps countries assess their state of digital development and formulate policy strategies and approaches in response. *Measuring the Digital Transformation: A Roadmap for the Future* outlines additional indicators and a future measurement agenda (OECD, 2019i).

While keeping track of key performance indicators is important for assessing the progress of specific programmes, comprehensive monitoring of the overall advancement of the DA is also necessary. The latter is especially helpful for national authorities when the achievement of one policy objective is based on the success of another goal (OECD/IDB, 2016). Several LAC countries have begun to include monitoring indicators to follow up on DA implementation. Brazil's strategy establishes monitoring indicators for each objective based on statistics from the Regional Center for Studies on the Development of the Information Society, the country's pre-eminent source for ICT statistics.

It is important that DAs align with NDPs, countries' main planning document. NDPs set out development strategies and can be articulated into various regional and sectoral plans, including DAs. Alignment of objectives among government plans is important for co-ordinating policy making. For instance, the Digital Strategic Agenda Panama 4.0 considered the main goals of its Government Plan 2014-19, its Strategic Government Plan, its National Competitiveness Plan and the objectives of the regional Digital Agenda (eLAC2020) co-ordinated by the Economic Commission for Latin America and the Caribbean.

DAs should follow a medium-term time frame of around five to ten years (Katz, 2009). Although many DAs in LAC are aligned with, and derive from, main NPD objectives, alignment tends to be problematic, as the temporal framework of DAs often coincides with the presidential term (Mattar and Cuervo, 2017): continuity of the strategy is in danger with each government turnover. While a short-term plan is useful to co-ordinate immediate actions, a longer-term strategy is necessary to invest in projects, such as ICT infrastructure, that have longer maturation times and whose results can only be assessed over the medium to long term.

Conclusion

The coronavirus (Covid-19) pandemic posed unprecedented challenges to public institutions, which face extraordinary policy dilemmas in an existing context of rising citizen aspirations and deepening distrust, dissatisfaction and social discontent. The crisis is likely to increase demands for stronger public institutions and better quality public services. The digital transformation offers opportunities to address these, although not without challenges.

The profound transformations brought about by technological progress challenge the adequacy of the current global and national institutional set-up. New risks and opportunities lie ahead; the rules of the game must adapt to make the digital transformation a driver of greater well-being for all. The digital transformation itself offers an opportunity to transform public institutions and adapt them to rising social aspirations, including those for new "digital rights". Latin America has seen a growing divide between citizens and institutions, leading to an institutional trap: a vicious circle of low trust, declining willingness to pay taxes and, consequently, low public resources to finance good-quality public services and meet citizen demands (OECD et al., 2019).

Three dimensions of public institutions must be rethought in the digital era. The first is the governance of the digital transformation. New regulatory challenges are emerging. Regulations must ensure fair and equitable advancement of the digital transformation by promoting fair competition, promoting digital innovation and investment, and protecting citizens and consumers. This demands an independent regulator and a stable, predictable regulatory framework to foster long-term investment. Digital security is one of the greatest challenges; yet, after Africa, LAC shows the least commitment, according to the Global Cybersecurity Index. However, there has been progress: 13 countries had a digital

security strategy in 2019. Data protection is another key issue that deserves a renewed policy framework. The GDPR set a model for many LAC countries.

The digital transformation comes with new ethical challenges. The increasing use of AI and machine learning in decision making in public institutions can raise questions and challenges related to human values, fairness, human determination, privacy, safety and accountability, among others. Regulations and standards to respond to these issues have progressed recently. The 2019 OECD AI Principles promote AI that is innovative, trustworthy and respects human rights. Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru have adhered to the Principles. The risks of mass misinformation (fake news) represent another key challenge. In LAC, 53% of the population believed that false information is spread frequently or very frequently to influence elections. Two main interventions are being used to address the problem: media regulation, which consists in structural changes aimed at preventing exposure to fake news; and media literacy, which consists in empowering individuals with tools to evaluate the news they encounter, including through fact-checking and news-verification initiatives.

The second dimension is the digital transformation of governments. Governments are incorporating technologies and moving from analogue to e-governments, then gradually towards fully digital governments. The OECD Digital Government Framework highlights six dimensions of a digital government: digital by design, user-driven, government as a platform, open by default, data-driven and proactive. Governments are not only required to adopt new technologies, but also rethink the way in which they are used in order to integrate their use into public sector modernisation efforts from the outset. LAC countries are at various stages of the digital transformation of their governments. EGDI, despite being an insufficient measure that does not capture the broader dimensions of digital governments, showed that Argentina, Brazil, Chile and Uruguay stood among the top 50 performers of the 193 countries surveyed in 2018, performing slightly below the OECD average. Belize, Cuba, Haiti and Nicaragua were among the worst LAC performers.

Digital technologies offer the opportunity to transform public governance and move towards more credible, effective, inclusive and innovative public institutions. New policies like OGD, which supports a culture of transparency, accountability and access to public information, make governments more credible. LAC countries have demonstrated commitment to OGD: by January 2020, there were 53 action plans in the region. Digital technologies can improve areas particularly susceptible to corruption, including public contracts, infrastructure investments and transfers from national to subnational authorities. Central purchasing bodies, the development of e-procurement solutions and use of Blockchain show promise.

LAC governments can be made more effective by using digital technologies to cut high transaction times and administrative costs. Bureaucratic simplification and automation, establishment of interoperable automated systems among government institutions and the digital transformation of tax administration (improving collection, storage, management and analysis of tax information) can reduce costs and increase public revenue. The digital transformation of the judiciary remains a highly necessary, yet pending, agenda in most LAC countries.

The digital transformation can make public institutions more inclusive by facilitating interactions with stakeholders and citizen involvement in decision making (e-decision making). There are innovative channels for stakeholder engagement at various stages of the policy-making process, such as a platform for citizens to track authorities' compliance with commitments, or spaces for dialogue between citizens and authorities to co-create solutions to policy challenges. By making the policy-making process more inclusive, digital technologies can therefore set the basis for a more participative social contract.

Digital tools can also make public services (e.g. e-learning, e-health) more inclusive by reaching more disadvantaged or remote segments of society.

Digital technologies can help governments be more innovative in all stages of policy making. The availability of massive amounts of data allow tracking of rapidly changing or previously under-recorded phenomena. It can help policy makers tailor and differentiate policy design by geographical area, policy setting or socio-economic group. Big Data and advanced econometric techniques supported by more granular data allow for greater policy experimentation and evaluation. Innovative governments should explore the potential of public-private collaboration in the exchange of data to inform public policies, including collaboration with GovTechs (SMEs and start-ups dedicated to developing digital technology solutions for public administrations).

The third dimension is the digital agenda in national development plans. Efforts to transform and adapt public governance to the digital era must be co-ordinated with a long-term strategic view. NDPs, and particularly DAs, are essential. Incorporation of digital issues varies across LAC NDPs. The digital transformation is more frequently linked to productivity-enhancing policies and less to social, institutional and environmental issues. Communication infrastructure, Internet access and use as well as the future of work are prominent topics, while the digital economy, digital government and regional integration are relatively under-represented. Most LAC countries have a DA. It is important that DAs align with NDPs. It is equally important that DAs include all levels of government and engage with all non-government stakeholders: institutional co-ordination and multi-stakeholder dialogue are key for a successful digital transformation, but also for advancing towards a more inclusive social contract. Clear responsibility and adequate implementation power are crucial for the success of DAs, as is an effective oversight framework for monitoring implementation and carrying out evaluation.

Annex 4.A1. Methodology used in Figure 4.15 and Figure 4.16

For Figure 4.15, each NDP was analysed with NVivo qualitative data analysis software and coded according to the four development traps. Coding rules followed were:

Table 4.A1.1. **Coding rules**

Code	Description	Examples
Environmental trap	Includes topics related to environment and climate change adaptation and mitigation	• "Elaboration of a National Policy for the Sustainable Use of Wood, which includes a plan for the replacement of wood with energy coming from less polluting sources, better regulation of the wood market ... " • "Fostering environmental education, awareness and culture, together with the access to information about the environment"
Institutional trap	Includes reforms related to institutional strengthening, including the modernisation of public services, citizen security, justice and international co-operation	• "The national government, in co-ordination with the Attorney General's Office, will dismantle and disrupt criminal organisations, as well as run investigations to extinguish money-laundering, in order to disrupt financial networks and the value chain of illegal activities." • "The public territorial entities (governorates and municipalities) will strengthen their process of digital transformation to develop the possibilities of Decree 1008 of 2018 on Digital Government."
Social vulnerability trap	Includes social and human development, social inclusion and cohesion, equity, education quality and access to basic services	• "Expanding the focus of the Strategy of the Management Platform 'Better Life', going beyond its role in the mitigation of poverty, to a broader role that includes a strategy for leaving this condition" • "Increasing the number of households with electricity, especially in rural areas"
Productivity trap	Includes macroeconomic stability, growth, employment, infrastructure development and investment in science and technology	• "Duplicating the growth rate with respect to the current government" • "Gradually converging towards a balance between structural revenues and expenditures in the next 6 to 8 years, in order to stabilise and then reduce the levels of public debt with respect to GDP" • "Improving the competitiveness of rural SMEs"

Source: Own elaboration.

After this, the frequency of the most recurrent word in the DA was calculated. The frequency of the words "computacional", "digital", "digitalización", "electrónico", "informático", "inteligente", "Internet", "online", "tecnología", "tecnológico", "virtual" and all their derivations (e.g. digital, digitales, digitalizar) was calculated for each trap. Last, the ratio of this frequency to the frequency of the most recurrent word was taken to produce the relative frequencies in Figure 4.15.

For Figure 4.16, each NDP was analysed with NVivo. A list of keywords was associated to the various topics, and relative frequencies were calculated.

Table 4.A1.2. **List of keywords used in the analysis**

Theme	Keywords
Access and use	Access to technology; access to Internet; Internet coverage; network coverage; Internet connection; Internet penetration; technology penetration; Internet use; technology use; connectivity; digital divide
Communication infrastructure	Analogic; aerial; electrification; wired, wireless; microwaves; mobile; router; satellite; telecommunication; telephony; television; transmission; 2G; 3G; 4G; 5G; high definition; high speed; broadband; optical fibre; GPRS; hardware; ICT infrastructure; mobile Internet; Mbps; MHz; Wi-Fi
Digital government	Electronic administration; digital administration; cybersecurity; smart city; e-procurement; open data; open government/state; e-invoice; e-government; e-education; e-health; m-government; electronic government; digital government; online government; mobile government; information privacy; information security; digital security
Digital economy	Incubation; incubator; Big Data; Blockchain; electronic commerce; digital commerce; online commerce; e-commerce; e-payment; Fintech; artificial intelligence; Internet of things; industry 4.0; audiovisual market; online business; open banking; online payment; digital payment; paying online; digital platform; digital productivity; digital competition; technological transfer; digital services; online services; start-up
Future of work	Virtual academy; digital literacy; continuous learning; automation; digital capital; technological skills; digital skills; digital knowledge; co-working; digital class; digital education; technology education; digital training; technological innovation; R&D; digital talent; teleworking; digital transformation; digital work; distance work
Regional integration	Regional digital integration; bilateral treaty; integration treaty; commercial treaty; subregional treaty; plurilateral treaty; common tariff; bilateral commerce; international co-operation; border integration; Latin American integration; macroregional integration; world integration; countries integration; regional integration; free circulation/movement; free transit; free trade; Asociación de Estados del Caribe; Asociación Latinoamericana de Integración; Alianza Bolivariana para los Pueblos de Nuestra América; Alianza del Pacífico; Comunidad de Estados Latinoamericanos y Caribeños; Comunidad Andina; Sistema Andino de Integración; Mercado Común Centroamericano; Mercado Común del Sur; Organización de los Estados Americanos; Organización del Tratado de Cooperación Amazónica; Proyecto de Integración y Desarrollo de Mesoamérica; Proyecto Mesoamérica; Sistema Económico Latinoamericano y del Caribe; Unión de Naciones Suramericanas

Source: Own elaboration.

Annex 4.A2. National development plan characteristics

Table 4.A2.1. National development plan characteristics, selected Latin American and Caribbean countries, latest plan analysed

	Latest NDP analysed	Regulatory framework	Budget	Participation	Planning authority
Argentina	Objetivos de Gobierno de Argentina 2015-2019				Ministerio del Interior, Obras Públicas y Vivienda (MIOPV) de la Argentina
Bolivia	Plan de Desarrollo Económico y Social en el marco del Desarrollo Integral para Vivir Bien 2016-2020	✓		✓	Ministerio de Planificación del Desarrollo (MPD) de Bolivia
Brazil	Plano Plurianual (PPA) "Desenvolvimento, produtividade e inclusão social" 2016-19	✓	✓	✓	Ministério do Planejamento, Desenvolvimento e Gestão de Brasil
Chile	Plan de Gobierno "Construyamos tiempos mejores para Chile" 2018-22				Presidencia de la República de Chile
Colombia	Plan Nacional de Desarrollo "Pacto por Colombia, Pacto por la equidad" 2018-22	✓		✓	Departamento Nacional de Planeación (DNP) de Colombia
Costa Rica	Plan Nacional de Desarrollo y de Inversion Publica 2019-22	✓	✓	✓	Ministerio de Planificación y Política Económica (MIDEPLAN) de Costa Rica
Dominican Republic	Estrategia Nacional de Desarrollo "Un viaje de transformación hacia un país mejor" 2010-30	✓		✓	Ministerio de Economía, Planificación y Desarrollo (MEPyD) de República Dominicana
Ecuador	Plan Nacional de Desarrollo "Toda una Vida" 2017-21	✓	✓	✓	Secretaría Nacional de Planificación y Desarrollo (SENPLADES) de Ecuador
El Salvador	"El Salvador: productivo, educado y seguro" 2014-19		✓		Secretaría Técnica y de Planificación (SETEPLAN) de El Salvador
Guatemala	Plan Nacional de Desarrollo: K'atun Nuestra Guatemala 2032	✓	✓	✓	Secretaría de Planificación y de Programación de la Presidencia (SEGEPLAN) de Guatemala
Honduras	Plan Estrategico de Gobierno 2018-22	✓		✓	Secretaría de Coordinación General de Gobierno de Honduras
Mexico	Plan Nacional de Desarrollo de México 2019-24				Presidencia de los Estados Unidos Mexicanos
Panama	Plan Estratégico de Gobierno 2015-19				Ministerio de Economía y Finanzas (MEF) de Panamá
Paraguay	Plan Nacional de Desarrollo "Paraguay 2030"	✓			Secretaría Técnica de Planificación del Desarrollo Económico y Social (STP) del Paraguay
Peru	Plan Nacional de Competitividad y Productividad 2019-30	✓		✓	Centro Nacional de Planeamiento Estratégico (CEPLAN) de Perú
Uruguay	Estrategia Nacional de Desarrollo Uruguay 2050	✓	✓	✓	Oficina de Planeamiento y Presupuesto (OPP) de Uruguay

Notes: When more than one planning document was available, priority was given to national development or government plans over *visión país* (country visions) and long-term plans for consistency reasons. In Argentina, the Presidency is responsible for the formulation of the Government Plan, whose objectives will be included in the Strategic Territorial Plan developed by the Ministry of the Interior. In Ecuador, the Secretaria Tecnica de Planificación "Planifica Ecuador" recently replaced SENPLADES as the main planning authority. In Peru, the Plan Nacional de Competitividad y Productividad 2019-30 was formulated by the Consejo Nacional de Competitividad y Formalización of the Ministry of Economy and Finance, but the main planning authority is the Centro Nacional de Planeamiento Estratégico. Also note that Panama released a new Strategic Government Plan (Plan Estratégico del Gobierno 2019-24) in December 2019, but the analysis is based on the previous plan.

Source: Own elaboration based on information from ECLAC (2020).

Notes

1. These type of risks are referred to as "digital security" risks, in line with the 2015 *Digital Security Risk Management for Economic and Social Prosperity: OECD Recommendation and Companion Document*, which prefers this term to "cybersecurity" to avoid the specificity of "cyber" (OECD, 2015a).
2. Based on Article 45 of EU Regulation 2016/679.
3. The survey asked, "Which of these was the MAIN way in which you came across news in the last week?".
4. The survey asked, "Which, if any, of the following have you used for news in the last week?" The share of people using WhatsApp for accessing news was 39% in Argentina, 40% in Chile and 41% in Mexico, compared with a 19% world average.
5. The survey asked, "WhatsApp allows you to set up, join, and participate in groups, where you can discuss news or related topics with like-minded people. Which, if any, of the following have you used in the past month on WhatsApp itself?"
6. The information draws on the 2015-16 and 2019 OECD/IDB Survey on Regulatory Policy and Governance. LAC countries surveyed in 2015-16 were Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico and Peru. The 2019 survey updated those countries and included Argentina, the Dominican Republic and El Salvador. Reponses were provided by government officials and reflect the situation as of 31 March 2019.

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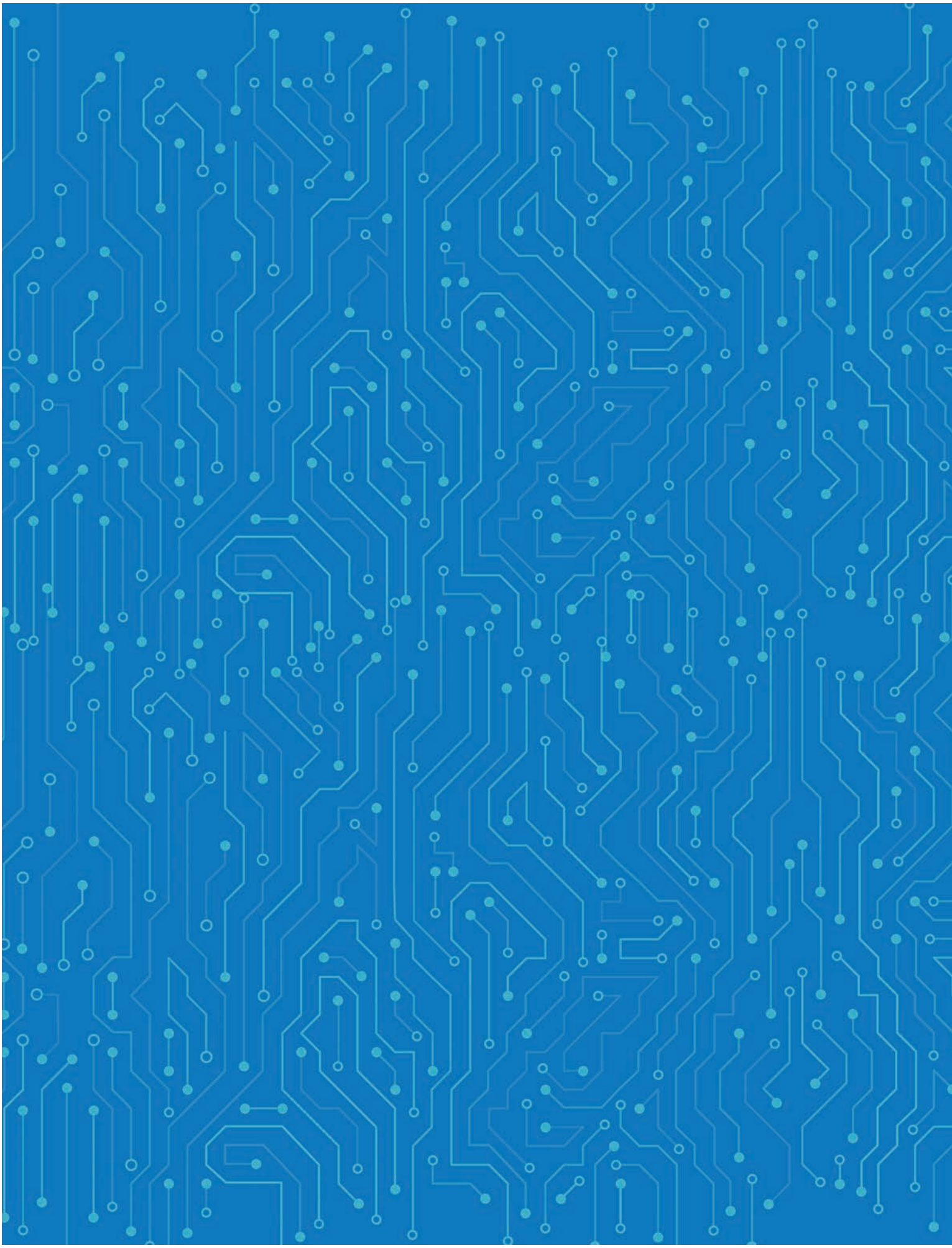


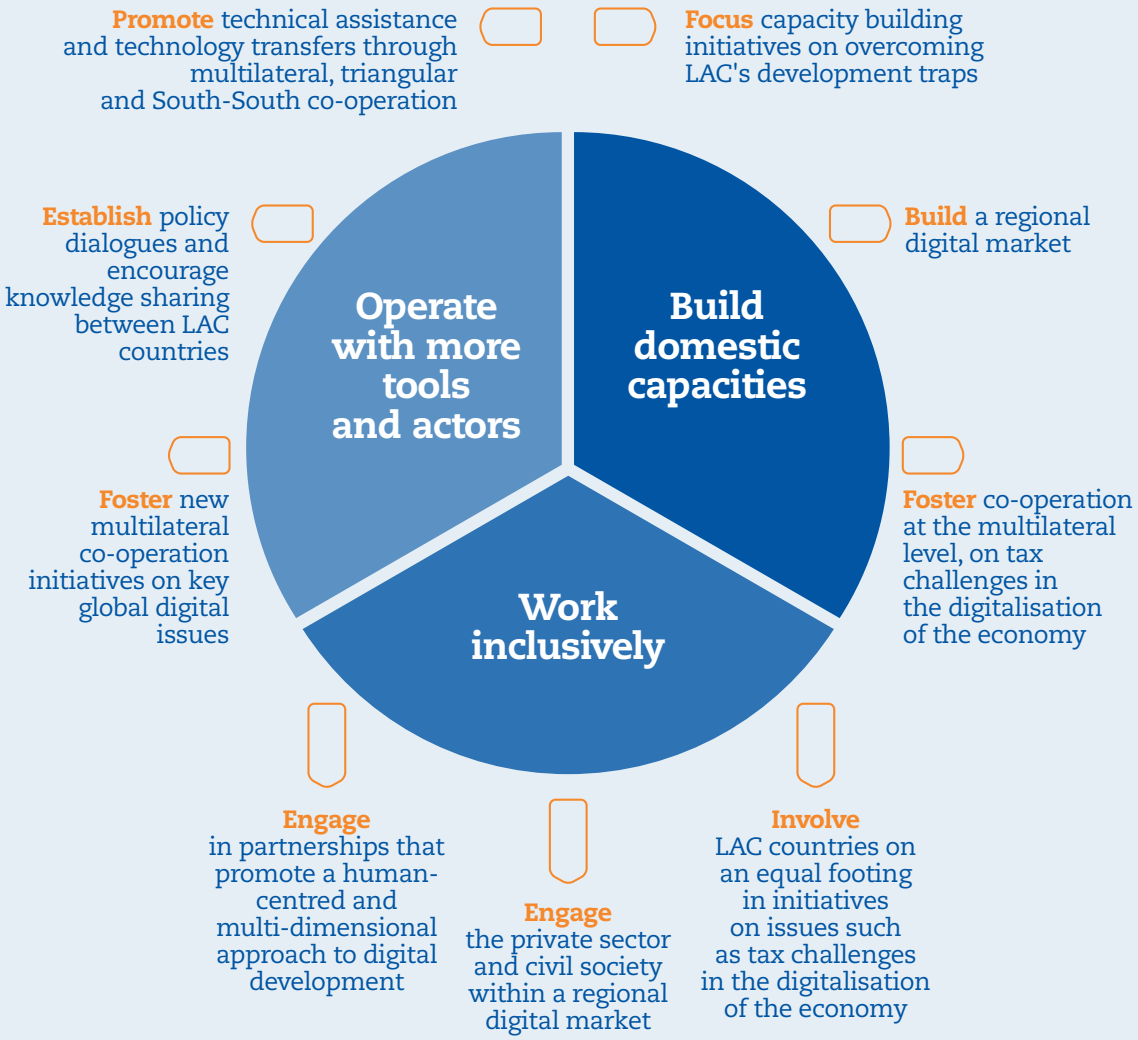
Chapter 5

The role of international co-operation in the digital age

As digitalisation creates both opportunities and challenges that transcend borders, international co-operation is a key dimension to make the most out of the digital transformation at local, national and international levels. This chapter describes how a renewed model of international co-operation can help LAC countries harness the digital transformation to foster their sustainable development. It first looks at how digital co-operation has helped LAC countries build their domestic capacities to overcome the interlinked challenges of the development traps, thus promoting a multi-dimensional approach to development and aligning national and international priorities. This chapter then explores how building a regional digital market can help the region tap into its digital potential, by harmonising strategies, articulating all levels of digital development and involving multiple stakeholders in a regional policy dialogue on digital issues. To do so, LAC countries can take advantage of useful international experiences, including the European Union's digital strategy. Finally, LAC countries can also take advantage of being fully involved in multilateral initiatives to address issues arising from digitalisation, notably addressing the tax challenges arising from the digitalisation of the economy.

The role of international co-operation

3 ways to facilitate LAC's digital transformation for greater inclusiveness:



Introduction

The digital transformation, complemented by structural reforms, could play a strong role in overcoming the development traps Latin America and the Caribbean (LAC) face. Digital tools can provide states with new capacities and make them more credible, inclusive, efficient and innovative. Digital transformation can allow firms to become more productive with deeper integration and greater competitiveness. It can improve quality of life by allowing citizens to work, study or receive medical attention on line. However, the digital transformation also brings risks for inclusive development, as mentioned in previous chapters, including winner-takes-all dynamics, increased disparities between and within countries, wider digital divides, automation of jobs, and security and privacy issues.

The coronavirus (Covid-19) crisis has highlighted benefits and pitfalls of the digital transformation in LAC. The pandemic and subsequent containment measures have shown the increasingly important role of new technologies. They have allowed part of the population to work or study and access updated information and public services while complying with social distancing. The Internet, digital platforms and e-commerce have allowed some socio-economic sectors to maintain activities.

Digital technologies can play an important role in the recovery while addressing persistent challenges in the region. They can facilitate new connections between supply and demand, commercial transactions and job matching. They can modernise traditional industries and create new ones. Coronavirus (Covid-19) containment measures highlighted the need to expand digital inclusion, to ensure that all benefit from the digital transformation. Despite improved connectivity, only citizens with adequate infrastructure and skills can benefit from the advantages of technological tools for working, studying or accessing goods and services. States have had to balance the use of digital tools to preserve public health with the risks that it could pose to privacy and security.

To make the most of the digital transformation in the context of the current crisis, international co-operation and new partnerships are more important than ever. The *Latin American Economic Outlook 2019: Development in Transition* (LEO 2019) called for a renewed model whereby international co-operation acts as a facilitator for LAC countries, supporting their strategies to overcome development traps (OECD et al., 2019). Given the highly transversal impact of digital tools, a renewed co-operation, with an extended network of partners that includes the private sector and civil society and focuses on the digital transformation of the LAC region, could support countries to overcome development traps. International co-operation can help them navigate the global context by contributing to productivity, social cohesion, better institutions and green economies, thus adopting a "human-centred" approach to the design and implementation of technology, which prioritises citizens' needs and rights.

Digital partnerships should play an essential role, supporting key dimensions for the region, including connectivity, digital skills, e-governments, entrepreneurship and job creation (European Commission, 2020a). Some countries in LAC and other regions have implemented good practices in information and communications technology (ICT). LAC countries can use some of these examples of co-operation in the digital field to foster development.

The coronavirus (Covid-19) crisis has revealed a need to increase co-ordination of international efforts, both to exploit the benefits of the digital age and to manage its potential pitfalls. This should be part of a larger role for international co-operation. The need for a global response to immediate and short- and medium-term impacts of the coronavirus (Covid-19) crisis cannot be overemphasised. International partners should

focus on three areas of co-operation: financial support, co-ordinated responses, and regional co-operation and integration (OECD, 2020a).

This chapter begins by exploring why a new model of international co-operation in digital initiatives is needed to foster development in LAC. It provides examples of how international co-operation in the digital sector can help LAC countries build domestic digital capacities to face the four development traps in the most efficient way. It examines the benefits of creating a regional digital market, including through deeper regional integration, considering the state of digitalisation in LAC, and what LAC could learn by observing and co-operating with other regions in digital development, notably the European Union (EU). Last, the chapter discusses how multilateral co-operation on digital tax issues could help LAC countries take greater advantage of the digital transformation.

Facilitating LAC's development through a renewed model of international co-operation

Challenges posed by the digital transformation call for the co-ordination of innovative policies at the international level. The coronavirus (Covid-19) crisis has accelerated the need for such responses, especially in LAC, where international co-operation on digital policies could play an essential role in overcoming development traps. To succeed, international co-operation with LAC should follow a renewed model, with digital initiatives co-ordinated at the international level to facilitate the region's development.

The digital transformation of economies and societies brings new opportunities and challenges that complicate the global context and increase the need for internationally co-ordinated policies. For instance, it has generated both cross-border trade opportunities and trade disputes between nations. Despite the economic activity they contribute to creating, digital companies pose taxation challenges that cannot be handled solely at the domestic level. The digital transformation has also created international policy issues related to access to digital tools, cybersecurity, data and intellectual property privacy and protection, fake news, future of work, artificial intelligence (AI) and the automation of production.

In LAC, international co-operation on digital issues could help solve persistent challenges. LEO 2019 identified four development traps in the region (low productivity, social vulnerability, institutional weaknesses and environmental risks) (OECD et al., 2019). The coronavirus (Covid-19) has intensified the need to address these challenges.

Many LAC countries entered the Covid-19 crisis with reduced fiscal space; more resources will be needed to manage the health-related and socio-economic impacts. As digital interactions spiked during the crisis, cybersecurity threats intensified and states must co-operate to protect citizens against external risks. While the pandemic accelerated adoption of digital technologies in some LAC countries, allowing some individuals and firms to continue to work, study and operate, it could amplify productivity gaps (see Chapter 2) and social vulnerability, with many Latin American citizens at risk of slipping back into poverty (see Chapter 3), and further erode trust in institutions (see Chapter 4). Greater international co-operation in the digital sector could be essential to overcome the region's interrelated challenges. It could help economies become more competitive, diversify the productive matrix, ensure that the digital transformation benefits all and promote more trustworthy, efficient, inclusive and innovative states. It is also important for LAC countries to build on international co-operation to close income, urban-rural and gender digital divides.

The coronavirus (Covid-19) crisis has made more evident the growing connection between national and global challenges, notably in the digital area, which has gained in

importance throughout the pandemic. As various co-operation initiatives already aim at harnessing the digital transformation to generate positive outcomes, it will be crucial to build on those to establish a new model of international co-operation, which can facilitate LAC countries' development, as identified in LEO 2019 (OECD et al., 2019).

Various initiatives promote new models of international co-operation in the digital sector. A renewed international co-operation framework should profit from current regional frameworks, such as the Economic Commission for Latin America and the Caribbean (ECLAC) Digital Agenda for Latin America and the Caribbean 2020 (eLAC2020), and benefit from greater cross-fertilisation and co-operation with other regions, based on their accomplishments (ECLAC, 2018a). The European Commission's digital single market strategy (DSM) resulted in shared benefits for member states (European Commission, 2019a). The EU General Data Protection Regulation (GDPR) is recognised as a step forward in tackling online privacy. Co-operating while building on these achievements could create opportunities to share the lessons of successful national and regional policies and help LAC countries make the most of the digital transformation.

At the multilateral level, despite becoming increasingly complex, the global architecture on digital co-operation has not necessarily become more effective. The United Nations' (UN) High-level Panel on Digital Cooperation is working on new global digital co-operation models, as well as on issues such as connectivity, digital inclusion, digital public goods, digital human rights and capacity building. The UN intends to act as a platform for multi-stakeholder policy dialogue on emerging technologies and the UN Secretary General will appoint an Envoy on Technology in 2021 (United Nations, 2020).

Building on this context, three main, interrelated components of a new model of international co-operation can contribute to sustainable development in LAC and developing countries in general. The model encourages: 1) nationally driven development processes by strengthening institutional capacities; 2) inclusive multilateral governance platforms to facilitate exchange on an equal footing; and 3) inclusion of new tools and actors within instruments to co-ordinate policies at the international level (OECD et al., 2019). These recommendations could have applications in the digital sector.

This model of international co-operation can help align national and international priorities in the digital world. Whether bilateral, regional, interregional or multilateral, some initiatives will, for instance, allow LAC countries to build, strengthen or reshape the digital ecosystems that will help them overcome the development traps. As many development challenges are interrelated, the most effective international initiatives contribute to building capacities in relation to several traps at once (see the section "Improving national capacities through international co-operation" and Annex 5.A1). Establishing a regional digital market could also help LAC countries use their digital potential to support their transition towards more sustainable development (see the section "Tapping into LAC's digital potential through regional integration"). At the multilateral level, co-operation on key global policy issues such as international digital taxation could provide additional resources for LAC countries' sustainable development (see the section "Addressing the global challenges arising from the digitalisation of the economy through multilateralism"). Such initiatives support LAC countries in devising their own development trajectories that answer national priorities while advancing international objectives, such as the UN Sustainable Development Goals (SDGs).

The renewed model touches on the governance of international frameworks and the need for them to include countries at all levels of development on an equal footing, as well as multiple stakeholders, to devise co-operation strategies that tackle the multi-dimensional nature of development. For LAC's digital sector, this means setting up multilateral co-operation platforms where all countries can participate in inclusive,

productive dialogues to share experiences, knowledge and exchanges on policies, international guidelines and standards. In that sense, it will be important for LAC countries to engage in partnerships with actors that promote a human-centred or multi-dimensional approach to development through digital co-operation (see the sections "Improving national capacities through international co-operation", Annex 5.A1 and "Exploring the potential of regional co-operation and interregional partnerships"). This could be done at the regional level: within the region's digital market, LAC countries could articulate all different levels of digital development and include multiple stakeholders to share experiences with digital issues (see section "Tapping into LAC's digital potential through regional integration"). At the multilateral level, it is also crucial to include LAC countries' voices in co-operation frameworks on digital global issues such as digital taxation (see the section "Addressing the global challenges arising from the digitalisation of the economy through multilateralism").

Table 5.1. **Facilitating Latin America and the Caribbean's development through renewed international co-operation in the digital sector**

Dimensions	Description	Application to digital co-operation
Building domestic capacities	Strengthening countries' capacities to design, implement and evaluate development policy priorities and plans, encouraging alignment between domestic and international priorities and ensuring integrated approaches to more complex and interlinked challenges	• Encouraging initiatives that build LAC countries' capacities to overcome several of the development traps • Building a regional digital market to tap into LAC's digital potential • Fostering co-operation at the multilateral level on issues such as digital taxation, for example through the OECD's Inclusive Framework on BEPS, which currently has 137 members, including most Latin American countries
Working inclusively	Engaging countries at all levels of development on an equal footing in building and participating in multilateral and multi-stakeholder partnerships to tackle shared multi-dimensional development challenges with multi-dimensional responses	• Engaging in partnerships that promote a human-centred and multi-dimensional approach to LAC's digital development • Articulating all levels of digital development and involving multiple stakeholders such as the private sector and civil society within LAC's regional digital market • Strengthen the involvement of LAC countries on an equal footing in multilateral and multi-stakeholder initiatives on issues such as digital taxation
Operating with more tools and actors	Expanding instruments for greater international co-operation (e.g. knowledge sharing, policy dialogues, capacity building, technology transfers) and including more actors (e.g. public actors) in a whole-of-government approach	• Promoting technical assistance and technology transfers through bilateral, multilateral, interregional, triangular and South-South co-operation for the development of LAC's digital capacities • Establishing policy dialogues and encouraging knowledge sharing and capacity building between LAC countries within a regional digital market • Fostering new multilateral co-operation initiatives on key global digital issues

Source: OECD et al. (2019), *Latin American Economic Outlook 2019: Development in Transition*, https://doi.org/10.1787/g2g9ff18-en.

The model also advocates for the inclusion of more tools and actors in the choice of international co-operation instruments and agents. This consists, for instance, in setting up knowledge-sharing platforms, insisting on technology transfers and capacity building, or adopting a whole-of-government approach when including public actors. LAC countries can engage in bilateral, multilateral, triangular and South-South co-operation (SSC) initiatives that establish technology transfers or technical assistance to build their digital capacities (see the section "Improving national capacities through international co-operation" and Annex 5.A1). A regional digital market could also serve as a platform to set up policy dialogues, capacity building and knowledge sharing between LAC countries (see the section "Tapping into LAC's digital potential through regional integration"). At the multilateral level, such renewed mechanisms could form part of issue-based co-operation initiatives on matters of international concern (see section "Addressing the global challenges arising from the digitalisation of the economy through multilateralism").

Improving national capacities through international co-operation

There already are examples of how international co-operation initiatives in the digital sector have had positive outcomes for LAC countries. Specifically, they can help increase domestic capacities to address the productivity, social vulnerability, institutional and environmental development traps (Annex 5.A1).

Limiting the impact of examples to one of the four traps would oversimplify both the multi-dimensional nature of development and the effect of international co-operation. There are strong interactions among development traps, and some initiatives can help build capacities against more than one. For instance, digitalisation of jobs can enhance productivity (productivity trap) and exacerbate inequalities, as low-skilled workers might be left further behind (social vulnerability trap). Job market transformations might also represent a challenge for state services, as current social security schemes might be inadequate to respond to new working conditions (institutional trap).

Sound analytical tools and co-ordinated policy responses that account for how development traps interact and reinforce each other are increasingly relevant. Better understanding the links and common causalities among policy issues and objectives is crucial to developing effective responses. It is essential to identify win-win policies that promote synergies and address trade-offs. The productivity inclusiveness nexus, for instance, suggests numerous links between these objectives, and calls for policies that boost both simultaneously (OECD et al., 2019).

By helping LAC countries address the complexity of their development challenges, international co-operation initiatives could help build necessary bridges between the region's national and international priorities. Existing examples in the digital sector could help translate guidelines into concrete results. International partnerships that effectively address the complexity of LAC's development challenges are emerging: for instance, the Building the Europe Link with Latin America Programme (BELLA), a 12-year strategic partnership on digital issues between Brazil and the European Union; the Environmental Technology Centre (CTA) in Peru; and opportunities for South-South co-operation through the People's Republic of China's (hereafter "China") Digital Belt and Road Initiative (BRI).

BELLA aims to provide for the long-term interconnectivity needs of European and Latin American research and education communities through the construction of a submarine optic fibre cable between the regions. BELLA also supports deployment of secure high-speed connections among Latin American countries. The initiative is co-financed by the European Union and Latin America, with an important contribution from the private sector. It draws on and strengthens co-operation between the regions' research and education communities (Annex 5.A1) (BELLA, 2019).

Contributing to upgrading LAC's communication infrastructure and its connection with other regions is an example of how international co-operation can bring about strategies that help LAC navigate the digital transformation, opening possibilities for its digital market, enhancing productivity prospects and fostering innovation and knowledge-based economic growth. BELLA will also use digital tools to support education and research, fortifying LAC citizens against the social vulnerability trap. Multi-dimensional approaches to international co-operation in the digital sector can help LAC use the digital transformation to address several development traps.

Bilateral co-operation initiatives can also be effective. Since 2008, Brazil and the European Union have implemented a Partnership for Scientific and Technological Cooperation, developed through a series of calls for joint research and innovation (European Commission, 2008). Based on extensive consultations between stakeholders and experts, the collaboration has generated 20 research projects totalling EUR 50 million. Co-operation

domains, including manufacturing, water management and agriculture, and the health and well-being of populations at risk, reflect Brazilian priorities in the digital age and are consistently improved by readjusting their impacts. The initiative leverages the digital transformation of the economy to help Brazil build capacities against the productivity, social vulnerability and environmental traps. By setting up policy dialogue on subjects with ramifications in various areas, such as digitalisation, international partnerships can launch initiatives that effectively address the multi-dimensional nature of development.

This co-operation initiative has had a wider structural impact by connecting national priorities to international challenges. As a result of co-operation on 5G, the Internet of Things (IoT) and cloud computing, based on projects launched in 2018 through the EU Horizon 2020 programme, Brazil joined the European Union on international-level discussions on the development of 5G and the IoT, and signed a joint declaration (European Commission, 2016). This was followed by arrangements among industrial stakeholders in the European Union and Brazil, including Telebrasil, 5GPP, the IoT Chamber and the Alliance for Internet of Things Innovation. This virtuous co-operation remains important in shaping Brazil's digital priorities, such as the country's 5G strategy and IoT Plan: according to former Vice Minister of Science, Technology, Information and Communications Martinhão, the co-operation with the European Union played a key role in reshaping Brazil's approach to research and innovation, aligning it with best practices standards of international organisations, such as the Organisation for Economic Co-operation and Development (OECD) (Annex 5.A1) (Ministério da Ciência, Tecnologia, Informações e Comunicações, 2017).

Other modalities of international co-operation, such as triangular co-operation, can also positively affect LAC capacities. To comply with new Peruvian environmental regulations and criteria imposed on exporters by international markets, important branches of Peruvian industry urgently needed experts in environmental technology, particularly in advisory and laboratory services. Between 2012 and 2014, Brazil and Germany co-operated with Peru to create the CTA (2012-14), which offered training adapted to market needs. A renewed model of international co-operation that includes new tools, such as triangular co-operation, dialogue on lessons learned, capacity building and knowledge exchange, can help leverage ICT to build LAC's capacities (Annex 5.A1) (GIZ, 2014).

Although a more recent co-operation framework with less information regarding outcomes, the BRI illustrates how South-South co-operation can play a key role in providing developing countries with infrastructure for the future of ICT while addressing their development challenges. Through the BRI, China is spearheading one of the most ambitious development plans in history. An estimated USD 1 trillion in infrastructure investments over ten years (since 2017) will enhance connectivity throughout Eurasia, Africa and close to 100 partner countries, establishing new forms of co-operation through technical exchange among countries in the Global South (OECD, 2018a).

The ICT component of this South-South co-operation framework, known as the Digital BRI or Digital Silk Road, could bring sustainable development to emerging markets through modern ICT infrastructure, such as 5G networks, international e-commerce platforms, smart cities and data centres, satellites, submarine Internet cables, Big Data and optical fibre networks across countries and regions. As of August 2019, Chinese entities had invested over USD 17 billion in Digital Silk Road projects completed since 2013 (Annex 5.A1) (Merics, 2019).

Although data on estimated outcomes are limited, the initiative is expected to allow developing countries to enter international and new, high value-added markets while advancing towards achieving the SDGs.

Tapping into Latin America and the Caribbean's digital potential through regional integration

To realise the full potential of the digital transformation, LAC countries need to update their communication infrastructure and upgrade to a regional digital market. Overcoming obstacles requires enhancing and harmonising regional co-operation initiatives.

The state of digitalisation in LAC and the benefits of a reinforced regional digital market

LAC is a large digital market. Yet, despite improvement in recent years, penetration remains poor compared with the OECD and the European Union (see Chapter 2). LAC counts 600 million consumers vs. slightly over 500 million in the European Union. However, e-commerce represented 3.0% of total retail trade in 2016, and in 2018 the percentage of Internet users was close to 68% of the total population, compared with more than 84% in the OECD (see Chapter 2). Although 3G covers populations across LAC evenly, 4G network coverage varies, from 20% in Honduras to almost 90% in Chile (ECLAC, 2018b).

A regional digital market could be key for LAC countries to close regional and intraregional gaps (see Chapters 2, 3 and 4 for the analyses of different gaps) and exploit their full digital potential (ECLAC, 2016). It could be particularly relevant for priority areas for the region, such as increased infrastructure, connectivity and digital services and content (Cullen International SA, 2019). A regional digital market could support infrastructure expansion and help LAC in its transition towards more sustainable, inclusive development (Cullen, I., 2016; ECLAC, 2018b). The ICT sector could realise greater economies of scale, competition (which can ultimately benefit consumers) and growth prospects. Increased competition is key for disciplining prices, promoting innovation and improving responsiveness to demand (OECD/IDB, 2016). Greater regional interconnectivity would help reduce costs for end users and increase data transmission speeds. A regional market could also allow greater access to online goods and services (Cullen International SA, 2019).

The regional digital market could also help LAC provide better access to online goods and services, which could help intraregional trade bounce back after the coronavirus (Covid-19) crisis. The high number of unbanked LAC citizens is a main obstacle to the development of e-commerce (Cullen International SA, 2019). Others include lack of trust in consumer protection or delivery logistics (ECLAC, 2018b) and, according to the UN Conference on Trade and Development B2C E-Commerce Index, insufficient Internet penetration (UNCTAD, 2016). A regional market could promote e-payment, e-contracts and e-signatures – solutions that could be adapted to the region's high mobile broadband penetration and compensate for lack of traditional payment methods – to develop e-commerce. To that end, LAC countries should co-operate to foster common guidelines and tools to increase trust and protection. The region also lacks common and harmonised frameworks for cybersecurity, privacy and data protection, and copyright and online piracy.

A regional digital market requires more integrated regional co-operation

To build a regional digital market countries should enhance regional co-operation by building on existing platforms.

Obstacles to a regional digital market

Efforts to harness the digital transformation of the economy should consider common regulation. Common rules are a fundamental aspect of international co-operation initiatives in the digital sector, as illustrated by several EU digital regulation

initiatives, for instance, the GDPR and the Regulation on the free-flow of non-personal data. Ongoing international debates also demonstrate the necessity to regulate the digital transformation. The United Nations has made various co-operation efforts towards international regulation, standardisation or dialogue on common principles for cybersecurity and intellectual property.[1] Regulatory co-operation can contribute to the expansion of the digital economy, as illustrated by the impact that the International Organization for Standardization (ISO) standards have had on the usability and the dissemination of digital media (OECD/ISO, 2016).

Regional and sub-regional organisations are looking into regulation of the digital market and ways to improve connectivity, infrastructure and access to online goods and services. Various regional and sub-regional LAC partnerships, alliances or co-operation forums are implementing several concomitant plans to develop LAC's digital economy. In fact, so far a number of initiatives of South-South and triangular co-operation have contributed to strengthening LAC countries' digital capacities through innovation. These initiatives were implemented in the Ibero-American region from 2007 to 2017 (Box 5.1).

Box 5.1. **Innovation for development in Ibero-America through South-South and triangular co-operation**

In the Ibero-American space, South-South and triangular co-operation projects have had a key role in promoting innovation. According to the data collected in the online Platform on South-South and Triangular Co-operation, between 2007 and 2017, Ibero-American countries participated in a total of 8 208 initiatives, and more than 10% of these (840) were South-South or triangular partnerships based on the exchange of knowledge and experiences with a clear component of innovation (Figure 5.1).

Of the 840 South-South and triangular co-operation initiatives, 30% are devoted to innovation and development (255), have a clear scientific-technological component and pursue an application that generates economic value. Another 10.8% are linked to the communications sector, and respond to a clear pattern of adaptation to the transformations imposed by the digital age. However, it is interesting to note that almost 6 out of 10 of these 840 initiatives come from sectors that are related to innovation from a broader and cross-cutting approach. This has been a distinctive feature of South-South and triangular co-operation for more than a decade in the Ibero-American region.

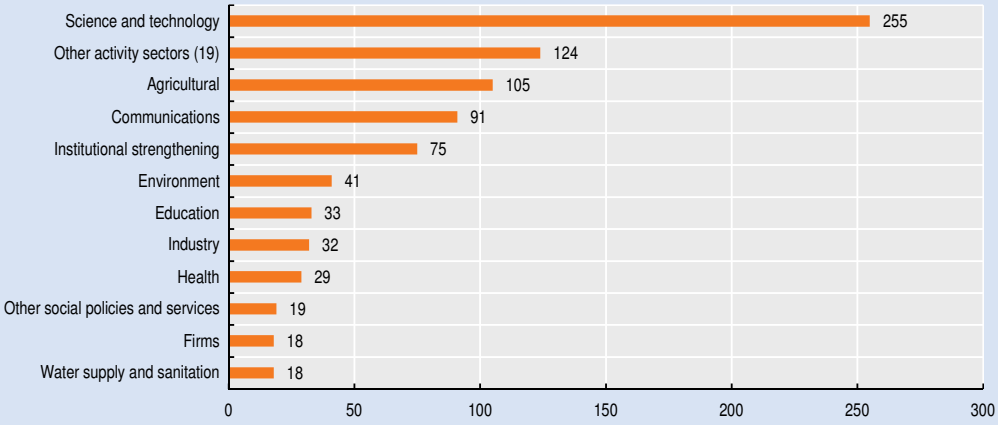
It is worth highlighting, for instance, that more than 100 initiatives contribute to sustainable development through the adoption of new techniques, management models or processes that allow the transformation of the agricultural sector to improve its productivity levels, but also to adapt them to the challenges posed by climate change and the increased frequency of extreme weather events. In addition, 8.9% correspond to innovations that strengthen institutions and public policies through the digitalisation of administration, online government, and the implementation of information systems and BigData. Other innovation processes act on the environment (5% of the initiatives), mainly from the adoption of technologies and tools for mitigation and adaptation to climate change.

Finally, it is worth noting that some initiatives contribute to modernise the industry sector (5%); others are in the field of education (through the adoption of new learning approaches), health (new treatments, telemedicine and advances in biotechnology), water supply and sanitation (new techniques for water treatment and its management). Also, some initiatives are related to other social services and policies (transfers of strategies, models and programmes that transform social reality).

Box 5.1. **Innovation for development in Ibero-America through South-South and triangular co-operation** *(cont.)*

Figure 5.1. **South-South and triangular co-operation initiatives that promote innovation, by sector**

2007-17 (in units)



Source: Secretaría General Iberoamericana (SEGIB)'s own elaboration based on the online Ibero-American Integrated Data System on South-South and Triangular Co-operation (SIDICSS).

StatLink https://doi.org/10.1787/888934172787

The evidence systematised over the years shows that South-South and triangular co-operation constitute powerful tools to promote innovation through knowledge exchange adapted to the local context, and are therefore more effective and efficient, not only within the Ibero-American region but also with other regions. Within this framework, the SEGIB and the European Union have established a strategic alliance in order to strengthen an innovative model of triangular co-operation within the framework of Development in Transition. Innovation, understood in its broad concept, is undoubtedly a key element for the achievement of the 2030 Agenda for Sustainable Development, as promoted by the Ibero-American Summit of Heads of State and Government, under the slogan "Innovation for sustainable development". In this sense, the concept of innovation goes beyond what is strictly scientific and technological and understands innovation as "all change (not necessarily technological) based on knowledge (not necessarily scientific) that generates value (not only economic)" (SEGIB, 2020).

More integrated co-operation through existing platforms could help LAC overcome obstacles

The idea to create a regional digital market emerged at the 2015 ECLAC Ministerial Conference on the Information Society, becoming a strategic priority of the eLAC2020. LAC countries agreed on actions and the section dedicated to this objective. Specifically, the strategic goal calls for the establishment of a regional strategy to increase trade, expand the digital economy and strengthen competitiveness through regulatory coherence, infrastructure integration, digital platform development, ease of cross-border data flows and trade facilitation measures (ECLAC, 2018a).

The idea, inspired by the EU DSM, has permeated at the sub-regional level. The Pacific Alliance (PA) has its own digital agenda, which includes implementation of a regional digital market platform, taking the agreements of the eLAC2020 as a reference (Pacific

Alliance, 2016). Similarly, in Central America, countries in the Mesoamerica Program (MP),[2] in collaboration with the Central American Integration System (SICA) Regional Technical Telecommunications Commission (COMTELCA),[3] are initiating activities to establish a regional digital agenda with aspirations similar to those of the PA initiative. The Caribbean Community (CARICOM) has been promoting the single ICT space strategy. The strategy constitutes the digital arm of the CARICOM Single Market Economy and aims to enable a borderless ICT space that fosters economic, social and cultural integration. It comprises regionally harmonised ICT policies, legislation, regulations, technical standards, best practices, networks and services.

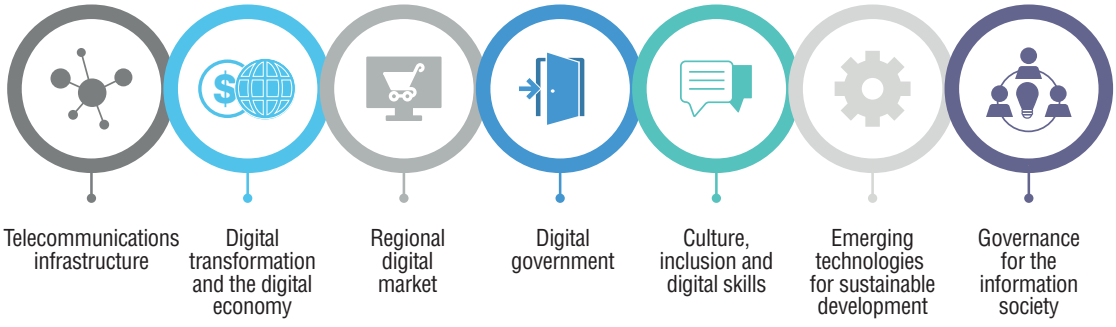
Other regional or sub-regional co-operation mechanisms, such as the Asia-Pacific Economic Cooperation (APEC), the Organization of American States (OAS), the Southern Common Market (MERCOSUR) and the Trans-Pacific Partnership (TPP), have adopted digital development plans and agendas or included measures that promote the development of LAC's digital sector (Cullen International SA, 2019).

Not all LAC countries participate in the same treaties or organisations, with the exception of the ECLAC and OAS, and not all measures apply to all countries. As a result, despite common goals and areas of work, there is fragmentation of measures and overlap of efforts (Cullen, I., 2016), which undermine potential benefits for LAC's digital sector.

More integrated co-operation through existing platforms could help LAC overcome these challenges. To harmonise existing digital co-operation initiatives, LAC countries could build on regional co-operation platforms, such as the Digital Agenda for Latin America and the Caribbean (eLAC) or the OAS Inter-American Telecommunication Commission (CITEL). Further integration could promote a renewed international co-operation model.

Although LAC has no single institutional framework for the adoption of norms and standards, the eLAC is a key platform to define common principles and priorities for the digital sector. An important feature of the eLAC is that it brings together 23 LAC countries, as well as representatives from the private sector, civil society and the technical community, to co-operate on issues relating to the digital transformation. The eLAC2020 was approved in April 2018 within the framework of the sixth Ministerial Conference on the Information Society in Latin America and the Caribbean. It sets out 54 co-operation activities, to be carried out by 9 working groups, aimed at strategic goals in a range of areas: connectivity and communication infrastructure; the digital economy; digital government; digital skills and an enabling environment; and a regional digital market (ECLAC, 2018a) (Figure 5.2).

Figure 5.2. **Areas of action of the Digital Agenda for Latin America and the Caribbean**



Source: ECLAC (2018a), *Digital Agenda for Latin America and the Caribbean (eLAC2020)*.

The eLAC2020 calls on countries to foster the development and implementation of broadband plans with measurable targets for the deployment of high-capacity networks. Countries also agreed to co-operate on expanding Internet penetration, especially through Internet exchange points and the deployment of Internet Protocol version 6. The eLAC2020 invites countries and private-sector associations, such as Asociación Interamericana de Empresas de Telecomunicaciones and GSMA, to participate in this dialogue and to propose a regulatory framework for convergence and public policies for the development of communication infrastructure in the region (ECLAC, 2018a).

To support the digital economy, governments agreed to encourage use of digital technologies in businesses, with a focus on small and medium-sized enterprises (SMEs), and promote entrepreneurship ecosystems and teleworking. A list of basic harmonised indicators for the information and technology industry has been defined. LAC countries will also co-operate on digital government issues, including work on adoption of regional standards for the interoperability and management of digital services, such as digital identity, e-signatures, e-apostilles and electronic medical records. Within the framework of the LAC electronic government network, a programme was proposed to develop and implement a framework to review and harmonise technical conditions for cross-border e-signature recognition (ECLAC, 2018a).

Using emerging technologies, promoting public policy design supported by evidence-based innovation and strengthening entities responsible for designing, implementing and monitoring digital policies constitute another area of work. The eLAC's objectives promote a people-centred approach to digital governance, for instance, by integrating a gender equality perspective into digital policies and safeguarding public information and freedom of expression. The eLAC2020 acknowledges the need to promote the development and incorporation of digital skills and computational thinking into education (ECLAC, 2018a).

As the eLAC covers the whole region, it could be the indicated co-operation platform to harmonise and consolidate regional and sub-regional initiatives in the digital area. Numerous such initiatives share objectives and areas of work; it is crucial to establish common principles and guidelines to ensure regulatory coherence throughout the region.

Sub-regional institutions, such as the PA and MP, have built on the eLAC to devise their strategies. The ECLAC is integrating initiatives into a broader regional framework. For instance, part of the eLAC's work on promoting digital trade strategies is done in partnership with the PA (ECLAC, 2018a). The PA's digital agenda sub-group is working with the ECLAC on a roadmap to materialise its commitments and promote compatible norms and standards among its members on technical interoperability, technological neutrality, personal data protection, cross-border data flow, consumer protection, cybersecurity, competition, intellectual property, trade facilitation, and taxes and tariffs on e-commerce. MERCOSUR has proposed similar work, and the PA has started conversations to converge. In that framework, the ECLAC provides additional platforms, such as a political panel conducted by Brazil and Mexico, which invites PA and MERCOSUR representatives to discuss trade promotion by boosting e-commerce (ECLAC, 2018a).

Such a broader regional framework could integrate and harmonise existing initiatives that cater to countries' and sub-regions' specific circumstances and digital development. Digital development contrasts in the region are such that LAC countries can provide technical assistance to each other. For instance, to reduce its digital gap, El Salvador receives support in promoting a digital transformation of institutions from the Uruguayan Agency of Electronic Government and Information Society (Red de gobierno electrónico de América Latina y el Caribe, 2019). At the regional level, El Salvador is part of Proyecto de Integración y Desarrollo de Mesoamérica, along with Colombia, Costa Rica, Guatemala,

Mexico and other countries. The interconnectivity branch of the project promotes public policies that reduce Internet costs and increase ICT access, thereby decreasing the digital divide in the sub-region. The project launched the Mesoamerican Information Highway, a 1 800 km regional fibre-optic network, administered by the public-private company Red Centroamericana de Telecomunicaciones, aimed at lowering broadband costs and increasing Internet penetration in Central America (Proyecto de Integración y Desarrollo de Mesoamérica, 2020).

A main positive outcome of eLAC has been its influence on national policy design. Nine national digital strategies articulate objectives in accordance with those in the eLAC2020. The strategy is emerging as a regional benchmark for the approach and scope of digital policies in LAC.

Over the years, political agreements within the agenda have consolidated regional positions on key issues. In 2013, the Declaration of Montevideo made a claim to avoid registration in various languages of the top-level domain names ".amazon" and ".patagonia" in defence of national and sovereign interests. The 2018 Declaration of Cartagena de Indias rejected unauthorised collection and improper and/or unauthorised use of personal data by any public or private entity, and promoted mechanisms to ensure transparent treatment of personal data (ECLAC, 2018a)

eLAC has also generated significant analytical material and reports to assist policy design, and promoted training for public officials, harmonisation of ICT statistics, exchange of best practices and policy dialogue. It has proved a successful tool to catalyse co-operation efforts at the regional level. In recent years, countries have promoted greater harmonisation of norms and standards, especially through the creation of a regional digital market strategy, an idea finally being incorporated into commercial and co-operation blocks at the sub-regional level. It is critical that eLAC be strengthened and allow greater dialogue among trade blocs as they develop and implement next-level integration strategies (ECLAC, 2018a).

LAC countries could also rely on the OAS, although it extends to non-LAC countries. The CITEL Strategic Plan for 2018-22 aims at the full integration of the American states into the world information society and the digital economy, with a view to enabling and accelerating social, economic, cultural and environmentally sustainable development for all inhabitants through the development of ICT (OAS, 2018). Two main CITEL activities are identifying best practices to reduce the digital divide between member states, notably through public policy and regulatory environment recommendations, and promoting gender equality, diversity and inclusion in the ICT sector (OAS, 2018).

LAC countries could use eLAC and CITEL to integrate and harmonise their efforts to boost digital sectors at the regional and sub-regional levels. Such regional co-operation platforms could provide an adequate space to discuss ways to benefit LAC consumers by enhancing connectivity.

A more integrated regional platform would allow LAC countries to promote a new model of regional co-operation in the digital field. Taking into account their national development strategies, they could determine to what extent and in which areas to deepen collaboration to benefit further from their growing digital markets. An integrated regional platform could promote the active participation of countries at all levels of development, align national and global priorities, and promote the region's participation in the global agenda. It could allow intra-regional discussions on measures to promote, for instance, e-payment to facilitate the growth of e-commerce or higher regional interconnectivity.

Regional co-operation to improve e-commerce, e-payments and lack of trust could include technical assistance for smaller countries, and analysis, definition and impact

studies of action plans and common standards. This would help countries determine the extent to which to harmonise their rules to maintain national sovereignty while expanding e-commerce opportunities in the region. Sharing national examples, such as the 2018 General Data Protection Law in Brazil, and technical co-operation initiatives, such as the one between the Uruguayan Agency of Electronic Government and Information Society and El Salvador on digital government, could allow for a more cohesive approach, with increased technical co-operation based on knowledge, capacity building and policy dialogue.

Building a regional digital market for LAC will require adequate understanding of the relevant regional and sub-regional gaps and ways to address them. It will also require strong, continuous political support to co-ordinate joint efforts and integrate actors, in the digital sector and in LAC countries, while maintaining national sovereignty.

New partnerships: How the private sector and civil society can support the establishment of a digital regional market

Multi-stakeholder partnerships can help tackle shared complex development challenges with multi-dimensional responses. Stakeholders other than public institutions, such as the private sector and civil society, could participate.

The creation of a regional digital market would significantly enhance business opportunities and support regional business models. Many digital businesses in the region operate in multiple national territories, e.g. via Mercado Libre, the region's largest e-commerce platform. A regional digital market could also support the tech start-up ecosystems emerging in regional hubs, such as São Paulo, Buenos Aires and Mexico City: there are 123 *Tecnolatinas*, including 9 "unicorns" (EMnet, 2020).

The private sector can help close digital divides. Greater access to the digital economy will be critical to ensure that regional initiatives contribute to closing digital divides between and within LAC countries. Understanding how private-sector initiatives geared towards expanding markets can be leveraged will be key. *Internet para Todos*, developed by Telefónica, Facebook, the Development Bank of Latin America and the Inter-American Development Bank, was created to connect communities in isolated areas while ensuring a financial return and commercial viability that could be replicated to bring Internet access to over 100 million people in LAC. New technologies and business models have rendered previously unconnected and under-connected areas in Peru profitable (NERA Economic Consulting, 2020).

The private sector can support the integration of unbanked sectors of the population. Fintech has improved access to credit, in particular for SMEs, helping reduce compliance costs and facilitating digital payments at low cost and with high security, benefitting segments of society previously unbanked or underbanked (OECD et al., 2019).

To make the most of technological advances, private-sector participation in the implementation of a regional digital agenda must be multi-sectoral. Co-operation at various government levels can bring value added. For instance, digitalisation can create more efficient electrical grids that can facilitate large-scale renewable energy provision and enhance energy efficiencies. Through shared value projects, LAC utility companies, such as Colombia's Grupo Energía Bogotá, based in Brazil, Colombia, Guatemala and Peru, are promoting access to sustainable energy solutions for communities previously unconnected to the grid (EMnet, 2020) and ensuring that new technologies contribute to inclusive, sustainable growth. Creating platforms that work with a wide range of stakeholders at regional and national levels will be key to building lasting collaborations.

During the coronavirus (Covid-19) pandemic, civil society has helped overcome school closures and the digital divide, preventing the deepening of education inequality. School systems have drawn on their experience with reaching remote areas and mass media education broadcasting. Education leaders and teachers, in close collaboration with local authorities and the private sector, have expanded Internet access in specific zones and provided students with ICT tools. They have also combined online learning platforms with WhatsApp, mobile or social media, traditional media (television, radio) and printed materials delivered to students and parents without Internet access (Basto-Aguirre, Cerutti and Nieto-Parra, 2020).

Civil society can also promote ethical use of digital tools in the public space through international co-operation. The digitalisation of LAC societies has had a strong impact on political processes, citizen rights and civil liberties. Disinformation, digital microtargeting and the exacerbation of collective determinants of vulnerability already subject to discrimination threaten to erode the quality of LAC democracies (see Chapter 4).

LAC civil society organisations can play a key role through co-operation in various activities, such as fact-checking on platforms elaborated with journalists, promoting new social norms and debunking anti-rights and fundamentalist discourse, and promoting open software and digital solutions. International government-civil society co-operation platforms could strengthen democratic values. For instance, 15 LAC countries[4] have signed the Open Government Partnership, agreeing to empower citizens and become more inclusive and transparent. Every two years, members submit an action plan, co-created with civil society, that outlines commitments to enhance transparency, accountability and public participation in government. In light of disruption of traditional co-operation processes due to the coronavirus (Covid-19) crisis, the partnership provided a guide to maintain co-creation processes on line, including practical tips, a curated list of online tools and platforms, and country examples (Open Government Partnership, 2020).

Exploring the potential of regional co-operation and interregional partnerships

In developing its regional digital ecosystem, LAC countries could explore which and how digital co-operation policies worked in other regions, and build interregional partnerships to share these experiences. The European Union's digital strategy is a valuable example of how regional co-operation in the digital sector can promote a human-centred approach.

The potential of regional co-operation: The European Union's digital strategy

The EU digital strategy's vision of a digital transformation that "works for people" and fosters sustainable growth has gained relevance since the coronavirus (Covid-19) crisis. The current 2019-24 digital strategy stems from the 2014-19 European Commission's DSM strategy. The Single Market seeks to guarantee the free movement of goods, capital, services and labour across all EU member states to generate economic growth and enhance citizen well-being. As a declination of the Single Market, the DSM seeks to open up digital opportunities for people and business and enhance Europe's position as a world leader in the digital economy by guaranteeing secure online access across Europe (European Commission, 2019b).

The DSM strategy's three pillars are stated as: access (better access for consumers and businesses to digital goods and services across Europe); environment (creating the right conditions and a level playing field for digital networks and innovative services to flourish); and economy and society (maximising the growth potential of the digital

economy) (European Commission, 2019b). Operationalisation of the pillars could enhance business competitiveness and productivity and consumer savings.

A fully functional DSM could have contributed up to an additional EUR 415 billion, or 3%, annually to the EU gross domestic product (GDP) by 2020. Facilitating e-commerce throughout Europe would bring greater efficiency and economies of scale, along with additional gains through enhanced competitiveness and better sourcing strategies across borders. This could result in lower prices and greater consumer choice. If e-commerce attained 15% of the total retail sector and single-market barriers were removed, the more intensive e-commerce landscape could by itself amount to long-term gains of EUR 204 billion, or 1.6% of EU GDP (European Parliamentary Research Service – European Added Value Unit, 2017) (Table 5.2).

Table 5.2. **Potential GDP gains from the Digital Single Market**

Blocks of potential GDP gains	Costs (EUR billion/year)
E-commerce	204
E- procurement	100
Single European Payments Area and e-payments	2
E-invoicing	40
Cloud computing	47
Online and alternative dispute resolution systems	22
Total	415

Source: European Parliamentary Research Service – European Added Value Unit (2017), *Mapping the Cost of Non-Europe 2014-19*, www.europarl.europa.eu/RegData/etudes/STUD/2017/603239/EPRS_STU(2017)603239_EN.pdf.

The DSM would also bring higher productivity thanks to a faster flow of information, which would benefit knowledge service industries, increase productivity in business-to-business (B2B) transactions and government services, and generate savings in public procurement procedures. E-procurement has been identified as a vector for an estimated potential annual gain of EUR 100 billion for the European economy. Moving from 5% of all annual B2B transactions in 2010 to widespread adoption in 2020, e-invoicing could bring EUR 40 billion annually. A low-end estimate of the implementation of the Single Euro Payments Area points towards an annual EUR 2 billion surplus for the European economy. By pushing for widespread public- and private-sector adoption of cloud computing, the DSM could also add up to EUR 47 billion to the EU GDP in saved ICT expenditures.

Last, potential savings for European consumers of EUR 20 billion, if quality alternative dispute resolution solutions were available, and EUR 2.5 billion, if online dispute resolutions for cross-border e-commerce transactions were available, would bring an additional EUR 22.5 billion to the European economy.

Importantly, an initiative based on the EU DSM could allow for new, more inclusive approaches to the world of work and promote gender equality, gender inclusion and female empowerment in LAC. The EU DSM provides ways to advance SDG 5 through initiatives such as Women in Digital (WID), which supports women's participation in the digital sector. If female participation increased, the EU GDP could gain an annual EUR 16 billion surplus (iClaves, 2018). The European Commission's WID scoreboard assesses member states' performance in gender equality in the digital sector. The scoreboard is strongly correlated to the Digital Economy and Society Index, which measures EU member states' general performance in the digital sector. This means that member states that lead in digital competitiveness also lead in women in digital (European Commission, 2019c).

The 2014-19 EU DSM strategy resulted in shared benefits for member states (European Commission, 2019a). It has also led in achievements that will ensure better co-ordination

in the digital sector, fostering better opportunities and protections (e.g. the GDPR, which protects personal data). It also resulted in the Open Data Directive and the Regulation on the free flow of non-personal data, which allows companies and public administrations to store and process non-personal data across the European Union, ensuring the free flow of non-personal data and the development of the data economy and realisation of its benefits (European Commission, 2019d). The DSM strategy included the Cybersecurity Act, which establishes a certification framework for digital products, services and processes, and extended the EU Agency for Cybersecurity's mandate while doubling its budget (European Commission, 2019e). Last, the DSM strategy resulted in a co-ordinated strategy on artificial intelligence (AI), under which national AI strategies will help scale up regional investments in AI, among other commitments (European Commission, 2018a).

The new 2019-24 digital strategy builds on these achievements with an even more human-centred and resilient approach, making the European Union a solid co-operation partner to help LAC channel its digital sector to build back better after the coronavirus (Covid-19) crisis. *Political Guidelines for the Next European Commission 2019-2024* stresses the need for Europe to "lead the transition to a healthy planet and a new digital world" (von der Leyen, 2019). Six new priorities for 2019-24 capture the region's ambition to become a global leader. They include a new strategy for Europe's digital sector – A Europe fit for the digital age – which aims to make the digital transformation work for people and businesses, adopting a human-centred approach while helping Europe achieve its climate-neutral by 2050 target. The European Union will further develop its unique digital co-operation model and promote it in its co-operation with other countries and regions.

The new digital strategy has three pillars (European Commission, 2019f). The first is to ensure that technology works for people. The European Union will invest in building citizens' digital competences, protecting citizens from cyber threats and ensuring AI development that respects rights and earns trust. It will also include rolling out ultra high-speed broadband for homes, schools and hospitals and expanding Europe's supercomputing capacity to develop innovative solutions for medicine, transport and the environment. The second pillar is to continue to establish a fair and competitive digital economy. The European Union will enable start-up and SME access to finance, propose a Digital Services Act to strengthen the responsibility of online platforms and clarify rules for online services, adapt EU rules to the digital economy, ensure that all companies compete in Europe on fair terms, and increase data access while safeguarding personal and sensitive data. The third pillar is to channel the digital transformation to support an open, democratic and sustainable society. The European Union will enlist technology to become climate neutral by 2050, for instance, by reducing the digital sector's carbon emissions. The strategy will also create a European health data space to improve citizens' control over and protection of their data and foster targeted research, diagnosis and treatment; and uphold democratic values by fighting disinformation on line and facilitating diverse and reliable media content.

Three action areas to achieve these objectives build on the 2014-19 DSM strategy's achievements. The first action consists in building excellence and trust in AI development, which can help find solutions to policy issues, from health to farming, security and manufacturing. Second, the new strategy builds on regulations and directives adopted under the last Commission to create a single market for data. The European Union aims to become a leader in a data-driven society, allowing data to flow freely within the region and across sectors for the benefit of businesses, researchers and public administrations. Last, the European Union is implementing an industrial strategy that builds on the green and digital transformations to empower industry and SMEs to remain competitive at the global level.

Positioning the European Union as a global leader for the digital transformation is a key element of the new digital strategy. Becoming a global role model for the digital economy

implies supporting developing economies in going digital and developing and promoting international digital standards. BELLA and the European Union-Brazil Partnership for Scientific and Technological Cooperation illustrate how digital co-operation initiatives can have a multi-dimensional impact on development challenges. Through human-centred approaches that consider social or environmental aspects, such initiatives will ultimately make technology work for people, as envisioned by the European Union's digital strategy, and help LAC use the digital transformation to address several often interconnected development traps and fortify LAC citizens against them. LAC could both use the European Union's digital strategy as a model for developing a regional digital market and see the European Union as a co-operation partner that could help guide LAC's digital transformation towards greater resilience against development traps or global risks, such as the coronavirus (Covid-19) pandemic.

The Digital North: Implementation of the European Union's digital strategy at sub-regional and national levels

The Nordic-Baltic region provides a useful example of how countries can implement the European Union's regional digitalisation standards at the sub-regional and national levels, adapting them to their levels of digitalisation while leveraging international co-operation to reap the benefits of such policies.

While the EU DSM set supranational standards for member states to attain at the regional level, countries remain responsible for finding the right policies to implement them at the national level: states must articulate the objectives with respect to their national contexts, capabilities and targets. Nordic and Baltic countries, including some non-EU members, adopted a common vision for digitalisation, implementing EU objectives, building experience and providing an example for the rest of Europe. It could also serve as an example for LAC to articulate sub-regional and national heterogeneity within a broader regional framework.

On 25 April 2017, during the Nordic-Baltic Ministerial Conference on Digitalisation, ministers responsible for digital development in Denmark, Estonia, the Faroe Islands, Finland, Iceland, Latvia, Lithuania, Norway and Sweden adopted the declaration, "The Nordic-Baltic region: A digital frontrunner" (The Digital North Declaration). It aims at building on the common "digital maturity" of the region's societies to spur the development of a more efficient DSM. Specifically, the three goals, as stated in the strategy, are: "1. Strengthening the ability for digital transformation of our governments and societies, especially by creating a common area for cross-border digital services in the public sector. 2. Strengthening the competitiveness of our enterprises through digitalisation. 3. Enhancing the digital single market in the Nordic-Baltic region." (Nordic Co-operation, 2017).

Countries of the region rely on inter-ministerial bodies, such as the Nordic Council of Ministers for Digitalisation 2017-2020 (MR-DIGITAL) and the Baltic Council of Ministers, to discuss, design, adopt and implement common digital policies that will be adapted to their national contexts but still channel international co-operation's advantages and inform regional initiatives. In the MR-DIGITAL framework, projects are implemented by single countries but jointly co-ordinated and managed by all countries through the inter-ministerial platform (Nordic Co-operation, 2018).

Examples include the Nordic-Baltic co-operation on digital identities (NOBID) project and a strategy to adopt 5G. The NOBID project was structured as a multinational project run by the Norwegian Agency for Public Management and eGovernment. It aims to ensure access to public services in other countries based on each country's national eID system. The project will produce technical concepts, building blocks and industry standards, and promote cross-border networks for technical and legal expertise. This

will allow countries to create useful concepts for cross-border exchange of personal data and implementation of regional arenas for co-operation on eID. The Swedish Ministry of Enterprise and Innovation established the Nordic-Baltic 5G initiative, which will help countries identify business models best suited to help expand the region's 5G networks. Mobile networks' 5G upgrade status is monitored, and small cell networks are created. Countries in the region co-operate by developing new testing facilities, co-ordinating 5G frequency bands and removing obstacles to deployment of 5G base stations and antennas (Nordic Co-operation, 2018).

MR-DIGITAL includes several other initiatives that could be of use for LAC economies, from co-operation on e-health to AI or access to financial data for SMEs across the region (Nordic Co-operation, 2018). The various initiatives show how countries with similar levels of development can co-operate to implement regional digital standards at the national level. They will help Nordic and Baltic countries develop their digital potential while building knowledge that will serve the EU DSM strategy. The Nordic-Baltic digital co-operation could be adapted to fit the different contexts and evolution of LAC countries.

Addressing the global challenges arising from the digitalisation of the economy through multilateralism: The case of international taxation

The digitalisation of the economy poses new tax challenges that transcend borders and affect all economies, including in LAC. Recent, rapid and expansive digital transformation has had deep economic and societal impacts resulting in significant changes. This has sparked global debates in many legal and regulatory realms and international tax is no different. The tax implications are wide-ranging, affecting both direct and indirect taxation, broader tax policy issues, and tax administration.

Multilateral co-operation is essential to overcome challenges that transcend borders, such as the taxation issues brought on by the digitalisation of the economy. On an equal-footing basis, LAC countries should greatly benefit from further co-operation within the region and with other jurisdictions, and the region has also an important role to play in reaching consensus solutions through effective multilateral co-operation.

Addressing the indirect tax challenges arising from the digitalisation of the economy

VAT (Value Added Tax) collection on cross-border e-commerce is one of the key challenges of the digital economy (OECD, 2015). Particularly where goods, services and digital products are purchased online by private consumers from offshore online sellers. In response to these challenges, there is an ongoing international dialogue lead by the OECD on the development of solutions to address these VAT challenges resulting from the continuously growing digital trade volumes. In particular, the OECD delivered a comprehensive set of internationally agreed standards and mechanisms for the effective collection of VAT on cross-border digital trade involving offshore e-commerce marketplaces and other online suppliers, along with detailed guidance to support their effective implementation. These standards have been implemented and/or are being implemented worldwide with great success, including by G20 economies such as Australia, China, India, Indonesia, Japan, Russia, Saudi Arabia, South Africa and the European Union. The continuously growing impact of these standards reflects their significant importance for countries' VAT revenues and for minimising competitive distortions between online traders and traditional businesses. This has become even more relevant in light of the outbreak of Covid-19, as containment and mitigation measures taken in response to the pandemic have notably led to spikes in online shopping and increased demand for digital products and online services.

In LAC, the cross-border challenges posed by the digitalisation of the economy on VAT collection are even more marked. VAT is the main source of tax revenue for many LAC economies, representing approximately one-third of the region's total tax revenues (OECD et al., 2020). The integrity and performance of the region's VAT regimes are crucial for domestic resource mobilisation. VAT systems in LAC are increasingly confronted with the challenges of the continuously, and in many cases exponentially, growing e-commerce trade. Many LAC economies have already taken action to implement measures to safeguard the proper collection of critical VAT revenues on online sale. LAC countries could greatly benefit from further co-operation within the region and with other jurisdictions. This could allow the region to share experiences and best practices with countries which have already implemented international solutions such as those proposed by the OECD.

The OECD standards on effective collection of VAT on online trade essentially involve a requirement for online vendors, including e-commerce marketplaces, to register in the jurisdiction where the customer is located and to remit the VAT on the online sale in that jurisdiction. To facilitate compliance, particularly for non-resident online vendors, a simplified registration and reporting mechanism has been developed, which allows for VAT registration, reporting and payment via electronic means. Responding to challenges from the collection of VAT online services can generate significant public resources that could contribute to financing development strategies in the region (ECLAC, 2019).

Addressing the corporate income tax challenges arising from the digitalisation of the economy

The digitalisation of the economy has raised strong doubts on whether the current international corporate income tax rules, developed more than a century ago, remain fit for purpose in the modern global economy. The fundamental elements of the global tax system that determined where taxes should be paid ("nexus" rules based on physical presence) and what portion of profits should be taxed ("profit allocation" rules based on the arm's length principle), need to be modernised to take into account globalisation and the digitalisation of the economy.

On one hand, the emergence of new and often intangible value drivers have revolutionised entire sectors creating new business models while continuously eroding the need for physical proximity to target markets. This continuously challenges the effectiveness of existing profit allocation and nexus rules to distribute taxing rights on income generated from cross-border activities in a way that is acceptable to all countries, small and large, developed and developing (the so-called allocation of taxing rights issue).

On the other hand, new technologies have facilitated tax avoidance through the shifting of profits by multinational enterprises (MNEs) to low or no tax jurisdictions. This is the essence of the base erosion and profit shifting (BEPS) project, which led to the adoption of the BEPS package in 2015. The OECD/G20 Inclusive Framework on BEPS (Inclusive Framework), created in June 2016, takes forward the implementation of the BEPS package and the development of a solution to the tax challenges of the digitalisation of the economy. As of 1 September 2020, 137 jurisdictions are part of the Inclusive Framework, including 32 LAC economies.[5]

Securing a multilateral, consensus-based solution to the tax challenges arising from the digitalisation of the economy constitutes a priority amongst the 137 members of the OECD/G20 Inclusive Framework on BEPS. Although practical challenges resulting from the pandemic have inevitably affected the pace of progress, technical work on a solution continues to progress well under both Pillar One (establishing a new nexus and reallocating taxing rights) and Pillar Two (ensuring a minimum level of taxation) (OECD, 2020b). Since January 2020, and the adoption of an outline of Pillar One based

on an OECD Secretariat proposal for a Unified Approach, 11 building blocks have been developed technically by the OECD/G20 Inclusive Framework. Work on Pillar Two has also progressed well, with the aim of delivering blueprints for each Pillar for the October 2020 meeting of G20 Finance Ministers. Failure to reach an agreement comes with serious risks of escalating tensions, which would further undermine the global economy, including that of the LAC region. LAC jurisdictions, 32 of which are participating on an equal footing[6] in the Inclusive Framework's discussions, have an important role to play in reaching such a consensus solution through effective multilateral co-operation.

Finally, the Inclusive Framework recently approved new model rules to require reporting by digital platform operators with respect to sellers in the sharing and gig economy (OECD, 2020c). Activities facilitated by digital platforms may not always be reported to tax administrations, either by third parties or by taxpayers themselves. The model rules are designed to help taxpayers comply with their tax obligations, while also ensuring a level playing field with traditional businesses, in the key sectors (e.g. accommodation and transportation) of the sharing and gig economy. These model rules also help digital platform operators by avoiding the excessive compliance burdens that would result from a multiplicity of uncoordinated unilateral reporting requirements. These new model rules constitute an important element in addressing the tax challenges arising from the digitalisation of the economy and demonstrate the benefits that multilateral co-operation continues to deliver. LAC jurisdictions would greatly benefit from swiftly implementing these model rules, which constitute a new tax compliance tool and would greatly enhance transparency in this sector of the digital economy.

Conclusions

International co-operation and new partnerships are more important than ever to make the most of the digital transformation. Because the digital transformation generates challenges and opportunities that transcend borders, co-ordinated responses are crucial. The coronavirus (Covid-19) crisis has underscored the importance of international co-operation and digital tools. Co-ordinating policies at the international level to promote digitalisation for all is fundamental. Traditional international co-operation has not met expectations. It should evolve into a renewed model, based on three pillars. First, this model should aim to support LAC countries' development strategies, taking into account the multi-dimensional nature of their development challenges and linking them to international priorities. Second, it should be based on inclusive and productive dialogue platforms, where countries at all levels of development are involved on an equal footing. Third, international co-operation should involve more tools and actors, expanding the possibilities for and impact of co-ordinated action. Examples of international co-operation in the digital sphere show the way towards a renewed model.

The coronavirus (Covid-19) crisis threatens to exacerbate socio-economic challenges in LAC. It is crucial for the region to insist on and multiply international co-operation efforts that can help LAC countries build domestic digital capacities to face current development traps. The most effective initiatives help tackle several traps at once, following a multi-dimensional approach to development. BELLA and the European Union-Brazil Partnership for Scientific and Technological Cooperation not only build LAC's productive or social inclusiveness capacities through digital tools but also allow for LAC countries to close the gap between national and international priorities. Triangular co-operation initiatives, such as the Environmental Technology Centre in Peru, could also serve as an example of how operating with new tools can help build capacities against development challenges (Annex 5.A1). The BRI could generate opportunities for South-South co-operation initiatives, which could foster sustainable development through digital co-operation.

Regional integration is another way to tap into LAC's digital potential through this renewed model of international co-operation. Building a regional digital market could help the region reach higher levels of development by helping countries enhance communication infrastructure and expand trade perspectives, which have been severely hit by the coronavirus (Covid-19) crisis. As LAC's digital regulatory frameworks and regional and sub-regional co-operation efforts are often not harmonised, regional co-operation initiatives, such as the eLAC, could prove useful to articulate frameworks and levels of digital development, exchange experiences and set up policy dialogues and knowledge sharing with multiple stakeholders and countries. In addition to boosting LAC's digital development, building a regional digital market could help align national strategies with international standards and reinforce the region's voice on international digital issues.

Examples from other regions and interregional partnerships are key elements to take into consideration. Europe provides a useful example of how to build an integrated regional platform and create common regulation for technological innovations while positioning itself as a key partner for co-operation, reinforcing its position in the multilateral system. Interregional partnerships with the European Union on digital issues based on knowledge exchange and lessons learned could help LAC tailor regional strategies for its digital ecosystem and even articulate sub-regional differences within a broader regional framework, as Europe did with the Digital North.

LAC jurisdictions have an important role to play as equal partners in the international discussions currently taking place within the OECD/G20 Inclusive Framework on BEPS to address tax challenges arising from the digitalisation of the economy. Existing and future multilateral initiatives to tackle global digital issues such as international taxation have to include LAC countries on an equal footing. Implementing a renewed model of international co-operation in the digital sphere, especially crucial during the crisis, will bring about the most effective solutions to LAC's multi-dimensional development challenges.

Annex 5.A1. Examples of international co-operation on information and communications technology building LAC countries' capacities to overcome development traps

Area of work	Modality	Partners	Policies
		Productivity trap	
Digitalisation of industry	Multilateral co-operation	European Union	The European Union's new strategy for digital transformation, "A Europe fit for the digital age", has three pillars. One is based on a new industrial strategy, which will use the green and digital transformations to empower industry and small and medium-sized enterprises. The digital chapter of this strategy will mostly rely on advancements made by the EU Digital Single Market (DSM) to foster further development. The strategy also intends to position the EU as a global leader for the digital transformation, through international co-operation (European Commission, 2019f).
Digitalisation of industry/ services/ agriculture/5G/ Internet of Things (IoT)/ cloud computing	Bilateral co-operation	European Union, Brazil	Implemented since 2008, the European Union-Brazil Partnership for Scientific and Technological Cooperation is developed through calls for projects and yearly dialogues. The fourth call, addressing 5G, the Internet of Things (IoT) and cloud computing, was carried out in 2017 as part of Horizon 2020. The six funded projects were launched in early 2018, representing an investment of EUR 8.5 million from the European Union, matched by Brazil through Rede Nacional de Ensino e Pesquisa. The IoT project consisted in launching pilot apps that helped assess the feasibility, scalability and sustainability of business models associated with IoT services, as well as its social benefits and acceptance. Domains of applications considered reflected Brazil's priorities: manufacturing, water management and agriculture, and health and well-being of populations at risk. The co-operation initiative leveraged the digital transformation of the economy to help Brazil build capacities against the productivity, social vulnerability and environmental traps. Setting a policy dialogue on subjects with ramifications in various areas of societies, such as digitalisation, international partners could launch initiatives that address the multi-dimensional nature of development. (European Commission, 2008; 2016; Ministério da Ciência, Tecnologia, Informações e Comunicações, 2017).
Connectivity/ communication infrastructure	South-South co-operation	China with African, Asian, European, Latin American and Pacific countries.	The ICT component of China's Belt and Road Initiative (BRI), known as the Digital BRI or Digital Silk Road, could bring sustainable development to emerging markets through modern ICT infrastructure, such as 5G networks, international ecommerce platforms, smart cities and data centres, satellites, submarine Internet cables, Big Data and optical fibre networks across countries and regions. As of August 2019, Chinese entities had invested over USD 17 billion in Digital Silk Road projects completed since 2013 (Merics, 2019).
Connectivity/ communication infrastructure	Multilateral co-operation	European Union	The European Commission Connecting Europe Facility (CEF) is a funding programme that aims at supporting the implementation of the Digital Single Market by financing projects that will provide Digital Service Infrastructures (DSI), also known as Building Blocks, to improve connectivity. The CEF Building Blocks will facilitate the delivery of digital public services across borders and sectors. The Building Blocks include: Big Data Test Infrastructure, Context Broker, eArchiving, eDelivery, eID, eInvoicing, eSignature and eTranslation (European Commission, 2014).
Artificial intelligence (AI)	Multilateral co-operation	European Union	The European Union's new strategy for digital transformation, "A Europe fit for the digital age", has three pillars. One promotes excellence and trust in AI, through a model of human-centric AI. This will be done through new public-private partnerships in AI and robotics, creation of research centres and digital hubs, easier access to funds, and procurement processes. The European Union will enact new AI legislation; promote new requirements for transparency, product traceability and unbiased data sets; and launch an EU-wide debate on facial recognition (EU Monitor, 2019; European Commission, 2019g).

Area of work	Modality	Partners	Policies
E-commerce	Multilateral co-operation	European Union	In the framework of its DSM strategy, the European Union has created new rules to facilitate e-commerce by breaking down barriers throughout the region. To realise the full potential of e-commerce, the European Union has worked on the revised Payment Services Directive and new rules on cross-border parcel delivery services that are already in force; new rules to stop unjustified geo-blocking; revised consumer protection rules that will enter into force in 2020; and new value added tax rules for online sales of goods and services that will enter into force in 2021 (European Commission, 2019h).
Fintech	Multilateral co-operation	European Union	In 2018, the European Commission adopted an action plan on Fintech to foster a more competitive and innovative European financial sector. The action plan sets out 19 steps that the European Commission intends to take to: enable innovative business models to scale up at the EU level; support the uptake of new technologies, such as Blockchain, AI and cloud services in the financial sector; and increase cybersecurity and the integrity of the financial system (European Commission, 2018b).
Taxation/ domestic revenue mobilisation	Multilateral co-operation	Inter-American Center of Tax Administrations-Secretary of State for Economic Affairs of the Swiss Government (CIAT-SECO), Bolivia, El Salvador, Guatemala, Guyana, Honduras, Nicaragua	CIAT-SECO aligned interests and resources to identify and support priority issues related to effective management of tax revenues in LAC. Tax administrations in Bolivia, El Salvador, Guatemala, Guyana, Honduras and Nicaragua received support (mainly technical assistance) in 2015-18. Guatemala's Superintendence of Tax Administration also received support in electronic invoicing. The technological architecture has the standards and requirements to scale up (CIAT, 2018).
		Social vulnerability trap	
Digital literacy/ future of work	Multilateral co-operation	Germany, Switzerland, Inter-American Development Bank	A multidonor fund of USD 13 million will accelerate the transformation of technical and vocational education and training in Latin America and the Caribbean (LAC) (IDB, 2019).
Digital cash transfers	Multilateral co-operation	Foundations, non-governmental organisations (NGOs), international organisations (IOs), Colombia, Dominican Republic, Mexico, Paraguay, Peru, Uruguay, others	The Better Than Cash Alliance is a partnership of governments, companies and IOs that accelerates the transition from cash to digital payments to reduce poverty and drive inclusive growth (Better Than Cash Alliance, 2019).
Platform/digital economy labour regulation	Multilateral co-operation	European Union	In 2018, the European Commission Joint Research Centre published a study on the European legal framework for digital labour platforms, exploring how they increasingly influence workers' rights, and how to safeguard workers' rights (European Commission Joint Research Centre, 2018).
Formal employment/ future of work	Multilateral co-operation	European Union	The High-Level Expert Group on the Impact of the Digital Transformation on EU Labour Markets, comprised of representatives from academia, civil society and industry, provides analysis and advice to the European Commission and explores policy options (European Commission, 2019i).
Common tertiary/ technical degree certification	Multilateral co-operation	European Union	The European Tertiary Education Register (ETER) database provides detailed data on 2 465 institutions in 32 European countries at the bachelor, master and PhD levels. Data include institution size, number and gender of students and staff, subject areas and degree levels, and information on research, international students and staff and funding. Using information from national statistical authorities, ETER complements other data on university performance and system-level higher education statistics (ETER, 2019).
Common tertiary/ technical degree certification	Multilateral co-operation	European Union	The European Qualifications Framework (EQF) is a translation tool that helps communication and comparison between European qualifications systems (European Union, 2019).

Area of work	Modality	Partners	Policies
Common tertiary/ technical degree certification	Multilateral co-operation	European Higher Education Area (EHEA), European Commission	Through the EHEA, 48 countries agree to adopt reforms on higher education on the basis of common values, such as freedom of expression and institutional autonomy. EHEA countries, institutions and stakeholders continuously adapt higher education systems to make them more compatible and strengthen their quality assurance mechanisms. The main goal is to increase staff and student mobility and facilitate employability (EHEA, 2019).
Infrastructure investments for rural border areas	Multilateral co-operation	European Union	The Rural Network Project (RuNe) is an open-access fibre network covering areas with an average of 36, and as few as 3, inhabitants per square kilometre. RuNe is funded by the Connecting Europe Broadband Fund, a private equity platform promoting broadband investment in areas with no existing network and no provision of early-stage equity (Rural Network Project, 2019).
Health	Multilateral co-operation	European Union	The eHealth Network, set up under Directive 2011/24/EU on patients' rights in cross-border health care, connects national authorities responsible for e-health. EU countries can give direction to e-health developments in Europe by playing an important role in strategic e-health-related decision making on interoperability and standardisation. The e-Health Action Plan supports the network with technical and scientific guidance to facilitate cross-border health care across the European Union and provides necessary policy support to the eHealth Digital Service infrastructure (European Commission, 2019j).
Health/food security	Multilateral co-operation	European Union, UK Aid, Bill & Melinda Gates Foundation	The National Information Platforms for Nutrition (NIPN) is a global initiative launched by the European Commission to provide information on food security and nutrition for policy makers in ten developing countries, including Guatemala, to fight malnutrition (NIPN, 2020).
E-education	Multilateral co-operation	European Union	The strategic framework for European policy co-operation (ET 2020 framework) is a forum for member states to build best practices in education policy, gather and disseminate knowledge and advance education policy reforms at the national and regional levels. Based on a lifelong learning approach, the framework addresses outcomes, from early childhood to adult vocational and higher education, and covers learning in all contexts: formal, non-formal and informal (European Commission, 2020b).
	Multilateral co-operation	European Union	The Collaborative Capacity Programme on ITS Training-education and Liaison (CAPITAL), funded by the European Union, is a collaborative capacity-building community and deployment programme that provides training and education resources to public and private stakeholders implementing co-operative and intelligent transport systems and raises awareness about services and benefits (CAPITAL, 2016).
Infrastructure investments for education and research	Multilateral co-operation	European Union, national research and education networks (NREN) of Brazil, Chile, Colombia, Ecuador, France, Germany, Italy, Portugal, Spain	The Building the Europe Link with Latin America Programme (BELLA) provides for the long-term interconnectivity needs of European and Latin American research and education communities. BELLA will achieve this through procurement of a long-term Indefeasible Right of Use for spectrum on a submarine optic fibre cable between the two regions, minimising latency. BELLA is also developing and deploying a 100 Gbps-capable research and education network across Latin America. BELLA is funded by three European Commission Directorates (DG-CONNECT, DG-DEVCO and DG-GROWTH) and the Latin American NREN community (BELLA, 2019).
			Institutional trap
Cybersecurity	Bilateral co-operation	Chile, Spain	Chile and Spain are co-operating on cybersecurity to face the risk of attacks on official bodies' computer systems and on financial and security systems. The agreement cites a good level of technical co-operation and high level of dialogue in the fight against terrorism, drug trafficking and organised crime (Ministerio de Relaciones Exteriores, 2018).
		European Union, Brazil	Begun in 2014, the European Union-Brazil Cyber Dialogue co-ordinates efforts for responsible state behaviour in cyberspace. At the last February 2020 meeting, the regions exchanged information on cybersecurity threats, capacity building and confidence-building measures, and identified potential areas for strengthening co-operation (European Union External Action, 2020).

Area of work	Modality	Partners	Policies
	Multilateral co-operation	European Union	In 2017, the European Commission adopted a cybersecurity package, which includes a proposal for an EU Cybersecurity Agency (ENISA) to assist member states in dealing with cyberattacks, and a new European certification scheme to ensure that digital products and services are safe to use. The Cybersecurity Act at the core of the package has entered into force, bringing about two changes: a new permanent mandate and comprehensive reform of the ENISA, and the creation of a European certification framework that will sustain Europe's growing cybersecurity market. In January 2020, the European Union published a communication on the cybersecurity of 5G networks, including an EU Toolbox of risk mitigating measures. Amidst the current coronavirus (Covid-19) pandemic, the European Union developed an approach for efficient contact tracing, issuing an EU toolbox for use of voluntary, privacy-compliant mobile apps (European Commission, 2019e).
Data protection and governance	Multilateral co-operation	Andorra, Argentina, Chile, Colombia, Costa Rica, Mexico, Peru, Spain, Uruguay	Begun in 2003 as a forum for knowledge exchange and discussion on data protection initiatives, the Red Iberoamericana de Protección de Datos, backed by the EU Fund for Regional Development, promotes Ibero-American co-operation towards common data protection frameworks to allow effective cross-border flow of data and facilitate international co-operation among responsible authorities (Red Iberoamericana de Protección de Datos, 2019).
		European Union, Brazil	Brazil's Lei Geral de Proteção de Dados Pessoais enforces measures similar to those of the EU General Data Protection Regulation (Presidência da República, 2018).
		European Union, Germany, Barbados, Caribbean Export Development Agency, the CARIFORUM	The European Union promotes data protection standards in Caribbean countries through a European Commission Technical Assistance and Information Exchange Instrument (TAIEX) programme (European Commission, 2020c).
Capacity building/digital skills of civil servants	Bilateral co-operation	El Salvador, Uruguay	El Salvador receives technical assistance from the Uruguayan Agency of Electronic Government and Information Society experts on digital themes. Projects aim to train public servants, to promote the digital transformation of government institutions (Red de gobierno electrónico de América Latina y el Caribe, 2019).
	Multilateral co-operation	European Training Organisation Network for Local and Regional Authorities	Before becoming an independent association, European Training Organisation Network for Local and Regional Authorities (ENTO) was created by the Council of Europe in 1995 to promote democratic and effective governance by ensuring that staff and elected representatives of local and regional authorities are well trained and qualified to carry out their responsibilities in a rapidly changing world. ENTO enables bilateral and multilateral partnerships and makes it possible for training bodies and local authorities to provide staff with courses, study and official visits (ENTO, 2020).
Open government	Bilateral co-operation	European Union, Colombia	Begun in 2014 and ended in 2018, the European Union-financed ACTUE Colombia project aimed to increase integrity and transparency and fight corruption. Objectives included promotion of open government and citizen control over public entities (ACTUE Colombia, 2017).
Open government	Multilateral co-operation	European Union	In 2016, the European Commission published two studies on open government. *Towards Faster Implementation and Uptake of Open Government* and *Analysis of the Value of the New Generation of eGovernment Services* and *How Can the Public Sector Become an Agent of Innovation through ICT* provide important knowledge on open government services and their potential value, and shed light on how public administrations and policy makers can establish open government practices and foster change through information and communications technology (PWC, 2016; PWC, Open Evidence and the Institute of Baltic Studies, 2016).
Open data	Multilateral co-operation	European Union	The EU Open Data Portal, set up in 2012, provides public access to an expanding range of data from EU institutions and other EU bodies, which can boost the region's economic development and institutional transparency (EU Open Data Portal, 2020).

Area of work	Modality	Partners	Policies
Measurement of digital transformation	Multilateral co-operation	European Union, 17 LAC countries, Spain	With the support of the European Union's EUROsociAL, the Red de Transparencia y Acceso a la Información, formed by LAC and Spanish public entities responsible, developed an international model for measuring transparency and access to information in member countries (Red de Transparencia y Acceso a la Información, 2019).
Digital government	Bilateral co-operation	France, Mexico	France and Mexico signed a declaration of digital co-operation on cultural and technological change. The project starts a co-operation between information and democracy aimed at fighting disinformation (fake news) (Embajada de México en Francia, 2019).
Digital agenda/ national development strategies or plans/digital transformation	Multilateral co-operation	Colombia, Sweden, United States Agency for International Development, World Bank	Through international co-operation, Colombia's National Planning Department developed the Terridata app, a statistical consultation portal that helps regional and local leaders be more efficient in formulating development plans (Departamento Nacional de Planeación, 2018).
		Environmental trap	
Data storage for the environment/ Earth observation	Multilateral co-operation	European Union	The EU Earth Observation Programme, Copernicus, provides information services based on satellite Earth observation and in situ (non-space) data. Services are free and can be used for applications in a range of areas, such as urban area management, sustainable development and nature protection, regional and local planning, agriculture, forestry and fisheries, health, civil protection, infrastructure, transport and mobility, and tourism. It is mainly used by policy makers and public authorities to develop environmental legislation and policies or make decisions in an emergency, such as a natural disaster or humanitarian crisis (Copernicus, 2020).
E-waste	Multilateral co-operation	European Union	In 2017, the European Commission established a common methodology for calculating the weight of electrical and electronic equipment on the national market in each member state and the quantity of waste it generated by weight (European Commission, 2017).
Intelligent transport modes/smart cities	Sub-national co-operation (city-to-city)	European Union, LAC cities	The three-year International Urban Cooperation Programme enables cities in various global regions to connect and share solutions to common problems. The city-to-city co-operation on sustainable urban development that pairs EU with non-EU partner cities boosts access to policy expertise, helping cities promote smart, green and inclusive growth (International Urban Cooperation Programme, 2019).
Training	Triangular co-operation	Brazil, Germany, Peru	To comply with new environmental regulations and criteria imposed on exporters by international markets, Peruvian industries needed experts in environmental technology, particularly in advisory and laboratory services. The Environmental Technology Centre in Peru (2012-14) was created to offer training adapted to market needs (GIZ, 2014).
Forest conservation	Multilateral co-operation	European Union, Association of Forest Communities of Petén (ACOFOP), Guatemala, ICOO Cooperation	With EU support, NGOs ACOFOP and ICOO Cooperation carried out workshops on use of drones to monitor community work in forests and initiate early fire alerts (Delegation of the European Union to Guatemala, 2018).

Source: Own elaboration.

Notes

1. For instance, the UN Group of Government Experts on Developments in the Field of Information and Telecommunications in the Context of International Security and the Open-ended Working Group, the International Telecommunication Union and its Global Cybersecurity Index, and the Global Symposium for Regulators help define new standards for cybersecurity worldwide. The UN World Intellectual Property Organization undertakes similar efforts for the protection of intellectual property.
2. An integration and development co-operation programme among Belize, Colombia, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama.
3. A specialised institution within the SICA framework that co-ordinates, supports and harmonises development of the telecommunications and ICT sectors.

4. Argentina, Brazil, Colombia, Costa Rica, the Dominican Republic, Honduras, Mexico, Panama and Peru.
5. Anguilla, Antigua and Barbuda, Argentina, Aruba, the Bahamas, Barbados, Belize, Bermuda, Brazil, British Virgin Islands, Caiman Islands, Chile, Colombia, Costa Rica, Curacao, Dominica, the Dominican Republic, Grenada, Haiti, Honduras, Jamaica, Mexico, Montserrat, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands and Uruguay.
6. Four of the 24 positions on the steering group of the Inclusive Framework on BEPS are currently held by LAC economies (Argentina, Brazil, Colombia and Jamaica).

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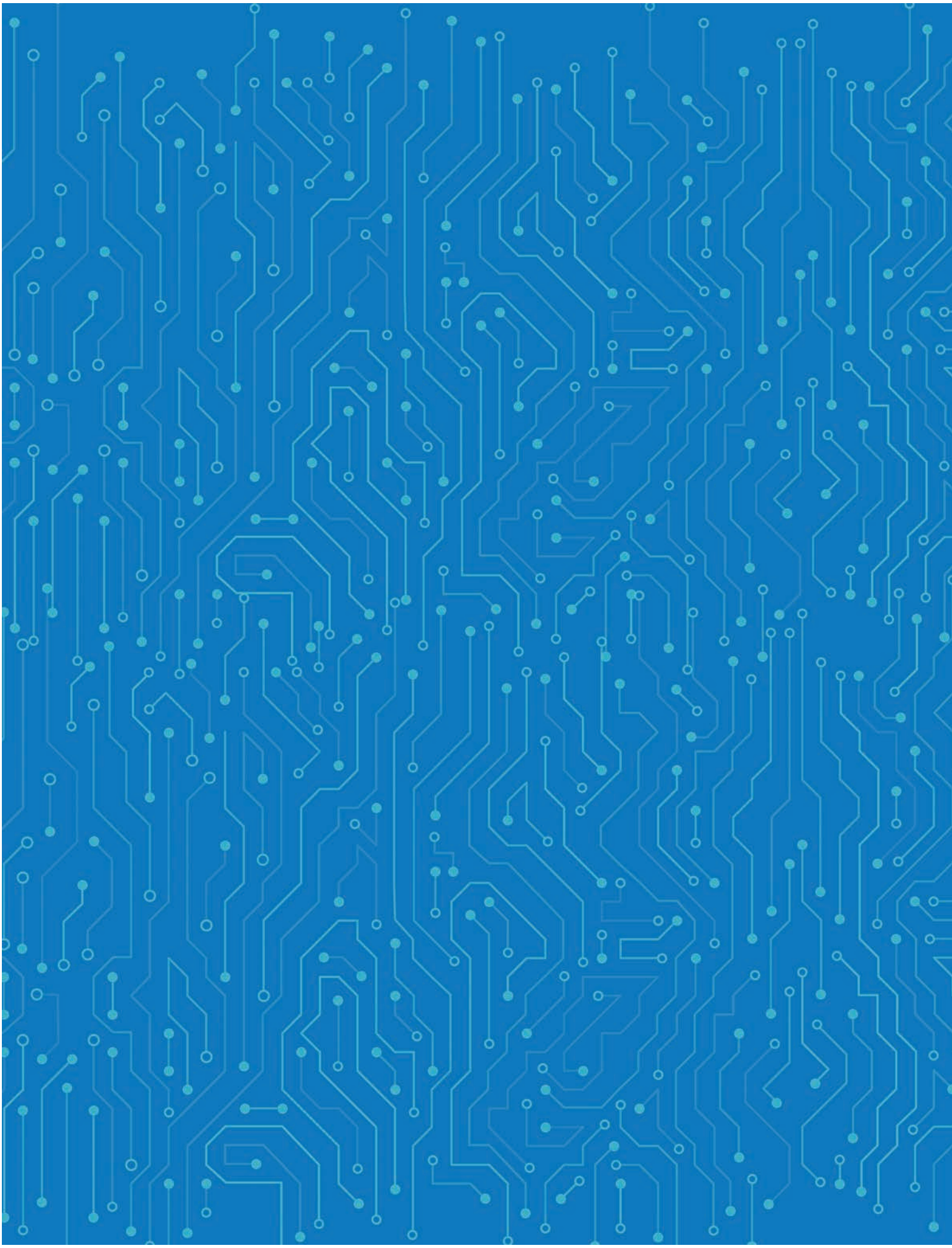


Chapter 6

Special feature: The Caribbean

This chapter explores the main challenges Caribbean countries face in promoting the digital transformation and summarises the impact of the coronavirus (Covid-19) crisis on these economies. In particular, it analyses regional and national digital strategies, focusing on key dimensions, including communication infrastructure, digital government and digital security, and highlighting disparities across and within countries. To make the most of the digital transformation, countries must implement national digital strategies effectively and increase sub-regional co-operation and co-ordination in information and communications policy, broadband infrastructure, e-government systems and policies aimed at using technology-based tools to manage and prevent natural disasters.

Digital transformation: an opportunity for the Caribbean to overcome various challenges

Border closures and other actions taken during the Covid-19 outbreak greatly affected several sources of income in the Caribbean

The Caribbean economy heavily depends on travel and tourism

Tourism accounted for **13.9%** of the GDP and **15.2%** of total employment in 2019

The slump in remittance flows severely affects households

Remittances as % of GDP

Haiti

Jamaica

Over 80% of remittances are used for basic needs

Caribbean countries face specific long-term vulnerabilities, including natural hazards and extreme weather events

During the 2020 Atlantic hurricane season, Caribbean countries may face overlapping health, climate and hurricane-related crises

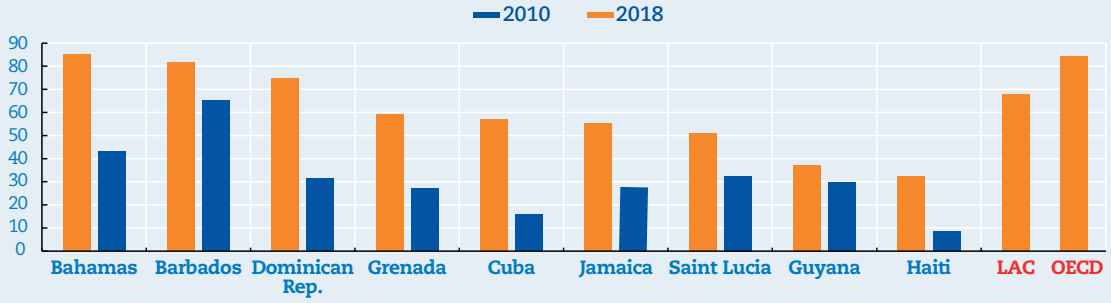
New technologies should support natural disaster preparedness and emergency response

To benefit from the digital transformation, Caribbean countries must develop digital agendas aligned with national development strategies

Given the sub-region's structural vulnerabilities, diversification of the production structure is critical ...

... accompanied by the digitalisation of the economy in areas such as e-government, telemedicine and e-learning.

The number of Internet users in the Caribbean increased, but remains relatively low in most countries



Introduction

Despite high heterogeneity in its impacts, the coronavirus (Covid-19) pandemic does and will affect all Caribbean countries. This owes in part to the sub-region's high economic dependence on travel and tourism, which virtually collapsed owing to border closures and other actions to stem the spread. Tourism services accounted for 13.9% of the Caribbean's gross domestic product (GDP) and 15.2% of total employment in 2019, making it the sub-region with the highest economic contribution from tourism in the world, followed by Southeast Asia and Oceania. Tourism's contribution to GDP and employment is much higher for some Caribbean countries. For the Eastern Caribbean States, in addition to the Bahamas, Belize and Jamaica, tourism and travel represent over one-quarter of GDP and over 30% of employment (reaching over 85% for Antigua and Barbuda) (ECLAC, 2020a).

Decreased remittance flows, which could contract between 10% and 15% in 2020 and take two to three years to resume 2019 levels, will severely affect individuals and households. In several Caribbean countries, remittances' contribution to economic activity is significant: they represented over 30% of GDP in Haiti and over 10% in Jamaica. Between 80% and 90% of remittances are used to cover receiving households' basic needs, so their contraction will have strong effects on consumption and the incidence of poverty (ECLAC, 2020a).

In addition to the short- and medium-term impact of the Covid-19 crisis, Caribbean countries face longer-term vulnerabilities, including the adverse impacts of climate change, natural hazards and extreme weather events. In the past few decades, the Caribbean has been the second most hazard-prone region in the world, owing to its location and the concentration of its population in exposed coastal areas. With an above-average forecast for the 2020 Atlantic hurricane season, Caribbean countries may face overlapping health, climate and hurricane-related crises (Phillips et al., 2020; Taylor, 2020). Given the sub-region's structural vulnerabilities, diversification of the production structure is critical (OECD et al., 2019), accompanied by the digitalisation of the economy in areas such as e-government, telemedicine and e-learning.

New technologies should contribute to natural disaster preparedness and emergency response. Continuity of digital services depends heavily on adequate digital and physical infrastructure planning, including data centres, to avoid loss of data after natural disasters. The Caribbean must also create an appropriate and sustainable digital ecosystem to accelerate the digital transformation, increase economic resilience and improve responsiveness to natural disasters (Giraldo, 2018). Building financial and technical capacity is key to this endeavour, since outdated information and communications technology (ICT) infrastructure prevents many Caribbean countries from quickly and efficiently adopting digital technologies. Optimal strategies for creating durable digital ecosystems address multiple vulnerabilities.

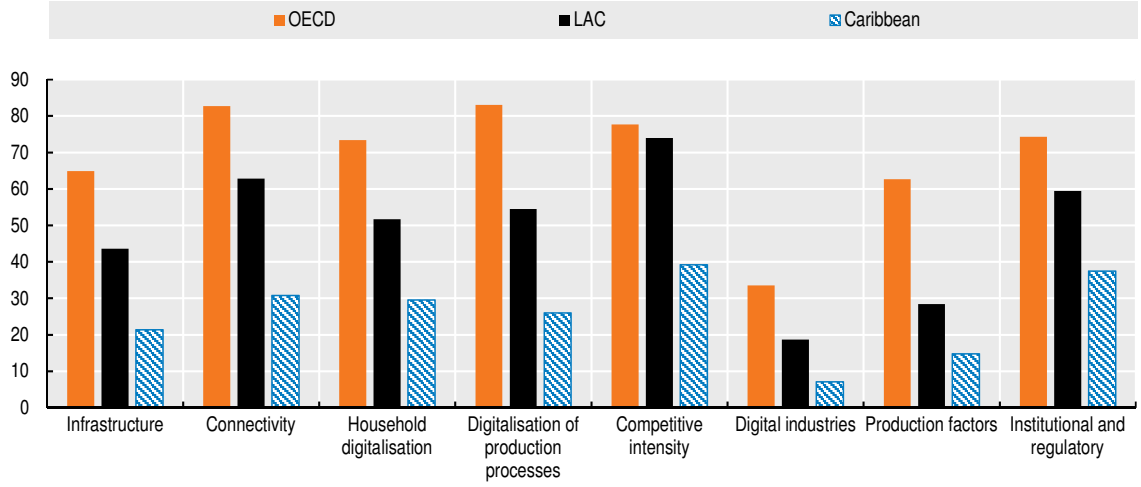
This chapter first describes the digital ecosystem in the Caribbean, compared with other sub-regions. Second, it briefly presents the main regional digital strategies. Third, it analyses national digital strategies. Fourth, it studies two key components of national digital agendas (DAs): digital government and digital security challenges. It finally concludes with policy recommendations.

The digital ecosystem in the Caribbean

The digital ecosystem is fundamental to accelerating the benefits of digital technologies. The Digital Ecosystem Development Index is based on eight multi-component pillars: infrastructure, connectivity, household digitalisation, digitalisation of production, competitive intensity, digital industries, factors of production, and regulatory

frameworks (see Chapter 2). In 2018, the index was 70.4 for the Organisation for Economic Co-operation and Development (OECD) area, 49.9 for Latin America and the Caribbean (LAC) and 24.3 for the Caribbean sub-region (Figure 6.1).

Figure 6.1. **Digital Ecosystem Development Index, OECD, Latin America and the Caribbean, and the Caribbean, 2018**



Note: Data were available for six Caribbean countries (Barbados, Cuba, the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago), representing about 93% of the population in the sub-region. Index points, index goes from 0 to 100, with 100 being the highest score.

Source: CAF (2020), "CAF: The Observatory of the Digital Ecosystem of Latin America and the Caribbean"; ECLAC (2020b), *Regional Observatory on Planning for Development in Latin America and the Caribbean*, https://observatorioplanificacion.cepal.org/en/opengov.

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The Caribbean's overall index hides disparities across countries: Trinidad and Tobago had a high score (64.1); Cuba (12.7) and Haiti (12.9) had the lowest. Since Cuba and Haiti represent 55% of the Caribbean population, the sub-region population weighted average is much lower.[1]

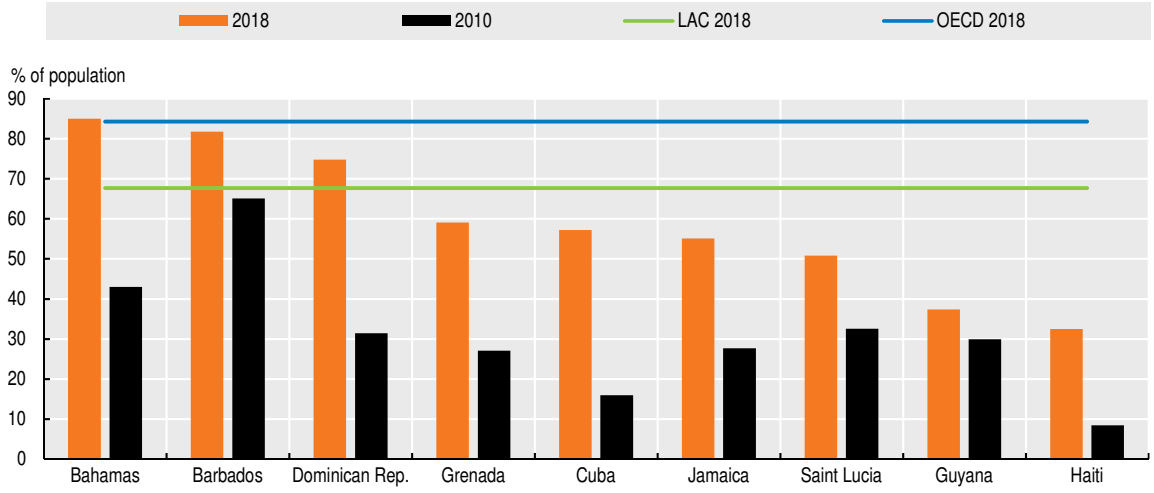
As reflected by the index, the Caribbean's infrastructure and connectivity is, on average, low but varies widely across countries. The proportion of Internet users (Figure 6.2) in the majority of Caribbean countries is still relatively low, compared with LAC and OECD averages, although rates increased significantly between 2010 and 2018, e.g. from 16% to 57% in Cuba, and 8% to 32% in Haiti. The Bahamas, Barbados and the Dominican Republic reached over 70%. Connectivity and usage costs also vary, aggravating inequality by country, island and type of household. At the national level, Internet penetration and connection quality are poorer in rural than in urban areas, and rich households are more likely to have Internet access than those in the poorest quintile of the income distribution (ECLAC, 2017). Countries have reported that limited access to broadband Internet, and other technological challenges, have hampered remote learning in the context of the pandemic (see, for instance, Young, 2020).

Unequal ICT access and service occur within countries, since many Caribbean Small Island Developing States (SIDS) have multiple islands spread over large distances, each with varying levels of access and service based on population size and governance arrangements (Bleeker, 2019a). Tobago has poorer ICT access than larger, more populous Trinidad. In the Turks and Caicos Islands, only some islands receive fixed broadband services, and the speed and reliability of broadband connections vary across islands.

The increase in Internet users is the result of a significant evolution in connectivity technology and quality in the last decades. In 2018, penetration of mobile broadband

was higher than penetration of fixed broadband (Figure 6.3). However, the gap with the rest of the region can particularly be seen in the share of mobile broadband penetration (Figure 6.4). With the exception of Haiti, this may also reflect the compactness of some countries relative to others. For instance, a number of countries have rural or low-population areas where connectivity is poor. Ten Caribbean countries are multi-island states with populations spread across separate landmasses, each with varying levels of connectivity (Bleeker, 2019b).

Figure 6.2. **Internet users, selected Caribbean countries, 2010-18 (or latest available year)**



Source: Own calculations based on data from ITU (2020a), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

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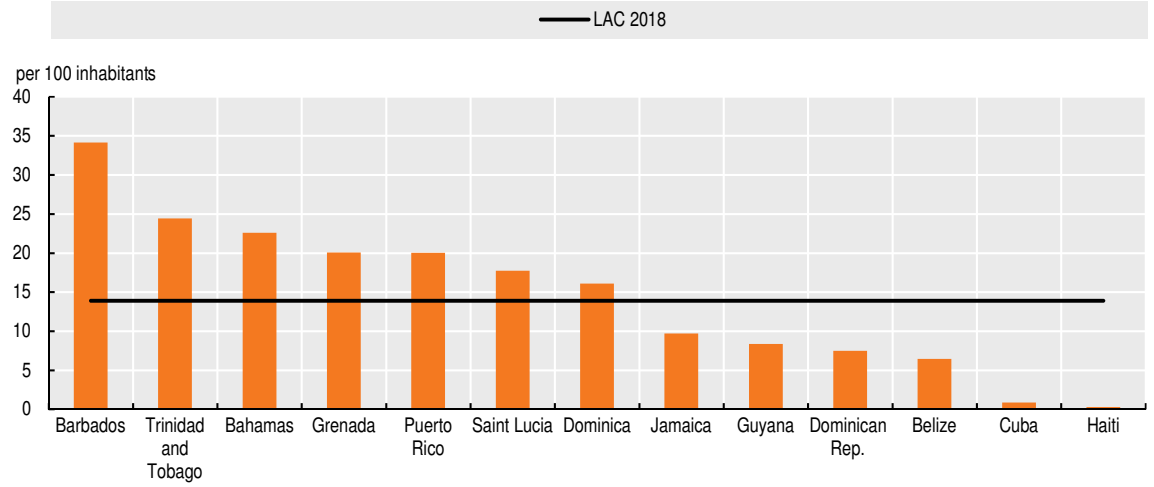
Figure 6.3. **Fixed broadband penetration, selected Caribbean countries, 2018 or latest available year**



Source: Own calculations based on data from ITU (2020a), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

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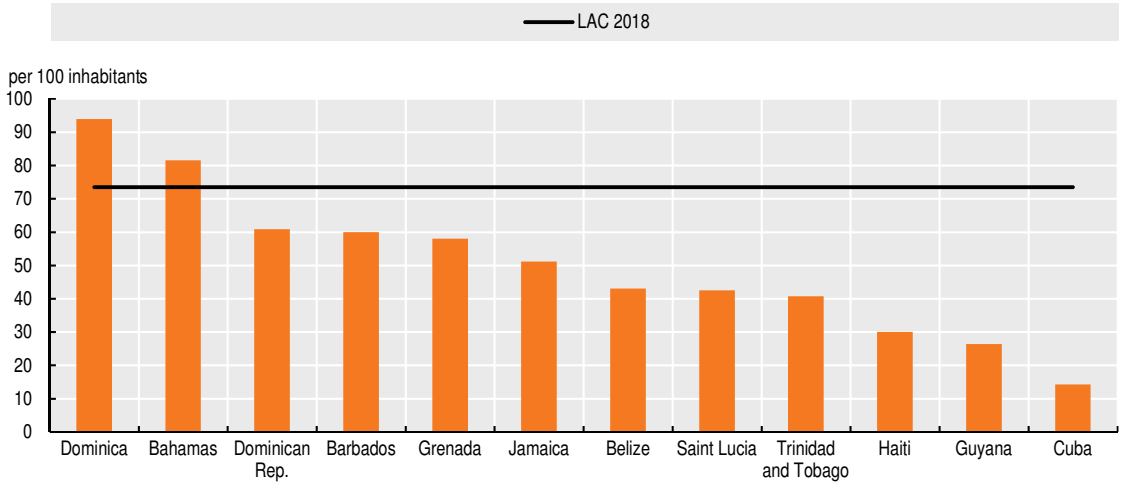
Connection speed is widely used to compare connectivity quality across countries. Low connection speed prevents simultaneous apps, a critical issue during the coronavirus

(Covid-19) pandemic. Between March and July 2020, gaps with the rest of the world have been important, and variation across Caribbean countries has been sizeable (Figure 6.5). The evolution of Internet connection has been particularly slow in Cuba, with the introduction of third-generation services only beginning in 2018. Connection speed also varies significantly across islands within Caribbean SIDS. In the Turks and Caicos Islands, Providenciales has the fastest mobile broadband (15-20 Mbps) via fibre-optic cable; North Caicos and South Caicos islands have the slowest (6-10 Mbps) owing to bandwidth limitations on microwave transmission to these islands (Bleeker, 2020).

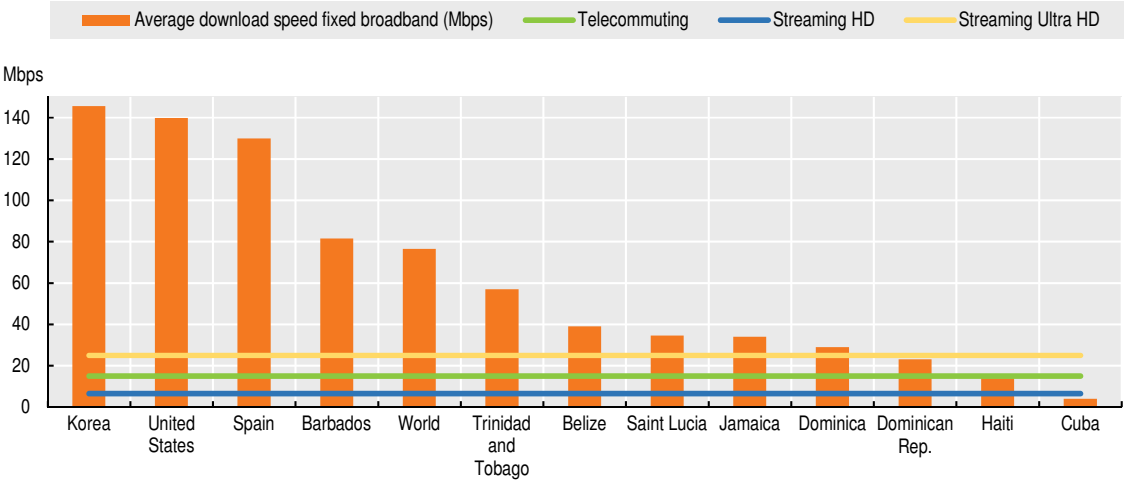
Figure 6.4. **Active mobile-broadband subscriptions, selected Caribbean countries, 2018 or latest available year**



Source: Own calculations based on data from ITU (2020a), *World Telecommunication/ICT Indicators Database 2020* (database), International Telecommunication Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed on 21 August 2020).

StatLink https://doi.org/10.1787/888934172863

Figure 6.5. **Fixed broadband download speed, selected countries, and reference bandwidth requirements (March-July 2020)**



Note: HD = High definition. Mbps = Megabytes per second. The indicator reflects wired broadband speed achievable "on-net". It does not fully represent the overall Internet experience and it provides only a partial view on Internet speed. Nevertheless, it provides a useful partial indicator available for both OECD and non-OECD countries (OECD, 2019). Fixed broadband download speed data are a monthly average from March to July 2020.

Source: ECLAC (2020b), *Regional Observatory on Planning for Development in Latin America and the Caribbean*, https://observatorioplanificacion.cepal.org/en/opengov, own calculations based on data from the Federal Communications Commission and Ookla Global Speed Test Index.

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Regional digital strategies in the Caribbean

In 2017, Caribbean Community (CARICOM) Heads of Government approved the Single ICT Space Project, which seeks to create a borderless ICT-enabled space that fosters economic, social and cultural integration for the betterment of Caribbean citizens in the grouping's 15 Member States and 5 Associate Members (CTU, 2017a). Envisioned as the digital layer of the Caribbean Single Market Economy, the project has four pillars: 1) regionally harmonised ICT policy, legal and regulatory regimes; 2) robust national and regional broadband infrastructure; 3) common frameworks for governments, ICT service providers and consumers; and 4) effective, secure technology and management systems.

The aim of the project is ubiquity and consistency of ICT services across CARICOM at affordable prices. The initial focus has been on creating an enabling environment for regional infrastructure projects and systems through regionally harmonised ICT policy, legal and regulatory regimes, since this is a necessary precursor to strong regional partnerships. According to the Caribbean Telecommunications Union (CTU), renewed collaboration is needed to meet many of the Single ICT Space Project's implementation milestones and deliver on its ambitious aims (Bleeker, 2019b).

As an aspect of the project, the CTU has been promoting the need for governments in the sub-region to become 21st Century Governments. Such governments use "citizen-centric, seamless, open, interactive and efficient processes and will make effective use of information and communication technologies to deliver services to its citizens, internal and external clients" (CTU, 2017b). The focus of the project, which has seven workstreams, is to accelerate e-government service delivery and transform the public service of Caribbean governments.

National digital strategies in the Caribbean

Caribbean governments have been developing national strategies to promote ICT adoption for several years (Table 6.1). Their effectiveness has been mixed. The unique characteristics of some Caribbean states create several challenges. Multi-island territories made up of small islands, some spread over large distances, tend to have high fixed overhead and transport costs. They also have small domestic markets and are vulnerable to external shocks, such as the coronavirus (Covid-19) crisis, and natural disasters. These factors lend themselves to difficulties in building economies of scale. Nevertheless, there are considerable opportunities for Caribbean countries to promote the adoption of digital technologies, especially those for building resilience and extending access to information and public services for people in geographically isolated islands (Bleeker, 2020).

In light of the coronavirus (Covid-19) crisis, new digital tools are critical in providing education and health services, social security access and e-government. Caribbean countries have rushed to bring digital services on line and increase ICT access during the pandemic, although they have been limited in their ability to provide for all population groups owing to financial and technical constraints. Enhanced digital services provision has mainly emerged in the areas of education, health care and other public sectors, with new e-learning and telemedicine tools, online payment systems and other e-government portals. However, such services have not benefitted all groups equally: governments are restricted in their ability to provide special digital inclusion programmes for the Caribbean's 1.3 million persons with disabilities and other marginalised groups, including the older population. The pandemic has also widened the digital divide for those whose financial circumstances deteriorated and who could no longer afford access to the Internet and digital devices.

Although some Caribbean countries have adopted some type of ICT strategy, many of these plans have not been renewed beyond their initial period, suggesting that countries are experiencing challenges in keeping plans up-to-date. Of the seven countries analysed, three have ICT strategies whose original period remains in force, while Jamaica opted for a long-term strategy, and Saint Vincent and the Grenadines, and Trinidad and Tobago have strategies in force until 2020. Some countries, including the Bahamas, have incorporated ICT policy objectives into their national development plans (NDPs). In the case of Barbados, despite not having a specific updated ICT strategy, they have incorporated several objectives related to the promotion of ICTs and the development of an information economy as part of their 2013-20 growth and development strategy.

Table 6.1. **National digital strategies, selected Caribbean countries**

	National DA/ICT plan	Objectives	Institution
Barbados	National Information and Communication Technologies Strategic Plan of Barbados 2010-2015	6 goals: develop an ICT-literate society; develop a culture of innovation and entrepreneurship; make ICTs available to all; ensure competitive jurisdiction; transform public and business sectors to an e-environment; facilitate continuity of governance in national disasters	Ministry of Economic Affairs, Empowerment, Innovation, Trade, Industry and Commerce
	Barbados Growth and Development Strategy 2013-2020	Develop a science and information economy, and strategies that aim to improve efficiency in Internet traffic management, early warning and mitigation of cyber-attacks, improve the Privacy & Data Protection Act, the Computer Misuse Act, and the Telecommunications Act B282	Ministry of Finance, Economic Affairs and Investment
Jamaica	Vision 2030 Jamaica: Information and Communications Technology (ICT) Sector Plan 2009-2030	2 main goals: strong and competitive ICT sector; Jamaica's national development advanced through widespread adoption and application of ICT	Cabinet
Saint Lucia	National ICT Strategy of St. Lucia 2010-2015	4 outcomes: effective governance and extensive e-service delivery; significant economic growth with the creation of new job opportunities; improved citizen health and well-being; enhanced citizen information literacy and innovation	Ministry for Social Transformation, Public Service, Human Resource Development, Youth and Sports
Saint Vincent and the Grenadines	National Broadband Plan 2015-2020	6 goals: promote the development of local and relevant broadband services; provide teachers with proper training in necessary skills; ensure sufficient broadband connection for all schools, health centres, community centres and government buildings; promote digital literacy; promote adoption of relevant IT and ICT courses in schools; ensure necessary support for aspiring ICT entrepreneurs	National Telecommunications Regulatory Commission
Trinidad and Tobago	Trinidad and Tobago's National ICT Plan: ICT Blueprint 2018-2022	5 strategic thrusts: improving connectivity; increasing human capacity; advancing digital government; fostering economic development; advancing the digital environment for social benefit	Minister of Public Administration and Communications
Grenada	Information and Communication Technology (ICT) 2006-2010: A strategy and action plan for Grenada	7 strategic thrusts: capacity building; legal framework; e-Commerce; IT and Internet education; e-government; high-quality, affordable telecommunications infrastructure; information society and information economy	Office of the Prime Minister
Saint Kitts and Nevis	National Information and Communications Technology (ICT) Strategic Plan 2006	5 main branches: building information infrastructure; enabling the policy and legal environment; developing ICT human resources and building capacity (information society); modernising government and delivering citizen services electronically; leveraging ICT for economic and social development through public-private partnerships	Not specified

Source: Based on public sources and country NDAs.

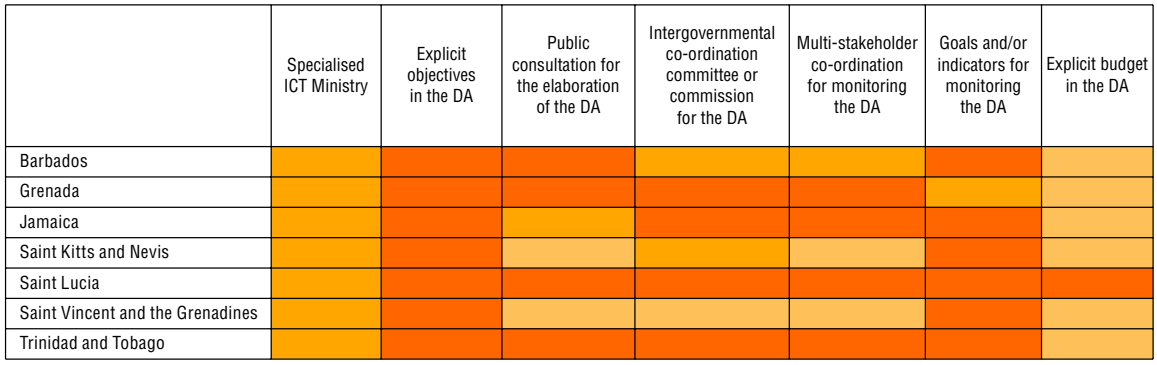
Caribbean countries' national digital strategies share several policy objectives regarding the use of digital technologies for sustainable development. All countries seek to expand infrastructure as the primary objective and to foster deployment of e-government services, promote innovation and economic development using digital technologies, improve technological adoption and digital literacy in schools, and update

regulatory frameworks. Recognising the importance of an enabling environment for deploying digital services and infrastructure projects, strategies usually include as a pillar, modern, appropriate legislative and regulatory frameworks for digital security, data protection, privacy, information sharing and e-transactions.

A central issue has been ICT resilience in the context of natural disasters, which disproportionately affect Caribbean countries. These countries face the challenge of creating digital ecosystems that will accelerate the digital transformation in order to prevent, mitigate and improve responsiveness to natural disasters. ICT is essential to improve the efficiency and effectiveness of disaster risk management (DRM) in Caribbean SIDS (Phillips, 2014). Following disasters, reliable and resilient ICT infrastructure can also be an important facilitator of recovery of government operations and socio-economic sectors, and play a critical role in post-disaster recovery efforts. Given the restraints on individual Caribbean SIDS' investment in ICT infrastructure, a regional digital strategy could enable procurement of technology-enabled DRM tools and foster information sharing and knowledge management. A regional approach could not only save lives but also reduce the toll on the sub-region's economic assets following extreme weather events.

Digital strategies in Caribbean countries show common institutional characteristics (Figure 6.6). Most have not established specialised ministries in the area of ICT; in almost all, ministries in charge of leading the digital policy have broader economic, social or government service provision mandates, as is the case in Barbados, Saint Lucia, and Trinidad and Tobago. The Prime Minister's Office is responsible in Grenada; the Cabinet in Jamaica; a regulatory agency in Saint Vincent and the Grenadines. Caribbean digital plans show an adequate level of maturity in their design, with clear principles and objectives. In most cases, strategies have been linked with a broader NDP.

Figure 6.6. **Institutional characteristics of national Digital Agendas (DAs), selected Caribbean countries**



Note: Colour intensity indicates the intensity with which the DA includes the characteristic in its institutional design.
Source: Based on the latest national Digital Agenda (DA).
StatLink https://doi.org/10.1787/888934172901

Digital transformation, driven by government, business and non-government stakeholders, is a process that demands participation by both single actors and society as a whole. It is therefore essential to involve a range of government, private and civil society actors in digital strategy design, implementation and monitoring. Multi-stakeholder dialogue is key to identifying and overcoming obstacles, and opening opportunities for partnerships. This is especially true in the Caribbean, where poor access to low-cost development finance has limited capacity to build ICT infrastructure capable of delivering high-speed connectivity (Bleeker, 2019b). Various Caribbean countries have established multistakeholder engagement in the digital plan elaboration process, but

this is not universal. The use of Universal Service Funds (USFs) in the sub-region to fund telecommunications infrastructure and ICT projects is an example of multi-stakeholder engagement that can support the realisation of DAs (Bleeker, 2019b). While several USFs have large amounts of undisbursed funds, some funds are being used to improve access to digital services in the context of the coronavirus (Covid-19) crisis (see, for instance, Jamaica Information Service, 2020a and 2020b).

Few ICT strategies in the Caribbean have an institutional design that seeks co-ordination with the private sector and civil society for DA implementation and monitoring. Nonetheless, Caribbean governments have sought to form sub-regional blocs to deliver ICT infrastructure projects. Grenada, Saint Lucia and Saint Vincent and the Grenadines recently partnered with private telecommunications provider Digicel and the CTU to build an undersea fibre cable system and government-wide area networks in and between the countries. This public-private partnership, the Caribbean Regional Communications Infrastructure Program (CARCIP), was financed by loans from the World Bank. The project could have accommodated more countries, but the mode of financing was out of reach for many because of already high levels of indebtedness. Intergovernmental co-ordination mechanisms for the implementation of national digital strategies should also be strengthened to support Caribbean countries' digital transformations. In this respect, renewed collaboration is needed to ensure that sub-regional initiatives, such as CARICOM's Single ICT Space Project and the CTU's 21st Century Governments initiative, can deliver on their aims.

Less present in Caribbean national digital transformation strategies are provisions detailing the policy implementation budget. Saint Lucia's policy does define a budget for each of its programmes. The general absence of such provisions is in part because Caribbean countries often rely on development financing from regional and international organisations to build ICT capacity and e-government, which is usually secured after the elaboration of a DA. Given high levels of public indebtedness in the region and even more limited fiscal space following the coronavirus (Covid-19) pandemic, Caribbean countries may need to increase their reliance on private-sector telecommunications providers and international development financing to realise their DAs.

Tracking key performance indicators is important for assessing progress and comprehensively monitoring the strategy. It can be especially important for adjusting plans and communicating expected outcomes. Some countries have begun to include monitoring indicators to follow up on DA implementation. Trinidad and Tobago's strategy defines metrics to measure levels of expected technology adoption and economic impact. It also includes goals for progress in global indexes, such as the World Economic Forum's Network Readiness Index and the International Telecommunication Union's ICT Development Index.

Digital government in the Caribbean

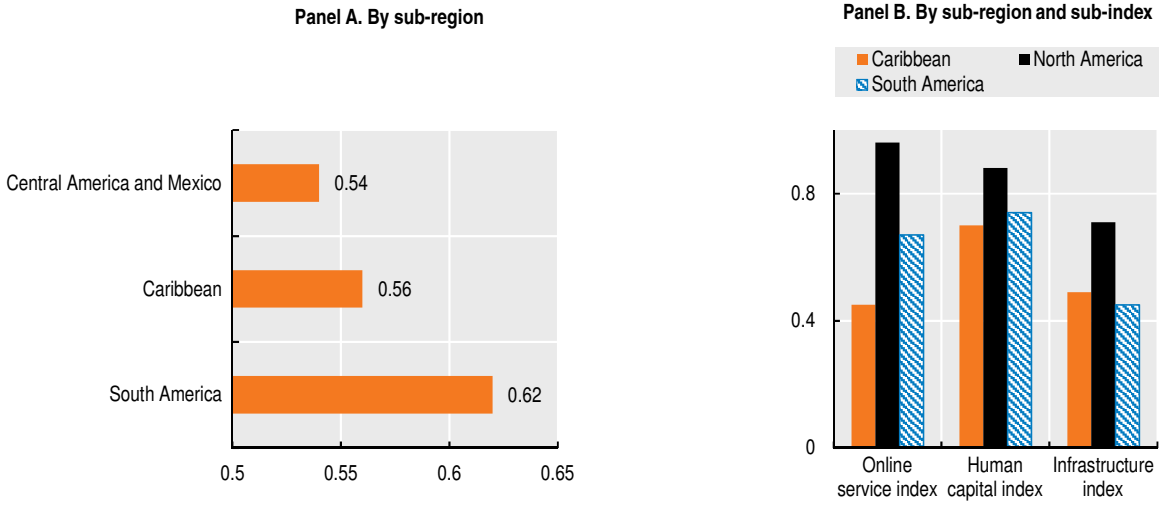
Caribbean governments have begun modernising government services, although effectiveness has been mixed. Government transactions take, on average, four hours, and over 30% require three or more visits to public offices (Roseth Reyes and Santiso, 2018). The need to digitalise transactions with user experience in mind is clear, but advances have been slow, partly because e-government app development and support are resource-intensive, usually requiring deployment of ICT infrastructure and investment in information technology solutions and human capabilities (Marius and Williams, 2016). These challenges are amplified in some Caribbean SIDS by small populations spread across islands, which prevents the economies of scale needed to justify investment.

According to the United Nations (UN) E-Government Development Index (EGDI), one of the most comprehensive measures of e-government development worldwide and an internationally recognised benchmark for comparing countries' efforts, some Caribbean countries, such as Haiti (ranked 163), appear among the worst performers of the 193 countries surveyed (UN, 2019). However, most Caribbean countries have reached "high" or "middle" ranking, and all improved their scores in 2018 from 2016 (Bleeker, 2020). There is a disparity between Latin American and Caribbean countries (see Chapter 4). South American countries have a higher level of development, according to the index (Figure 6.7, Panel A). Furthermore, only South America is above the world average; Central America and the Caribbean are below the world average and only above regions like Africa and Oceania.

According to the EGDI, the greatest challenges for the Caribbean compared with South America are in online service development; there are less significant gaps in telecommunications infrastructure and human capital (Figure 6.7, Panel B). The online service index, gathered by examining several websites in each country, measures the maturity of e-government services according to four stages of development: emerging information service, enhanced information service, transactional services and connected services.

One of the main factors that has allowed South American countries to advance in online service provision has been the design and implementation of e-government strategies (see Chapter 4). Following Uruguay's successful e-government strategy, countries, including Barbados and Jamaica, developed detailed and ambitious e-government plans. Barbados now has the highest EGDI ranking among Caribbean countries and is one of the few with a stand-alone e-government policy. Jamaica, another e-government leader in the Caribbean, recently committed to 90% of government services integrated and available on line (*Gleaner*, 2020). Since the beginning of the coronavirus (Covid-19) crisis, the Jamaican government has been implementing an e-signature project to enable individuals and entities to transact business digitally with all state agencies safely (*Jamaica Observer*, 2020).

Figure 6.7. **E-Government in the Caribbean, United Nations E-Government Development Index, 2018**



Note: The Caribbean is a simple average of 11 countries, excluding Cuba and the Dominican Republic. North America is a simple average of Canada and the United States. The E-Government Development Index is a composite indicator that consists of three indexes (Online Service Index, Telecommunication Infrastructure Index and Human Capital Index), which are equally weighted. It ranges from 0 to 1, with 1 being the most developed.

Source: UN (2019), *UN e-Government Knowledgebase Database* (database), https://publicadministration.un.org/egovkb/en-us/Data-Center.

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Although Caribbean countries are at various stages of e-government development, their most pressing and common issue is a comprehensive regional framework, encompassing common standards, protocols and clear processes for the entire public sector (Marius and Williams, 2016). Many Caribbean countries have no legislative or regulatory frameworks in place for digital security, data protection, information sharing and e-transactions, among other areas. Existing frameworks require updating in light of technological developments and the massive data processing capacities of governments and companies. On the contrary, some countries have no relevant data protection legislation in place, and only a handful have aligned legislation with international and regional best practice in order to address technological developments in data profiling, automated processing and government surveillance. The absence of modern, appropriate data-protection and data-sharing frameworks prevents Caribbean countries from ensuring the free flow of information and digital trade within and beyond the sub-region.

Caribbean countries may benefit from a regional approach to e-government apps and services procurement, since an incoherent approach among individual ministries, departments and agencies can lead to duplication of efforts and lack of interoperability. CARCIP is a recent example of a successful joint ICT infrastructure project. Through joint negotiation, countries improved their bargaining power and procured broadband infrastructure, leading to significant cost reduction (Bleeker, 2019b). Other potential benefits include knowledge sharing, improved app quality, reduced redundancy and standardisation of systems and outputs.

If national standards can be aligned as regional standards, there is potential to benefit from economies of scale through procurement, capacity building and industrial policy. Caribbean countries are already adopting similar software projects, e.g. the Automated Systems for Customs Data, and moving towards Open Source Software. However, there is still redundancy in implementation and misalignment in choice of technology; many initiatives could benefit from tighter harmonisation. The Caribbean Harmonization Project (HIPCAR), which concluded in 2013, was a Caribbean-wide effort to create common ICT policies and legislation. Broadband Infrastructure Inventory and Public Awareness in the Caribbean aimed "to identify an inventory of the existing broadband infrastructure in the participating countries, and practical guidelines for the ubiquitous implementation of broadband access technologies in an efficient manner that is consistent with globally adopted standards and international best practices" (Canto, 2015). The Secretariat of the Organisation of Eastern Caribbean States' Electronic Government for Regional Integration Project is another regional initiative.

There are enormous opportunities to improve regional co-ordination, but there are significant challenges, from differing national policies and priorities to procurement process issues, change-management concerns and difficulty escaping vendor lock-in. However, the challenges can be solved, and regional initiatives can play an important role in developing e-government in the Caribbean. Projects most likely to succeed are those that target common problems, have sufficient commitment and build on existing legal and institutional frameworks for collaboration (Marius and Williams, 2016).

Digital security challenges in the Caribbean

Addressing digital security risks must be a key component of any digital strategy, especially as cyberattacks worsen in frequency and sophistication, disrupting critical infrastructure and compromising key information. Although several Caribbean nations

have started to implement laws and policy frameworks dealing with digital security, few could be said to have a national strategy for digital security or have a national agency responsible for digital security and the critical information infrastructure protection needed to deal with the nuances of cybercrime. Where laws are in place, Caribbean countries do not yet have robust systems to deal with the sophisticated nature of cybercrime (McKendrick, 2020). The ineffectiveness of governments' responses to cyberattacks reveals their lack of institutional and governance capacity.

The UN Global Cybersecurity Index (ITU, 2020b) measures countries' commitment to cybersecurity in five dimensions: legal, technical, organisational, capacity building and international co-operation.[2] No Caribbean country has a "high" rating, and only Jamaica has a "medium" score (0.669-0.340). Other countries have a "low" score (0.339-0.000) (Table 6.2). Compared with the previous index, 7 in 11 countries fell in their ranking. Jamaica, the highest-scoring Caribbean country, ranks 94 of 193 countries.

With respect to South America and North America, the Caribbean's smallest gaps relate to legal aspects, such as the issuance of legislation or regulations on data protection and privacy, protocols for cybercrime response and containment of spam emails. Efforts have also been directed towards organisational aspects. Challenges remain in implementing technical aspects, such as developing computer security incident response teams and agencies to develop or adapt digital security standards, and technical measures for spam containment and child protection on line. The sub-region needs to strengthen efforts in capacity building associated with awareness campaigns, professional certification standards and research investment, and international co-operation (Figure 6.8).

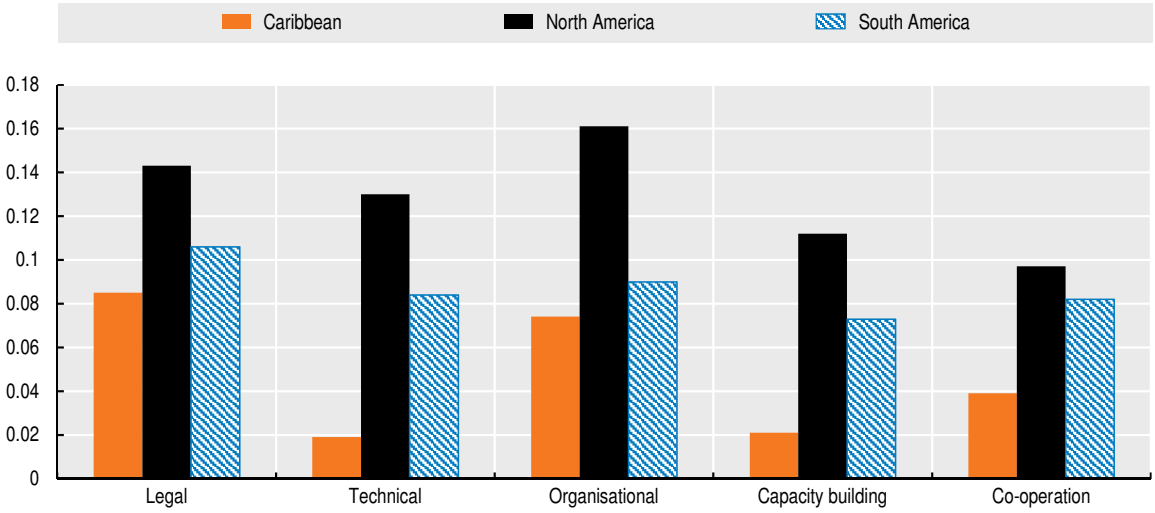
As with their other ICT-related legislation and policy frameworks, Caribbean countries could benefit from a harmonised regional approach to cybercrime laws and procedures. Significant variation exists among countries' substantive legal provisions and procedures, which likely leads to enforcement challenges. Given the borderless nature of the Internet and the many digital security incidents and limited capacity to respond to them, a harmonised approach would facilitate mutual assistance, reducing cybercriminals' ability to operate without repercussion in the Caribbean (McKendrick, 2020).

Table 6.2. **United Nations International Telecommunication Union Global Cybersecurity Index, selected Caribbean countries, 2018**

	Normalised score	2018 ranking	Ranking change (2017 to 2018)	2018 regional ranking
Jamaica	0.407	94	-10	11
Antigua and Barbuda	0.247	113	3	17
Trinidad and Tobago	0.199	119	21	19
Barbados	0.173	127	-33	20
Saint Vincent and the Grenadines	0.169	129	-16	21
Bahamas	0.147	133	-5	22
Grenada	0.143	134	2	23
Saint Lucia	0.096	149	6	29
Saint Kitts and Nevis	0.065	157	-7	30
Haiti	0.046	164	-4	31
Dominica	0.019	172	-10	33

Source: ITU (2020b), *Global Cybersecurity Index* (database), www.itu.int/en/ITU-D/Cybersecurity/Pages/global-cybersecurity-index.aspx.

Figure 6.8. **Five pillars of the United Nations International Telecommunication Union Global Cybersecurity Index, 2018**



Note: Caribbean data use a simple average of 11 countries, excluding Cuba and the Dominican Republic. North America is a simple average of Canada and the United States. The Global Cybersecurity Index measures countries' commitment to cybersecurity at a global level. It has five pillars: 1) legal measures; 2) technical measures; 3) organisational measures; 4) capacity building; and 5) co-operation. It ranges from 0 to 1, with 1 being the highest level of cybersecurity.

Source: ITU (2020b), *Global Cybersecurity Index* (database), www.itu.int/en/ITU-D/Cybersecurity/Pages/global-cybersecurity-index.aspx.

StatLink *https://doi.org/10.1787/888934172939*

Conclusion

The Covid-19 pandemic does and will strongly impact all Caribbean countries, which are highly dependent on travel and tourism. In addition, a strong decrease in remittance flows will severely bear upon individuals and households, affecting consumption and incidence of poverty.

Caribbean countries also face longer-term vulnerabilities, such as climate change, natural hazards and extreme weather events, potentially amounting to the perfect storm of overlapping health, climate and hurricane-related crises. To address short- and long-term challenges, the sub-region needs to diversify its economic structure. The digital transformation can play a critical role. This would entail the digitalisation of the economy and public services in areas including e-government, telemedicine and e-learning. Technology can be crucial for natural disaster preparedness and emergency response.

To benefit from the digital transformation, Caribbean countries must develop further DAs aligned with national development strategies, with resources allocated to implementation. The Caribbean must also create an appropriate and sustainable digital ecosystem to accelerate the digital transformation, increase economic resilience and improve responsiveness to natural hazards. Building financial and technical capacity is essential, as outdated ICT infrastructure prevents many countries from adopting digital technologies quickly and efficiently.

Multi-stakeholder dialogue is key to identifying and overcoming obstacles and opening opportunities for partnerships. This is especially evident in the Caribbean, where poor access to low-cost development finance has limited capacity to build ICT infrastructure capable of delivering high-speed connectivity.

Advancing sub-regional co-operation and co-ordination is fundamental to economies adopting digital transformation inclusively, effectively and efficiently. Several aspects benefit from such co-operation, including ICT policy, broadband infrastructure, e-government systems and policies aimed to use technology-based tools to manage and prevent natural disasters.

Notes

1. Despite scoring third and fourth in the region per population, the Dominican Republic (44.3) and Jamaica (40.0) scored just below the LAC average (49.9).
2. The index combines 25 indicators in a single measure, ranging from 0 to 1, with 0 being the total absence of cybersecurity efforts.

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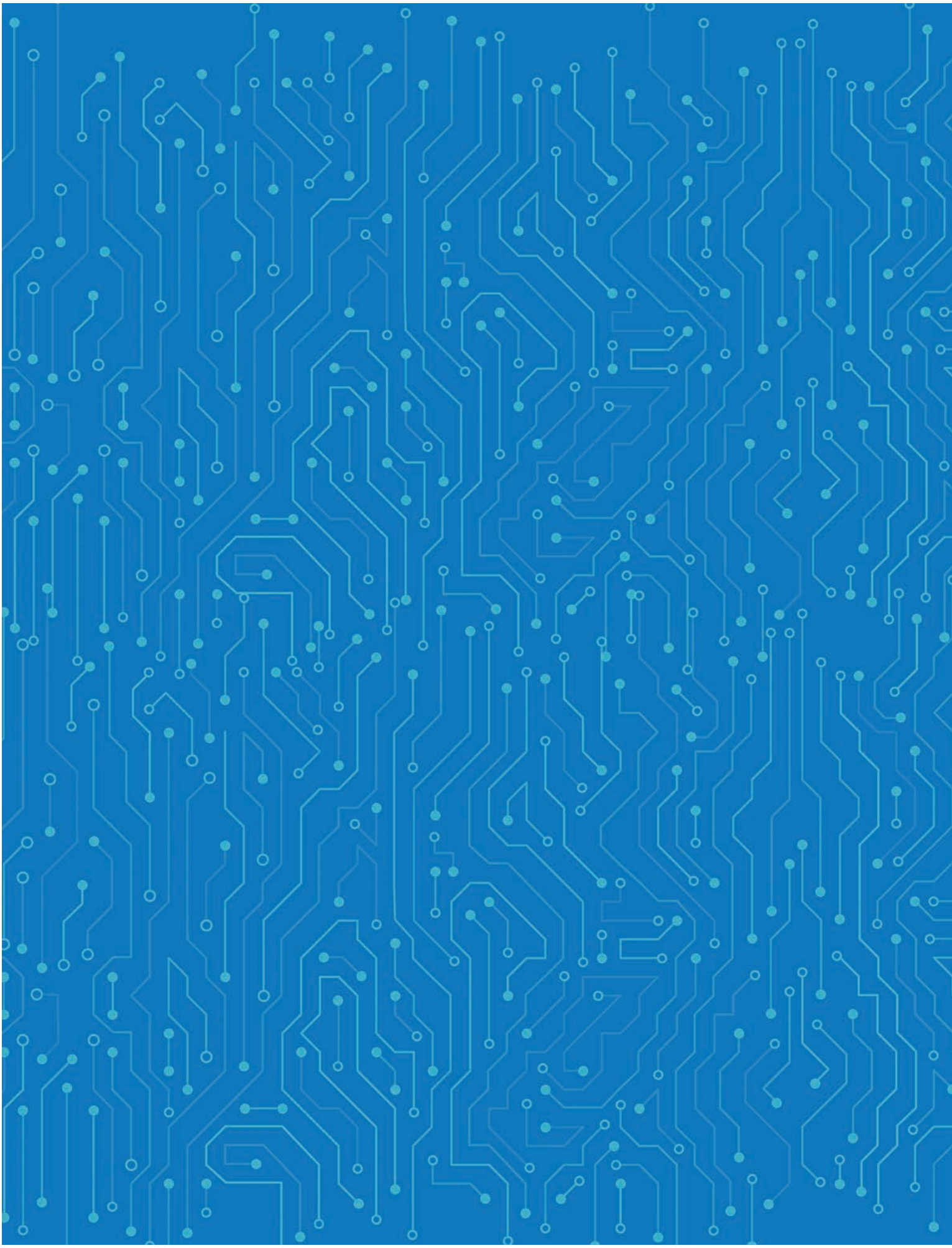

Country notes

- Argentina
- Brazil
- Chile
- Colombia
- Costa Rica
- Dominican Republic
- Ecuador
- El Salvador
- Guatemala
- Mexico
- Panama
- Paraguay
- Peru
- Uruguay

ARGENTINA

Recent trends

In the last decade, Argentina has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased. The country has progressed in the digital transformation of government, ranking among the most advanced countries in Latin America and the Caribbean (LAC) in terms of open government data policies, according to the Organisation for Economic Co-operation and Development (OECD) OURdata Index.

In terms of promoting an inclusive digital society, challenges remain, including the number of computers available to students. Trust in online privacy and e-commerce safety have increased in the past decade but remain below LAC averages. In terms of enabling digital innovation, both the share of information and communications technology (ICT) service imports and high-technology exports as a share of total manufactured exports fell in the period 2008-18.

National strategies and international co-operation for digital transformation

The digital agenda (DA) *Agenda Digital Argentina*, which is in line with the United Nations 2030 Agenda for Sustainable Development, is the basis for governing the digital transformation of the country. The DA aims to take advantage of digital technologies to achieve the full digital inclusion of all citizens, improve economic productivity and competitiveness, and put the state at the service of citizens. It will continue to be revised under the government that assumed power in December 2019.

Among initiatives to promote the digital transformation, the *Aprender Conectados* (Learn connected) programme encourages innovation in education and digital alphabetisation, offering digital education, programming and robotics classes in kindergarten and primary and secondary education. *Programa País Digital* (Digital nation programme) aims to modernise public administration, improve quality of services, and promote transparency, digital inclusion and innovation, in co-ordination with municipal governments. *Puntos Digitales* (Digital points) continue to work within the framework, providing connectivity, training and access to new information and communications technologies. In 2019, Argentina launched the Cybersecurity National Strategy to provide safe cyberspace for individuals and public and private organisations, and renewed the regime that promotes the knowledge-based economy. Argentina also launched the Plan Industry 4.0, involving various ministries, to enhance the industrial sector's competitiveness through adoption of digital technologies. To combat the coronavirus (Covid-19), the government launched the Coronavirus Argentina app *Cuidar* for citizens to self-assess symptoms. Additionally, the Ministry of Public Innovation, along with the Ministry of Health and Facebook, launched a chatbot to provide official information and updates (CAF, 2020).

In terms of international co-operation, the Argentine Fund for International Cooperation (FO.AR) is responsible for South-South, triangular and multilateral initiatives. Through FO.AR, Argentina co-operated with Panama on a project to develop photogrammetry and digital mapping techniques and processes.

The Ministry of Science, Technology and Productive Innovation held the 11th Joint Steering Committee on co-operation on science and technology between the European Union (EU) and Argentina in 2019. They agreed to continue developing common principles and the framework conditions needed to create a level playing field in order to co-operate on research and innovation. Argentina and the EU also co-operate on developing the digital economy, holding an initial meeting in 2018, with a second expected in 2020. Argentina and the EU are co-operating on the International Digital Cooperation project on data protection and data flows to enable the development of a safe and right-based international digital sphere. Argentina and the EU also co-operate with Colombia on a project financed by *Adelante* to group and digitalise biometric data. There is also a regional project on digitisation and data protection under the Partnership Instrument, which will update the legislative and regulatory framework, striving for more alignment with the EU.

Digital indicators - Argentina[1]						
Enhancing access	**Argentina**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	7.8	19.1	4.1	13.9	22.2	32.5
	2010	**2017**	**2010**	**2017**	**2010**	**2017**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	4.9	80.7	5.4	66.8	37.7	97.3
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	90.0	95.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	2.5	3.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Argentina**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.58	0.73	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of Internet users (% of population)[4]	28.1	74.3	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	51.9	50.0	46.4	51.5	73.3	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	19.2		14.8		N/A	
Enabling digital innovation	**Argentina**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	9.4	5.3	9.3	8.6	16.3	15.1
Share of ICT service imports, as % of total trade in services[7]	5.46	5.15	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.19	0.21	0.14	0.34	30.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	0.45	0.53	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.53		0.43		0.61	
Ensuring quality jobs for all	**Argentina**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	48.1		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	66.4	90.0	37.5	60.5	66.6	73.8
	2015		**2015**		**2015**	
Tertiary graduates by field (%) - Education[11]	21.1		16.4		10.3	
Tertiary graduates by field (%) - Health[11]	20.7		14.7		14.3	
Tertiary graduates by field (%) - Engineering[11]	5.5		12.8		14.5	
Promoting an inclusive digital society	**Argentina**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	8.2	8.4	6.9	7.2	17.4	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	2.1	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Argentina**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	4.2		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.41	0.41	0.36	0.43	0.55	0.78
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	48.8	58.7	72.0	63.1	61.7	58.6
Trust in online privacy (%)[20]	40.0	42.0	52.8	54.9	41.7	46.0
Fostering market openness	**Argentina**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.36	0.30	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.03		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

BRAZIL

Recent trends

Brazil continues to perform better than the Latin America and the Caribbean (LAC) average in selected indicators related to shaping an inclusive digital economy and society. However, despite some progress, the country remains below the Organisation for Economic Co-operation and Development (OECD) averages in some of these indicators. The country has made efforts to enhance access to communication infrastructure and services, although a significant digital divide still exists. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade, albeit still below the OECD average. Brazil rose in the E-Government Development Index from 0.57 in 2008 to 0.73 in 2018, which is above the LAC average (0.65) but below the OECD (0.82). The index measures national administrations' willingness and capacity to use information and communications technology (ICT). Additional open data indicators show that Brazil ranks relatively well regionally and globally (Open Knowledge Foundation, 2019; World Wide Web Foundation, 2017). The UNCTAD B2C E-commerce Index shows that the economy's support for online shopping was constant between 2015 and 2019 and is above the LAC average but below the OECD.

The country outperforms LAC in digital innovation metrics but remains below OECD averages. High-technology exports as a share of total manufactured exports rose to 13% in 2018, which is above the LAC average (8.6%) but below the OECD (15.1%). In terms of promoting an inclusive digital society, the number of students per computer rose, from 3.7 in 2015 to 6.0 in 2018, which is above LAC and OECD averages. The Global Cybersecurity Index shows that, despite a lower ranking in 2019 than in 2016, Brazil is above the LAC average but below the OECD average. Performance in the 2019 OECD OURdata Index, which measures open government data policies, was above LAC and OECD averages.

National strategies and international co-operation for digital transformation

The digital transformation strategy *E-Digital* is the central policy document for the digital transformation of the country. It adopts a whole-of-government approach to a data-driven economy, co-ordinating state initiatives related to the digital transformation in order to harness digital technologies' potential to promote sustainable and inclusive growth and to increase competitiveness, productivity and employment. The strategy foresees three ICT sector action plans: the National Internet of Things Plan (IoT.Br), Science at School programme and *Brasil Conectado* (Connected Brazil) programme, part of the Brazilian Digital Transformation Strategy. In April of this year, the country launched the Digital Government Strategy that will guide the actions of federal agencies to transform the digital government and offer better, more affordable services at a lower cost.

IoT.Br focuses on fostering partnerships between public and private organisations and improving connectivity for all. It evaluates local supply, demand and capacity to help formulate IoT solutions and strengthen the digital start-up ecosystem. Science at School aims to strengthen science education with a focus on problem solving. In 2019, Brazil selected 19 projects from federal universities, institutes of science, cultural organisations and other sources to improve science teaching in 22 states. The Connected Brazil programme aims to foster connectivity, promote technological diffusion and digital inclusion, reform the institutional framework and prioritise co-operation among different ministries and stakeholders in education, health, agriculture and national defence. This includes a broad range of initiatives to expand broadband connectivity nationwide, such as installing broadband satellite connection points to expand digital inclusion, especially among socially vulnerable communities and in remote areas. To respond to the coronavirus (Covid-19) crisis, the Ministry of Science, Technology, Innovation and Communications created a crisis committee for the supervision and monitoring of communications, named the Connected Network. The committee co-ordinates actions of telecommunications and broadcasting services, promotes continuity of telecommunications services, allows users to access value-added services and provides access to information (CAF, 2020). The Ministry of Health also developed the Coronavirus-SUS app which provides information about Covid-19 and virtual screening tools. The telecommunications legal framework underwent a reform with Law No. 13 879 of 2019.

In terms of international co-operation, Brazil has collaborated on 5G research and development projects, for instance, the EU-Brazil Agreement for Scientific and Technological Cooperation, formed in 2016 to reach global consensus on a 5G vision, standards and spectrum requirements. Since 2008, Brazil and the European Union have worked within the framework of an agreement for scientific and technological co-operation: countries agreed to expand bilateral dialogue and co-operation on ICT matters encompassing policy, regulation and research.

Digital indicators - Brazil[1]						
Enhancing access	**Brazil**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	5.2	14.9	4.1	13.9	22.7	32.9
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	1.8	88.1	0.5	73.5	19.4	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	93.5	95.5	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.51	0.50	0.58	5.1	2.2	27.7
Strengthening their effective use	**Brazil**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.57	0.73	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	33.8	70.4	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	56.2	56.9	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	22.3		14.8		N/A	
Enabling digital innovation	**Brazil**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	12.2	13.0	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	6.36	6.37	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.34	0.52	0.14	0.34	30.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	0.99	1.3	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.63		0.43		0.61	
Ensuring quality jobs for all	**Brazil**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	1.3		6.9		4.8	
	2015		**2018**		**2018**	
Share of informal employment to total employment[14]	45.0		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	30.8	51.3	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	19.7		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	13.9		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	11.0		12.5		14.6	
Promoting an inclusive digital society	**Brazil**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	7.3	7.4	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	3.7	6.0	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Brazil**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	5.3		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.71	0.56	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	93.6	73.5	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	60.0	38.0	52.8	54.9	41.7	45.6
Fostering market openness	**Brazil**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.25	0.29	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.09		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

CHILE

Recent trends

In the last decade, Chile has strengthened trust in digital technologies. In 2019, perceived e-commerce safety (73.1%) and trust in online privacy (59.6%) were above averages in Latin America and the Caribbean (LAC) (63.1% and 54.9%) and the Organisation for Economic Co-operation and Development (OECD) (58.3% and 45.6%). Performance in the Global Cybersecurity Index improved but remains below the OECD average. The country made progress in digital inclusion: Internet users and active mobile broadband and fixed broadband subscriptions increased.

Chile has the most mature digital ecosystem in LAC for start-ups catering to the public sector in the *Corporacion Andina de Fomento GovTech* index, which measures the development of the start-up industry, government policies and procurement systems. In terms of promoting an inclusive digital society, the number of students per computer fell from 1.7 in 2015 to 1.1 in 2018, which is in line with the OECD average (1.1) and below the LAC average (1.6). A gap persists in digital innovation metrics: high-technology exports represented 6.4% of total manufactured exports in 2018, compared with averages in LAC (8.6%) and the OECD (15.1%).

National strategies and international co-operation for digital transformation

The 2020 digital agenda (DA) *Chile Digital para Tod@s* (Digital Chile for everybody) is the main reference document for the digital transformation of the country. It looks at technology as a means to reduce inequalities, open new and better development opportunities, and advance human rights. The DA is based on six objectives: respecting human rights related to the Internet and information and communications technologies (ICTs); achieving universal connectivity; using ICT to improve quality of life; contributing to expanding the digital economy; using digital technologies for quality education; and supporting policies for the digital transformation that have a multi-sectoral approach.

Related policies include Law No. 21.180 of 2019 on the Digital Transformation of the State, which aims to digitalise and modernise public institutions' administrative procedures. Chile launched *ClaveÚnica* (SingleKey) in 2012, a state authentication system, used by more than 5 million Chileans in 2020, allowing access to public services on line with a unique identification number. Chile introduced the Cybersecurity Policy in 2018. Under the National Artificial Intelligence (AI) Policy, to be launched in 2020, the development and use of AI tools will empower citizens. The policy has three pillars: enabling factors (i.e. human capital, communication infrastructure and data); development and use of AI; and ethics, regulation and socio-economic impacts. The policy is being developed by an expert and an intergovernmental committee, along with a wide and unique participation process, including self-convocated roundtables, regional workshops, virtual meetings and a public consultation. To respond to the coronavirus (Covid-19) crisis on aspects related to telecommunications, the government launched the *Plan Solidario de Conectividad* (Solidarity connectivity plan), which allows families with limited resources to connect to the Internet for free. The Ministry of Education, along with the Ministry of Transport and Telecommunications, is promoting a plan that provides 3 million students with free access to education sites through mobile devices. The online platforms cater to students in pre-kindergarten to grade 4 (CAF, 2020).

Among Chile's initiatives, *Tu Empresa en Un Día 2.0* (Your firm in one day) is a digital platform, developed in 2013, to encourage entrepreneurship and facilitate firm registration. It allows entrepreneurs to carry out transactions in the lifecycle of firms in one place. *Estado Cero Filas* (Government without queues) aims to eliminate unnecessary public transactions and digitalise at least 80% of transactions by 2021 and 100% by 2023. Public institutions will be restricted from requesting citizen information that they already possess, encouraging interoperability within public administration. The Ministry of Economy, Development and Tourism's Digitalise your SME programme assists small and medium-sized enterprises (SMEs) to increase sales, lower costs and improve customer and supplier relations through digital technologies. *Hospital Digital* (Digital Hospital) consists in the digitalisation of the health-care system, with plans to offer e-health services and access to information on past medical examinations, vaccines and patient files through an electronic health record system.

In terms of international co-operation, Chile, New Zealand and Singapore finalised negotiations of the first Digital Economy Partnership Agreement in January 2020. The objective is to establish basic rules on digital trade and a friendly framework for ICT firms to enable more SMEs to enter the global economy.

Chile also collaborates with the European Union (EU) on High Performance Computing (HPC) as part of the European Commission's Future and Emerging Technologies programme. HPC initiatives develop technology and solutions to improve performance in scientific applications and services. It will identify key application areas and hardware and system requirements, identify international funding schemes and promote exchange of best practices between the EU and research communities in Chile and other LAC countries.

Digital indicators - Chile[1]						
Enhancing access	**Chile**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	8.5	17.4	4.1	13.9	22.7	32.9
	2009	**2018**	**2009**	**2018**	**2009**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	3.6	91.6	1.8	73.5	29.8	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	90.0	95.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	1.0	30.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Chile**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.58	0.74	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of Internet users (% of population)[4]	37.3	82.3	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	60.3	67.0	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	17.5		14.8		N/A	
Enabling digital innovation	**Chile**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	6.8	6.4	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	3.64	4.14	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.52	0.82	0.14	0.34	30.9	38.2
	2007	**2016**	**2007**	**2016**	**2007**	**2016**
R&D expenditures, as % of GDP[11]	0.31	0.36	3.7	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.41		0.43		0.61	
Ensuring quality jobs for all	**Chile**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	12.1		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	29.3		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	54.0	88.5	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	15.1		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	21.5		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	15.5		12.5		14.6	
Promoting an inclusive digital society	**Chile**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	8.3	8.7	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	1.7	1.1	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	12.4		7.7		27.7	
Strengthening trust	**Chile**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	5.4		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.38	0.47	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	70.8	73.1	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	46.0	59.6	52.8	54.9	41.7	45.6
Fostering market openness	**Chile**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.26	0.26	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.06		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

COLOMBIA

Recent trends

Colombia has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade. Colombia rose in the E-Government Development Index from 0.53 in 2008 to 0.69 in 2018, which is above the Latin America and the Caribbean (LAC) average (0.65) but below the Organisation for Economic Co-operation and Development (OECD) average (0.82). Colombia had lower foreign direct investment (FDI) restrictions than LAC and the OECD in the 2018 OECD FDI Regulatory Restrictiveness Index.

The country is below the LAC average in digital innovation metrics. High-technology exports as a percentage of total manufactured exports rose to 7.3% in 2018 but remain below the LAC (8.6%) and OECD (15.1%) averages. Finally, Colombia has made progress in terms of shaping an inclusive digital society. In particular, the number of students per computer fell from 1.6 in 2015 to 1.1 in 2018, which is in line with the OECD average and below the LAC average.

National strategies and international co-operation for digital transformation

The 2018-22 national development plan (NDP) *Pacto por Colombia, Pacto por la Equidad* (Pact for Colombia, pact for equity) and the 2018-22 information and communications technology (ICT) plan *El Futuro Digital es de Todos* (The digital future is for everybody) are the main planning instruments for the development strategy and digital transformation of Colombia. The NDP is divided into structural and regional pacts. A Digital Transformation Pact identifies two main work streams. First, it addresses the issue of digital inclusion, with the aim of increasing access to and use of ICT for all, in line with the United Nations 2030 Sustainable Development Goals, and the empowerment of citizens and households in a digital environment. Second, it addresses issues of transparency and efficiency to promote the development of a digital society and industry 4.0. It aims to promote the digital transformation in three dimensions: public administration, economic sectors and provinces. Through this stream, the government targets 34 high-impact government services to be made available on line.

The ICT plan, Colombia's national digital strategy (DA), is based on four axes: the ICT environment, digital social inclusion, empowerment of citizens and households in a digital environment, and digital sectoral transformations (OECD, 2019b). In 2019, the government passed a law to modernise the ICT sector by aligning agents' and authorities' incentives, updating the sector's institutional framework with a single regulator and a focus on investments to close the digital divide. It also adopted the National 5G Policy to facilitate adoption nationwide. Other relevant policies include the National Policy for Digital Transformation and Artificial Intelligence and the National Policy on the Exploitation of Data. Colombia is also developing a national policy on trust and digital security and a national policy to promote innovation in education practices. To respond to the coronavirus (Covid-19) crisis on aspects related to telecommunications, the government issued a decree to guarantee the maintenance and operation of telecommunications services. It provides the necessary and exceptional conditions to ensure that users, especially the most vulnerable, will not have services restricted, even if they have difficulties with payment, by extending invoices for 30 days. The decree provides authorisation to prioritise access to the content and apps of health services, emergency care, government, and labour or education information (CAF, 2020).

In terms of international co-operation, Colombia has South-South alliances with more than 90 countries in Africa, Asia, Latin America and the South Pacific. Projects supported by Colombia include online government programmes in the Dominican Republic and Guatemala. The *Saber Hacer Colombia* initiative, managed by the Presidential Agency for International Cooperation, collects good practices to replicate, including in the digital field, as part of the international co-operation Colombia offers.

The European Union (EU) is Colombia's largest source of foreign investment, supporting themes ranging from emerging technologies to climate resilience. Colombia recently engaged in co-operation with the EU on innovation, Colombia's rich cultural assets, and creative industries – the so-called orange (OECD, 2019b), green and circular economies. Colombia also works with the EU in the BELLA (Building the Europe Link with Latin America) project, where the aim is to provide for the long-term interconnectivity needs of European and Latin American research and education networks.

Digital indicators - Colombia[1]						
Enhancing access	**Colombia**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	4.0	13.5	4.1	13.9	22.7	32.9
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	0.35	52.3	0.53	73.5	19.4	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	100.0	100.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.71	5.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Colombia**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.53	0.69	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	25.6	64.1	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	44.6	60.5	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	14.9		14.8		N/A	
Enabling digital innovation	**Colombia**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	4.0	7.3	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	3.62	5.33	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.13	0.26	0.14	0.34	30.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	0.15	0.27	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.88		0.43		0.61	
Ensuring quality jobs for all	**Colombia**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	61.4		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	33.7	56.4	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	8.2		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	6.8		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	16.7		12.5		14.6	
Promoting an inclusive digital society	**Colombia**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	5.5	5.6	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	1.6	1.1	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Colombia**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	5.1		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.59	0.57	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	80.0	57.8	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	70.0	56.0	52.8	54.9	41.7	45.6
Fostering market openness	**Colombia**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.30	0.30	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.03		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

COSTA RICA

Recent trends

In the last decade, Costa Rica has made advances in digital inclusion. Internet users represented more than 74% of the population in 2018, with further increases in the previous year. In 2018, active mobile broadband subscriptions stood at 100.9 per 100 people and fixed broadband subscriptions at 16.6 per 100 inhabitants. These figures were above the Latin America and the Caribbean (LAC) averages (73.5 and 13.9, respectively). Performance in the E-Government Index, a measure of national administrations' willingness and capacity to use information and communications technology (ICT), also improved. The country remains behind in open government data policies, performing below the region and Organisation for Economic Co-operation and Development (OECD) averages in the OECD OURdata Index.

In terms of performance in enabling digital innovation, Costa Rica's above-average high-technology exports as a percentage of total manufactured exports, relative to the LAC average (9.6%), decreased from 39.6% in 2008 to 18.5% in 2017, which is in line with the OECD average (15.1%). In terms of promoting an inclusive digital society, the number of students per computer fell from 2.8 in 2015 to 1.3 in 2018, which is still above the OECD average but below the LAC average.

National strategies and international co-operation for digital transformation

The National Telecommunications Development Plan 2015-2021 and *Estrategia de Transformación Digital hacia la Costa Rica del Bicentenario 4.0 2018-2022* (Digital Transformation Strategy towards the Costa Rica of Bicentennial 4.0 2018-2022) are the main references for the digital transformation of the country. The plan relies on inter-institutional and inter-sectoral co-ordination in three pillars: digital inclusion, digital economy, and transparent and electronic government. The strategy aims to advance towards a digitally inclusive, better connected, productive and more innovative country. Its guiding principles are: the adoption of industry 4.0 technologies; development of a digitally intelligent government; inclusive, integrated and secure digital services; and development of human talent. The Ministry of Science, Technology and Telecommunications (MICITT) is responsible for the implementation, co-ordination and follow-up of these plans.

The strategy's Business Transformation 4.0 axis looks at the role of digital technologies in the development of the bioeconomy, to minimise environmental impact and maximise efficiency. It establishes that the bioeconomy, biotechnology and bioinformatics will be vehicles for decarbonisation and productivity. The MICITT is leading the creation of a National Bioeconomy Strategy, with the support of private and public national institutions, the United Nations Economic Commission for Latin America and the Caribbean and the German Agency for International Cooperation. The strategy is in line with the National Decarbonisation Plan 2018-2022, which aims to achieve a modern, green, emission-free, resilient and inclusive economy by 2050. To respond to the coronavirus (Covid-19) crisis on aspects related to telecommunications, the Ministry of Science, Technology and Telecommunications and the Council of the Superintendency of Telecommunications made agreements with mobile operators in the country to provide continuity and maintenance of services. This agreement enables the Ministry of Health to establish a systematic method of sending text messages with sanitary recommendations. It also provides free browsing on Ministry of Education, Social Security Fund, Ministry of Health, Presidency of the Republic and Pura Vida Digital websites (CAF, 2020).

Costa Rica recently developed *Bola de Cristal* (Crystal ball), a smart digital platform matching jobs and skills supply and demand. It also informs users on skills needed in the knowledge economy and careers in high demand; promotes training and certification customised to user profiles; supports financial products for access to training and certification; and creates job opportunities with firms in the knowledge economy.

In terms of international co-operation, Costa Rica signed an ICT co-operation accord with Estonia focused on digital government, cybersecurity and interoperability in September 2019. Projects include developing digital identity and promoting co-operation between the countries' technology firms.

Costa Rica also collaborates with the European Union (EU) on the Connect 2020 programme, which focuses on stimulating co-operation in ICT between Europe and LAC countries. The project is funded by the Seventh Framework Programme and is part of the Latin American Technology Platforms in Innovation project under the EU Horizon 2020 programme.

Digital indicators - Costa Rica[1]						
Enhancing access	**Costa Rica**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	2.5	16.6	4.1	13.9	22.7	32.9
	2010	**2018**	**2010**	**2018**	**2010**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	7.4	100.9	5.4	73.5	37.7	103.6
	2015	2018	2015	2018	2015	2018
Proportion of population covered by at least 3G network[5]	93.4	97.3	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	1.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Costa Rica**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.51	0.70	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	32.3	74.1	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	52.4	64.1	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	18.5		14.8		N/A	
Enabling digital innovation	**Costa Rica**		**LAC**		**OECD**	
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
High-technology exports (% of manufactured exports)[9]	39.6	18.5	9.3	9.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	7.69	7.70	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.19	0.50	0.14	0.34	30.9	38.2
	2007	**2016**	**2007**	**2016**	**2007**	**2016**
R&D expenditures, as % of GDP[11]	0.36	0.46	0.34	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.37		0.43		0.61	
Ensuring quality jobs for all	**Costa Rica**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	6.8		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	37.4		54.9		N/A	
	2004	**2017**	**2004**	**2017**	**2004**	**2017**
Tertiary gross enrolment rate (%)[9]	26.7	55.7	34.5	60.5	63.0	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	21.3		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	15.1		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	6.9		12.5		14.6	
Promoting an inclusive digital society	**Costa Rica**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	9.4	9.7	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	2.8	1.3	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Costa Rica**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	4.0		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.35	0.22	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	67.4	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	58.0	52.8	54.9	41.7	45.6
Fostering market openness	**Costa Rica**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.04	0.04	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.03		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

DOMINICAN REPUBLIC

Recent trends

In the last decade, the Dominican Republic has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased. The country is also making progress in strengthening trust in the digital ecosystem. Performance in the Global Cybersecurity Index is in line with the Latin America and the Caribbean (LAC) average (0.43) but below the Organisation for Economic Co-operation and Development (OECD) average (0.79).

The Dominican Republic's e-government rankings also improved, but there remains room to expand open government data policies, according to the OECD OURdata Index. In terms of promoting an inclusive digital society, the number of computers available to students increased between 2015 and 2018, surpassing the LAC average and closing the gap with the OECD. However, 40% of students have a computer in good condition, 30% have one requiring repairs, and 10% have one in poor condition.

National strategies and international co-operation for digital transformation

The Dominican Republic's 2016-20 digital agenda (DA) is the main document governing the digital transformation of the country and is in line with *Estrategia Nacional de Desarrollo 2030* (National Development Strategy 2030). It is based on five strategic axes: infrastructure and access; e-government and digital services; skills development; productive development and innovation; and enabling environment. The National Commission of the Knowledge and Information Society (CNSIC) is responsible for formulating, co-ordinating and following up on implementation of the DA. The CNSIC is made up of national entities from government, the private sector, academia and civil society. It aims to encourage the sustainable use of information and communications technology (ICT) for development based on collaboration among these groups.

Among related activities, *República Digital* (Digital Republic) aims to reduce the digital divide and offer better services to citizens. The project is based on four axes: education, access to ICT, productivity and employment, and digital government. The country has so far put more than 1 000 services on line, promoted robotics and science classes in 742 education services, and developed a National Cybersecurity Strategy 2018-2021 to enable trust in the digital ecosystem. To mitigate the economic impact of the coronavirus (Covid-19), the Institute of Telecommunications (Indotel) prohibited the suspension or cancellation of telecommunications services during the state of emergency and exempts users from defaulting on late payments in the five days following the termination of the state of emergency (CAF, 2020).

The Dominican Republic is a member of the Better than Cash Alliance, a partnership of governments, companies and international organisations that accelerates the transition from cash to digital payment to advance the United Nations Sustainable Development Goals. Among other projects, the alliance supports the distribution of benefits on a reloadable Visa card as part of the *Solidaridad* programme by the Social Subsidies Administration, in partnership with Visa and local financial institutions. The country is a member of the Open Government Partnership, the joint work of governments and civil society organisations to promote accountable, responsive and inclusive governance. As part of its commitments, the Dominican Republic is currently carrying out the fourth Open Government Action Plan 2018-2020. As part of the plan, the country has introduced the concept of Social and Democratic Rule of Law to public procurement. Similarly, the country is also engaged in policy discussions at the World Summit on the Information Society and will chair the 2020 edition focusing on the use of digital technologies in the Covid-19 response and mitigation.

The Dominican Republic was part of the Latin America, Caribbean and European Union Network on Research and Innovation (2012-17). The country also collaborated with the European Union (EU) through workshops on digital co-operation aimed to align EU-LAC digital regulations and policies. Main topics were cybersecurity, telecommunications regulation, e-commerce platforms and the media. The workshops led to the definition of possible mechanisms to structure collaboration in the medium and long term. Since 2019, in line with the challenges of the information and knowledge societies, the Dominican Republic has been involved in creating a framework for personal data protection regulation, drawing on experiences from the EU legal framework.

Digital indicators - Dominican Republic[1]

	Dominican Republic		LAC[2]		OECD[3]	
Enhancing access						
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	2.5	7.5	4.1	13.9	22.7	32.9
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	0.44	60.8	0.53	73.5	19.4	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	98.8	99.2	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.40	2.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Dominican Republic**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.49	0.57	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	20.8	74.8	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	39.9	60.4	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	13.2		14.8		N/A	
Enabling digital innovation	**Dominican Republic**		**LAC**		**OECD**	
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
High-technology exports (% of manufactured exports)[9]	3.7	8.6	9.3	9.6	15.6	15.3
Share of ICT service imports, as % of total trade in services[7]	2.70	2.70	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.14	0.05	0.14	0.34	30.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	N/A	N/A	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.46		0.43		0.61	
Ensuring quality jobs for all	**Dominican Republic**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2017		**2018**		**2018**	
Share of informal employment to total employment[14]	57.2		54.9		N/A	
	2003	**2017**	**2003**	**2017**	**2003**	**2017**
Tertiary gross enrolment rate (%)[9]	34.1	59.9	35.3	60.5	59.9	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	19.6		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	16.5		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	8.7		12.5		14.6	
Promoting an inclusive digital society	**Dominican Republic**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	5.6	5.8	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	3.2	1.4	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Dominican Republic**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	3.7		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.12	0.43	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	56.1	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	56.0	52.8	54.9	41.7	45.6
Fostering market openness	**Dominican Republic**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

ECUADOR

Recent trends

In the last decade, Ecuador has made efforts to enhance digital access and use for all. The share of Internet users as well as active mobile broadband and fixed broadband subscriptions have considerably increased in during this period. In particular, active mobile broadband subscriptions (per 100 people) increased from 8.8 in 2008 to 54.7 in 2018 but remained below the Latin America and the Caribbean (LAC) average (73.5) and the Organisation for Economic Co-operation and Development (OECD) average (103.6). Perceived e-commerce safety and trust in online privacy are above LAC and OECD averages.

Ecuador's performance in enabling digital innovation showed mixed results in the last decade. High-technology exports as a share of total manufactured exports increased from 5.0% in 2008 to 5.3% in 2018 but remain below averages in LAC (8.6%) and the OECD (15.1%). Further efforts are needed for the digital transformation of government. Ecuador is among the underperformers in LAC for open government data policies in the OECD OURdata Index. Similarly, the country ranks below LAC and OECD averages in the E-Government Development Index (EGDI).

National strategies and international co-operation for digital transformation

The 2017-21 *Toda una Vida* (A lifetime) national development plan (NDP) and *Política Ecuador Digital* (Digital Ecuador Policy) are the main references for the development and digital transformation of the country. The NDP focuses on three main objectives: universal rights, economy at the service of society, and better institutions. The Digital Ecuador Policy is based on three axes: connectivity; efficiency and security of information; and innovation and competitiveness. The first axis aims to expand telecommunications service coverage and migrate to higher speed networks. The second aims to guarantee citizen participation, democratic public services, simplified transactions, efficient public management, access to and use of open data and information and data security. The third aims to turn Ecuador into a model of innovation and competitiveness in the region through the development of smart cities, the digital transformation of firms and the creation of a National Strategy for E-Commerce.

The Ministry of Telecommunications and Information Society is developing strategic projects related to the three axes. Cheaper Internet will increase telecommunications coverage and benefit poor households with preferential tariffs. Digital Social Fingerprint will improve public services by providing public institution information on an integrated digital platform. Ecuador is also working on a National Cybersecurity Strategy. Last, a project to include ICT in education curricula will help develop the computational thinking and digital skills needed to achieve innovation and competitiveness. To mitigate the economic impact of the coronavirus (Covid-19), the government agreed with the telecommunications industry to increase the data provided to mobile service users and expand landline bandwidth at no extra cost, to meet the growing demand for networks. The Ministry of Telecommunications also assigned a phone number for up-to-date pandemic information, including testing locations and telemedicine information (CAF, 2020).

In terms of international co-operation, Ecuador received bilateral technical support from Brazil for the implementation of terrestrial digital television, following the Japanese-Brazilian model. As part of a triangular co-operation project, Ecuador and Germany shared their e-government experiences with El Salvador. Ecuador also participated in the European Union-backed MAGIC project (2015-17) to streamline global scientific and academic collaboration. Programmes to boost knowledge sharing, training and access to e-infrastructure were among its main achievements. The country also forms part of the Cyber Resilience for Development, a European Union project designed to promote cyber-resilience and digital security in order to protect public and private enterprises across the globe.

Digital indicators - Ecuador[1]

	Ecuador		LAC[2]		OECD[3]	
Enhancing access						
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	1.1	11.4	4.1	13.9	22.7	32.9
	2010	**2018**	**2010**	**2018**	**2010**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	8.8	54.7	5.4	73.5	37.7	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	91.9	93.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	5.0	0.58	5.1	2.2	27.7

	Ecuador		LAC		OECD	
Strengthening their effective use						
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.48	0.61	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of Internet users (% of population)[4]	18.8	57.3	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	45.0	39.9	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	8.8		14.8		N/A	

	Ecuador		LAC		OECD	
Enabling digital innovation						
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	5.0	5.3	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	0.93	0.25	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.01	0.07	0.14	0.34	30.9	38.2
	2006	**2014**	**2006**	**2014**	**2006**	**2014**
R&D expenditures, as % of GDP[11]	0.13	0.44	0.35	0.40	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.29		0.43		0.61	

	Ecuador		LAC		OECD	
Ensuring quality jobs for all						
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	72.7		54.9		N/A	
	2008	**2015**	**2008**	**2015**	**2008**	**2015**
Tertiary gross enrolment rate (%)[9]	38.8	44.9	41.5	51.0	64.4	70.1
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	18.8		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	12.7		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	9.0		12.5		14.6	

	Ecuador		LAC		OECD	
Promoting an inclusive digital society						
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	5.4	5.5	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	N/A	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	4.4		7.7		27.7	

	Ecuador		LAC		OECD	
Strengthening trust						
	2020		**2020**		**2020**	
CAF GovTech Index[18]	3.6		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.35	0.37	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	63.8	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	66.7	52.8	54.9	41.7	45.6

	Ecuador		LAC		OECD	
Fostering market openness						
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

EL SALVADOR

Recent trends

El Salvador continues to progress in enhancing digital access and use for all, but a digital gap remains. Despite improvements, active mobile broadband subscriptions in 2018 were below Latin American and Caribbean (LAC) and Organisation for Economic Co-operation and Development (OECD) averages, while Internet users represented 33.8% of the population, compared with 62.9% in LAC and 83.4% in the OECD in 2017. More progress is needed in enhancing trust in the digital ecosystem. In particular, trust in online privacy and the Global Cybersecutiry Index are below LAC and OECD averages.

El Salvador's performance in enabling digital innovation remains subdued. Despite increased research and development expenditures between 2007 and 2016, information and communications technology (ICT) patent applications filed under the Patent Cooperation Treaty (PCT) remain low.

National strategies and international co-operation for digital transformation

The Digital Agenda 2020-2030 is the main reference document for the development and digital transformation of El Salvador. The digital agenda (DA) details a set of actions that seek to integrate all actors that participate in the development of the country through innovation and the application of ICT. It lays out a ten-year plan for the digital transformation. Its four main streams of work are: digital identity; digital governance; state modernisation; and innovation, education and competitiveness. The DA is aligned with the United Nations (UN) Sustainable Development Goals and eight national strategic projects.

The Secretary for Innovation of the Presidency of the Republic manages, supervises and evaluates progress towards the implementation of the DA. Among other responsibilities, this recently created secretary is responsible for developing and implementing digital identity and electronic signature services based on the Unique Identity Number. For this purpose, information registration systems are being standardised through adoption of a single informatics system in the Register of Vital and Family Records.

Other planned projects include: achieving interoperable systems to facilitate exchange of digital information within public administration; integrating digital technologies into education curricula at all levels; and creating a regulatory framework for Fintech. The National Policy on Open Data, introduced in 2018, and the open data portal Datos.gob.sv are part of a government initiative to promote transparency and fight corruption. To mitigate the economic impact of the coronavirus (Covid-19), the government approved measures to suspend payment of telecommunications services for three months. El Salvador also increased the use of telemedicine, enabling patients to consult their doctors from home (CAF, 2020).

In terms of international co-operation, El Salvador receives expert technical assistance on digital themes from the Uruguayan Agency of Electronic Government and Information Society. Projects aim to train public servants, promoting the digital transformation of government institutions. The country also participates in *Proyecto Mesoamérica* (Mesoamerica project), which seeks to promote the development of ICT infrastructure and public policies for the integration of ICT services.

El Salvador held the seventh Senior Officials Meeting on Science and Technology of the European Union (EU)-Community of Latin American and Caribbean States (CELAC) Joint Initiative on Research and Innovation in October 2017. Countries highlighted the strategic relevance of research and innovation for implementing the UN 2030 Agenda for Sustainable Development and acknowledged the strategic policy inputs of bi-regional projects and programmes.

Digital indicators - El Salvador[1]						
Enhancing access	**El Salvador**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	2.0	7.7	4.1	13.9	22.7	32.9
	2009	**2018**	**2009**	**2018**	**2009**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	1.8	54.5	1.8	73.5	29.8	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	61.3	86.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	3.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**El Salvador**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.50	0.55	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of Internet users (% of population)[4]	10.1	33.8	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	31.7	37.2	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	9.0		14.8		N/A	
Enabling digital innovation	**El Salvador**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	5.9	6.1	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	2.92	2.53	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.00	0.01	0.14	0.34	30.9	38.2
	2007	**2016**	**2007**	**2016**	**2007**	**2016**
R&D expenditures, as % of GDP[11]	0.11	0.15	0.34	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.28		0.43		0.61	
Ensuring quality jobs for all	**El Salvador**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2017		**2018**		**2018**	
Share of informal employment to total employment[14]	70.2		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	24.3	28.6	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	12.2		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	17.8		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	10.5		12.5		14.6	
Promoting an inclusive digital society	**El Salvador**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	5.6	5.8	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	N/A	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**El Salvador**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	N/A		4.42		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.21	0.12	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	66.7	61.5	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	44.0	39.2	52.8	54.9	41.7	45.6
Fostering market openness	**El Salvador**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

GUATEMALA

Recent trends

Guatemala continues to progress in enhancing digital access and use for all. The share of Internet users increased from 8.3% in 2008 to 65.0% in 2018, which is above the current Latin America and the Caribbean (LAC) average (62.9%). Active mobile broadband subscriptions also increased but are below the LAC and Organisation for Economic Co-operation and Development (OECD) averages. The country has made progress in enhancing trust in the digital ecosystem, as seen by improvement in perceived trust in online privacy and in the Global Cybersecurity Index. In particular, the Global Cybersecurity Index increased from 0.21 in 2016 to 0.25 in 2018, but remains below LAC (0.43) and OECD (0.79) averages.

Guatemala's digital innovation metrics leave room for improvement. In particular, high-technology exports represented 5.3% of total manufactured exports in 2017, compared with averages of 9.6% in LAC and 15.3% in the OECD.

National strategies and international co-operation for digital transformation

The national development plan (NDP) *K'atun, Nuestra Guatemala 2032* (K'atun, Our Guatemala 2032) and the digital agenda (DA) *Agenda Nación Digital 2016-2032* (Digital Nation 2016-2032) are the main planning instruments for the digital transformation of Guatemala (ECLAC, 2018). The NDP includes an axis on well-being, with actions for the promotion of science and technology. It establishes two main objectives. The first is to close the digital gap within public institutions to improve and speed up processes and transactions and, within society, generate knowledge. The second is to design, approve and implement policies for digital inclusion. The DA aims to take advantage of information and communications technology (ICT) to contribute to the country's technological, social and economic development. It prioritises education and security but also focuses on health, transparency and development.

Related policies include the National Policy of Scientific and Technological Development 2015-2032, which aims to generate skills and encourage multidisciplinary research in science, technology and innovation. The 2018 National Policy of Cybersecurity aims to create conditions for participation in and development of cyberspace. It recognises, among others, international government co-operation as a pillar of cybersecurity. Guatemala created *Viceministerio de Asuntos Registrales* (Vice Ministry for Registry Affairs) in 2019 to digitalise Ministry of Economy services. In 2020, the renamed *Comisión Presidencial de Gobierno Abierto y Electrónico* (GAE; Commission for Open and Electronic Governance) was tasked with co-ordinating the application of measures, commitments and strategies derived from international instruments and national policies and action plans regarding open government and electronic signature. The goal is to contribute to the transformation of public management, ICT innovation, citizen participation, accountability and transparency. To mitigate the economic impact of the coronavirus (Covid-19), the government announced that telecommunications companies would operate as an essential service and continue during lockdown. Claro and Tigo, large telecommunications and media operators, offered a *Plan Básico de Navegación* (Basic navigation plan) to ensure connection to users unable to pay their Internet plans (CAF, 2020).

In terms of international co-operation, Guatemala was involved in a triangular co-operation project with Germany and Mexico in 2016-18 that aimed to create a space of dialogue for identifying best practices in the management of technical development co-operation among countries facing similar challenges. It included the creation of a digital platform to record and organise the country's existing technical development co-operation. With the help of the European Union, Guatemala also implemented a Platform of National Information on Nutrition to help monitor chronic malnutrition. It aims to strengthen management of information, evidence-based policy making, and co-ordination and technical planning.

Digital indicators - Guatemala[1]						
Enhancing access	**Guatemala**		**LAC[2]**		**OECD[3]**	
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Fixed broadband subscriptions (per 100 inhabitants)[4]	0.67	3.1	4.1	12.0	22.7	32.2
	2009	**2017**	**2009**	**2017**	**2009**	**2017**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	2.0	16.5	1.8	66.8	29.8	97.3
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	92.0	95.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	2.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Guatemala**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.43	0.50	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of Internet users (% of population)[4]	8.3	65.0	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	21.4	37.5	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	10.6		14.8		N/A	
Enabling digital innovation	**Guatemala**		**LAC**		**OECD**	
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
High-technology exports (% of manufactured exports)[9]	4.3	5.3	9.3	9.6	15.6	15.3
Share of ICT service imports, as % of total trade in services[7]	1.72	4.58	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.04	0.00	0.14	0.34	30.9	38.2
	2006	**2015**	**2006**	**2015**	**2006**	**2015**
R&D expenditures, as % of GDP[11]	0.05	0.03	0.35	0.40	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.54		0.43		0.61	
Ensuring quality jobs for all	**Guatemala**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2017		**2018**		**2018**	
Share of informal employment to total employment[14]	80.9		54.9		N/A	
	2007	**2015**	**2007**	**2015**	**2007**	**2015**
Tertiary gross enrolment rate (%)[9]	17.3	21.8	37.5	51.0	66.6	70.7
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	N/A		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	N/A		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	N/A		12.5		14.6	
Promoting an inclusive digital society	**Guatemala**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	3.9	4.0	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	N/A	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Guatemala**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	N/A		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.21	0.25	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	66.7	46.8	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	44.0	56.9	52.8	54.9	41.7	45.6
Fostering market openness	**Guatemala**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

MEXICO

Recent trends

Mexico continues to outperform Latin America and the Caribbean (LAC) in terms of shaping an inclusive digital economy and society. The country has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade. Mexico rose in the E-Government Development Index from 0.59 in 2008 to 0.68 in 2018, which is above the LAC average and below the Organisation for Economic Co-operation and Development (OECD) average.

Mexico's performance in high-technology exports as a share of total manufactured exports has been above LAC and OECD averages in the last decade. In terms of promoting an inclusive digital society, the number of students per computer rose from 2.2 in 2015 to 2.4 in 2018, which is above LAC (1.6) and OECD averages (1.1). The Global Cybersecurity Index (0.63) shows improved and consistently higher results than the LAC average (0.43) but below the OECD average (0.79). Mexico had higher foreign direct investment restrictions than LAC and the OECD in the 2018 OECD FDI Regulatory Restrictiveness Index.

National strategies and international co-operation for digital transformation

The 2019-24 national development plan (NDP) is Mexico's main development planning instrument. The NDP embeds digital tools in specific policy areas to achieve its goals, specifically targeting productivity, inclusion, public administration and climate change. The Office of the President of the Republic developed *Estrategia Digital Nacional* (National Digital Strategy) with the goal of maximising information and communications technology (ICT) capabilities. The Coordination of the National Digital Strategy, which reports directly to the Office of the President, is responsible for the elaboration and co-ordination of the plan, as well as the development of ICT for its use in the public administration.

The National Plan to Fight Corruption and Impunity, and to Improve the Public Administration 2019-2024 uses digital tools in its execution. The goal is to establish a programme to promote efficiency in public administrations, while modernising and improving public service provision. Specifically, the programme will implement a system of digital platforms and tools for citizens to supervise federal public administration activities, including public procurement processes. It will also promote transversal ICT adoption across government entities and the implementation of the Digital Platform for Public Procurement. To mitigate the impact of the coronavirus (Covid-19), the Ministry of Public Education implemented *Aprende en Casa* (Learn at home) to enable classes during lockdown. Education content is made available online and through public television. Additionally, the government created an official website for general coronavirus (Covid-19) information (CAF, 2020).

The Ministry of Economy is responsible for implementing the Development of the Software and Innovation Industry, which focuses on industrial innovation, adoption and development. It also prioritises the digitalisation of Mexican companies as they tackle industry 4.0.

In terms of international co-operation, Mexico established the Better than Cash Alliance through multilateral co-operation with Colombia, Paraguay, Peru and other countries around the world. The partnership aims to accelerate the transition from cash to digital payment to reduce poverty and drive inclusive growth. The country co-operated with France on a digital project on information and democracy to fight disinformation and fake news.

Mexico also co-operates with the European Union, playing a major role in the plan to advance High Performance Computing (HPC). Mexico will receive support to create a roadmap for future HPC research co-operation, identify national and regional funding schemes, and improve links between research communities in Europe and Mexico and other LAC countries.

Digital indicators - Mexico[1]						
Enhancing access	**Mexico**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	6.8	14.6	4.1	13.9	22.7	32.9
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	0.04	70.0	0.53	73.5	19.4	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	89.0	89.6	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.51	10.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Mexico**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.59	0.68	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	21.7	65.8	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	49.1	47.5	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	16.8		14.8		N/A	
Enabling digital innovation	**Mexico**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	20.6	21.0	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	1.08	0.45	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.21	0.32	0.14	0.34	30.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	0.37	0.49	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.71		0.43		0.61	
Ensuring quality jobs for all	**Mexico**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	7.2		6.9		4.8	
	2004		**2018**		**2018**	
Share of informal employment to total employment[14]	65.9		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	25.4	40.2	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	13.8		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	9.7		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	21.3		12.5		14.6	
Promoting an inclusive digital society	**Mexico**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	7.9	8.2	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	2.2	2.4	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	7.6		7.7		27.7	
Strengthening trust	**Mexico**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	5.2		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.32	0.63	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	84.4	65.3	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	66.0	51.9	52.8	54.9	41.7	45.6
Fostering market openness	**Mexico**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	0.14	0.14	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.19		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

PANAMA

Recent trends

Panama aims to shape an inclusive digital economy and stronger, more transparent administration with the use of digital tools. The country has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade although regional, gender and age disparities remain a challenge. Panama rose in the E-Government Development Index from 0.47 in 2008 to 0.61 in 2018, which is below the Latin America and the Caribbean (LAC) average (0.65). The index measures national administrations' willingness and capacity to use information and communications technology (ICT) to deliver public services. The UNCTAD B2C E-commerce Index shows that the economy, despite being a regional hub, is slightly below the LAC average for online shopping.

In terms of enabling digital innovation, Panama performs below the LAC and OECD averages in several indicators including R&D expenditures (as a percentage of GDP), patents' applications and the share of ICT service imports. In terms of promoting an inclusive digital society, relative to the LAC average, the country has a similar number of computers available to students.

National strategies and international co-operation for digital transformation

Plan Estratégico del Gobierno 2019-2024 (Strategic Plan of the Government 2019-2024) and *El Camino a un Ciudadano Digital* (Digital Agenda 2020: The Journey towards a Digital Citizen) are the main reference documents for the development and digital transformation of Panama. These strategies highlight the need to move from e-government towards a fully digital government, following the Organisation for Economic Co-operation and Development (OECD) *Digital Government Review of Panama* (OECD, 2019c).

Digital policies primarily focus on establishing online processes for government entities. The modification of Law No. 83 of 2012 by Decree No. 275 of 2018 laid the groundwork for the implementation of electronic procedures and institutional interoperability. It focuses on promoting e-signature, data protection and updating information and services on *Panamá Tramita* (Panama processes) and *Portal Nacional de Pagos* (National payments portal). Panama processes catalogues the 2 700 central government procedures with citizens or businesses and the 1 463 with local government. In 2019, Panama also adopted a personal data protection law, which establishes the legal framework for interoperability and development of data centres for cloud applications for public and private enterprises. Other initiatives include the modernisation of public procurement, aiming to achieve more transparent and efficient resource management through *Panamá Compra* (Panama buys), an e-procurement platform. Last, as part of Digital Agenda 2020, the country launched the Panama Digital Hub to turn the country into an international centre for digital innovation. To mitigate the social impact of the coronavirus (Covid-19), the Ministry of Education made education material available through the *Educa Panamá* (Educate Panama) portal and launched the Ester e-learning platform. The National Directorate of Informatics is responsible for surveying how many students have access to mobile devices and the Internet (CAF, 2020). However, despite these efforts, due to the lack of Internet access and electricity there are concerns that inequalities can be exacerbated with the Covid-19 crisis.

In terms of international co-operation, Panama collaborates with other LAC countries through the eLAC group. The eLAC's 2020 Digital Agenda addresses the development of digital communication, encouraging the implementation of plans in remote areas and promoting digital technologies that respond to natural disasters. The agenda endorses use of technologies for sustainable development by promoting convergent use of various types of emerging technologies in public policies and digital service design. Panama is also part of the Commission for Scientific and Technological Development in Central America and Panama, which encourages links among countries' national science and technology bodies to generate scientific policy and develop a regional science, technology and innovation strategic plan.

Panama also collaborates with the European Union on the Information Systems Programme for Food and Nutrition Security Resilience in the *Sistema de la Integración Centroamericana* (Central American Integration System) region. It contributes to the process of Central American integration and aims to achieve the United Nations Sustainable Development Goals related to hunger and food security. In 2019, Panama City hosted a TAIEX workshop to foster co-operation on Copernicus satellite applications, which aimed to contribute to establishing Copernicus as a global practice and promote the uptake of Copernicus data globally in order to maximise its societal value in solving global challenges.

Digital indicators - Panama[1]						
Enhancing access	**Panama**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	5.6	10.8	4.1	13.9	22.7	32.9
	2010	**2018**	**2010**	**2018**	**2010**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	3.2	79.1	5.4	73.5	37.7	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	79.0	95.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	4.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Panama**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.47	0.61	0.52	0.65	0.72	0.82
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Share of Internet users (% of population)[4]	33.8	57.9	25.3	62.9	65.0	83.4
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	47.2	50.4	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	14.6		14.8		N/A	
Enabling digital innovation	**Panama**		**LAC**		**OECD**	
	2008	**2016**	**2008**	**2016**	**2008**	**2016**
High-technology exports (% of manufactured exports)[9]	1.2	9.2	9.3	9.8	15.6	16.6
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Share of ICT service imports, as % of total trade in services[7]	2.9	1.6	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.14	1.3	0.14	0.34	30.9	38.2
	2006	**2013**	**2006**	**2013**	**2006**	**2013**
R&D expenditures, as % of GDP[11]	0.24	0.06	0.35	0.32	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.46		0.43		0.61	
Ensuring quality jobs for all	**Panama**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2017		**2018**		**2018**	
Share of informal employment to total employment[14]	49.4		54.9		N/A	
	2007	**2016**	**2007**	**2016**	**2007**	**2016**
Tertiary gross enrolment rate (%)[9]	43.3	47.8	37.5	57.8	66.6	73.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	22.8		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	7.9		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	9.0		12.5		14.6	
Promoting an inclusive digital society	**Panama**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	7.8	8.0	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	1.6	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Panama**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	4.0		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.29	0.37	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	64.4	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	69.2	52.8	54.9	41.7	45.6
Fostering market openness	**Panama**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

PARAGUAY

Recent trends

Paraguay continues to improve in terms of shaping an inclusive digital economy and society. The country has made efforts to enhance digital access for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade. Paraguay rose in the E-Government Development Index from 0.47 in 2008 to 0.53 in 2018, which is below the Latin America and the Caribbean (LAC) average (0.65) and the Organisation for Economic Co-operation and Development (OECD) average (0.82). The index measures national administrations' willingness and capacity to use information and communications technology (ICT) to deliver public services.

The country is below the LAC average in most of the digital innovation metrics, including R&D expenditures and the share of ICT service imports. However, high-technology exports as a percentage of total manufacturing exports stagnated at around 9.7% between 2008 and 2018, above the LAC average (8.6%). Finally, the UNCTAD B2C E-commerce Index increased between 2015 (43.8) and 2019 (50.5) and is just below the LAC average (51.5).

National strategies and international co-operation for digital transformation

The National Development Plan: Paraguay 2030 and the National Digital Agenda (DA) are the main reference documents for the development and digital policies of the country. The DA aims to achieve digital transformation through three axes: digital inclusion and ICT use, advancement of digital government, and innovation. Digital transformation policies link directly to the development plan's three overarching goals: poverty reduction and social development, inclusive economic growth, and deeper inclusion in the international economy.

Key activities include implementation of Law No. 6207/18, which created the Ministry of Information and Communication Technologies (MITIC). MITIC is the technical entity responsible for the formulation and implementation of public sector ICT plans and projects. It is also the administrative authority responsible for both the social and education aspects of the inclusion, innovation and implementation of technologies. Actions mainly focus on transparency, citizen participation, user rights protection and cybersecurity. MITIC emphasises the importance of the administration of communication infrastructure and the promotion of interoperability of public sector systems. To mitigate the impact of the coronavirus (Covid-19), MITIC is co-ordinating with digital service providers to offer free online access to the Ministry of Public Health and Social Welfare and World Health Organization websites. Users can also call the General Directorate of Health Surveillance for free. MITIC also introduced a digital telemedicine tool for citizens to access information, upload data and communicate with healthcare professionals (CAF, 2020).

In terms of international co-operation, Paraguay receives support from the Inter-American Development Bank to implement the DA. The DA has a six-year implementation plan, which will promote the competitiveness of the economy and the quality of public services to citizens and businesses. Country-level objectives include reducing the transactional costs of access to public services and increasing broadband by extending connectivity and improving quality of services. Paraguay is part of the Better than Cash Alliance, along with Colombia, Mexico, Peru and other countries around the world. The partnership of governments, companies and international organisations aims to accelerate the transition from cash to digital payment to reduce poverty and drive inclusive growth.

Paraguay also collaborates with the European Union (EU) through the EU-Mercosur Association Agreement. In the context of this agreement, Mercosur countries will seek to increase co-operation in digital economy and innovative research. Paraguay also forms part of the Open Government Partnership along with over 70 other countries. The 2018-20 action plan focuses on promoting digitalisation and reducing the digital divide.

Digital indicators - Paraguay[1]						
Enhancing access	**Paraguay**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	0.21	4.6	4.1	13.9	22.7	32.9
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	0.93	57.7	1.8	73.5	29.8	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	66.0	97.7	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.26	3.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Paraguay**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.47	0.53	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	14.3	65.0	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	43.8	50.5	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	13.2		14.8		N/A	
Enabling digital innovation	**Paraguay**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	9.6	9.7	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	0.17	0.08	3.1	3.9	4.6	6.7
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.04	0.00	0.14	0.34	30.9	38.2
	2008	**2016**	**2008**	**2016**	**2008**	**2016**
R&D expenditures, as % of GDP[11]	0.05	0.15	0.34	0.42	1.8	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.52		0.43		0.61	
Ensuring quality jobs for all	**Paraguay**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	70.3		54.9		N/A	
	2007	**2010**	**2007**	**2010**	**2007**	**2010**
Tertiary gross enrolment rate (%)[9]	28.7	34.6	37.5	45.5	66.6	68.8
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	N/A		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	N/A		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	N/A		12.5		14.6	
Promoting an inclusive digital society	**Paraguay**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	6.1	6.4	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	N/A	N/A	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Paraguay**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	3.4		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.21	0.60	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	N/A	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	N/A	52.8	54.9	41.7	45.6
Fostering market openness	**Paraguay**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

PERU

Recent trends

Peru has made efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade. Peru rose in the E-Government Development Index from 0.53 in 2008 to 0.65 in 2018, which is in line with the Latin America and the Caribbean (LAC) average (0.65) and below the Organisation for Economic Co-operation and Development (OECD) average (0.82).

Peru's performance in high-technology exports as a share of total manufactured exports (4.6%) improved but remained below averages in LAC (8.6%) and the OECD (15.1%) in 2018. Similarly, research and development expenditures of 0.1% of gross domestic product (GDP) were below the LAC average (0.4% of GDP) in 2016. Peru had slightly higher foreign direct investment restrictions than LAC and the OECD in the 2018 OECD FDI Regulatory Restrictiveness Index. Finally, Peru continues to improve in terms of shaping an inclusive digital society. In particular, the number of students per computer fell from 2.2 in 2015 to 1.4 in 2018, which is in line with the LAC average and above the OECD average.

National strategies and international co-operation for digital transformation

Plan Nacional de Competitividad y Productividad 2019-2030 (National Plan for Competitiveness and Productivity 2019-2030) and the Law of Digital Government of 2018 are the main reference documents for the development and digital transformation of Peru. The national plan focuses on eight main objectives to increase international competitiveness and put Peru on a stable growth path to raise well-being. Almost half the measures relate to digital transformation, indicating the importance of digital innovation for competitiveness and productivity. The law, approved by legislative Decree No. 1 412 of 2018, regulates the digital transformation, with a focus on government entities. It establishes the framework for the management of digital identity, digital services, interoperable systems, digital and data security, and the transversal implementation of information and communications technology (ICT) across the public administration.

The government's digital transformation strategy is threefold. First, increase competitiveness and productivity through regulation. Alongside policies, the government created a High-Level Commission for multi-sectoral co-ordination and the Digital Government Secretariat of Peru, which is responsible for formulating policies and supervising and evaluating progress towards the digital transformation of government. Second, simplify administrative procedures through progressive implementation of interoperability. Public administration entities are obliged to exchange technical and legal documents in digital format. As part of this strategy, public administrations must provide user information on marital status, criminal records, registered assets and degrees for free. They must also connect their documentation processing systems through the State Interoperability Platform. Third, digitalise public services. The GOB.PE digital platform provides a single point of contact for clear, simple and safe citizen interactions with government. Peru is focused on advances in national fibre-optic networks to narrow the digital divide. To mitigate the impact of the coronavirus (Covid-19), the government announced that public and private sector employers must adapt to remote working as long as the state of emergency is in effect. Additionally, the Ministry of Transport and Communications donated 2 000 Internet-connected tablets to the Ministry of Health to collect and analyse data (CAF, 2020).

In terms of international co-operation, Peru established the Better than Cash Alliance through multilateral co-operation with Colombia, Mexico, Paraguay and other countries around the world. The partnership aims to accelerate the transition from cash to digital payment to reduce poverty and drive inclusive growth. Brazil and Germany assisted in the creation of an Environmental Technology Centre, giving Peru the opportunity to host international environmental technology experts to comply with new legislation and criteria imposed on exporters by international markets.

Peru also co-ordinated with the European Union on the Building Europe Link to Latin America project to establish ultra high-speed cable connectivity, both submarine and terrestrial, between the regions by 2021. It includes 11 European and Latin American research and education networks and is led by RedCLARA, an international organisation aiming to connect Latin America's computer networks, and GEANT, a pan-European research education network.

Digital indicators - Peru[1]						
Enhancing access	**Peru**		**LAC[2]**		**OECD[3]**	
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Fixed broadband subscriptions (per 100 inhabitants)[4]	2.5	7.3	4.1	12.0	22.7	32.2
	2009	**2017**	**2009**	**2017**	**2009**	**2017**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	0.29	65.7	1.8	66.8	29.8	97.3
	2015	**2017**	**2015**	**2017**	**2015**	**2017**
Proportion of population covered by at least 3G network[5]	70.8	73.9	86.1	93.2	98.2	99.0
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.40	2.0	0.58	5.1	2.2	27.7
Strengthening their effective use	**Peru**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.53	0.65	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	30.6	52.5	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	43.1	47.8	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	13.2		14.8		N/A	
Enabling digital innovation	**Peru**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	2.9	4.6	9.3	8.6	15.6	15.1
	2008	**2017**	**2008**	**2017**	**2008**	**2017**
Share of ICT service imports, as % of total trade in services[7]	2.3	3.7	3.1	3.8	4.6	6.6
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.00	0.09	0.14	0.34	30.9	38.2
	2011	**2016**	**2011**	**2016**	**2011**	**2016**
R&D expenditures, as % of GDP[11]	0.08	0.12	0.33	0.42	1.9	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	N/A		0.43		0.61	
Ensuring quality jobs for all	**Peru**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2017		**2018**		**2018**	
Share of informal employment to total employment[14]	68.9		54.9		N/A	
	2006	**2017**	**2006**	**2017**	**2006**	**2017**
Tertiary gross enrolment rate (%)[9]	34.2	70.7	39.9	60.5	64.3	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	9.1		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	16.3		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	16.0		12.5		14.6	
Promoting an inclusive digital society	**Peru**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	5.6	5.8	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	2.2	1.4	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	6.3		7.7		27.7	
Strengthening trust	**Peru**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	4.0		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.32	0.40	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	64.6	72.5	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	52.0	75.5	52.8	54.9	41.7	45.6
Fostering market openness	**Peru**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	0.08		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

URUGUAY

Recent trends

Uruguay continues to stand out in Latin America and the Caribbean (LAC) in terms of shaping an inclusive digital economy and society. The country has made considerable efforts to enhance digital access and use for all. Internet users, active mobile broadband and fixed broadband subscriptions increased in the last decade. Uruguay rose in the E-Government Development Index from 0.56 in 2008 to 0.79 in 2018, which is above the LAC average (0.65) but below the Organisation for Economic Co-operation and Development (OECD) average (0.82). The UNCTAD B2C E-commerce Index shows that the economy's support for online shopping is still above the LAC average. This positive result is partly attributed to the development of digital banking in the country.

Uruguay is below the LAC average in digital innovation metrics. High-technology exports as a percentage of total manufactured exports increased to 7.2% in 2018 but remains below the LAC average (8.6%). Research and development expenditures as a percentage of gross domestic product increased in the past decade and are in line with the LAC average. In terms of promoting an inclusive digital society, the number of students per computer fell from 2.7 in 2015 to 2.3 in 2018 but remains above LAC and OECD averages.

National strategies and international co-operation for digital transformation

Agenda Uruguay Digital 2020 (Uruguay Digital Agenda 2020) goes beyond infrastructure and technological tools to improve and support traditional processes. It is in line with the country's strategic development goals and those of the United Nations 2030 Agenda for Sustainable Development. The digital agenda (DA) focuses on activities critical to the digital transformation of the country, such as strengthening skills, incorporating technology into productive sectors, deepening ties between the state and citizens, and relying on an enabling framework to develop the DA.

As part of the DA, Uruguay established the Digital Government Strategy 2020, which proposes a holistic vision of digital government and six areas of action: smart government, open government, efficient government, proximity government, whole-of-government and reliable digital government. The Agency for Electronic Government and the Information and Knowledge Society (Agesic) will act as promoter and incubator of proposed initiatives. To mitigate the impact of the coronavirus (Covid-19), Antel, a public telecommunications enterprise, provides free top-ups of 50 GB. Additionally, the government created the coronavirus.uy app for citizens with possible symptoms to connect with healthcare providers, to reduce wait times (CAF, 2020).

As Uruguay's DA co-ordinator, Agesic is responsible for developing the digital ecosystem, facilitating dialogue among actors in the digital transformation and promoting the development of citizen skills and the digitalisation of small and medium-sized enterprises. It promotes research and innovation in co-ordination with universities and other agencies. *Plan Ibirapitá*, for instance, provides tablets and connectivity to low-income retirees to improve social inclusion, participation and equity. *Plan Ceibal* ensures that all children in public education have an Internet-connected laptop.

In terms of international co-operation, Uruguay aims to develop connectivity, open government and open standards as part of the Digital Nations group (along with Canada, Denmark, Estonia, Israel, Korea, Mexico, New Zealand, Portugal and the United Kingdom). Through this co-operation, Uruguay has established the electronic medical history and digital signature of its entire population. Digital Nations also strives to guarantee digital rights and support to all citizens to access digital services.

Uruguay also collaborates with the European Union on the MAGIC project, which will streamline global scientific and academic co-operation. It focuses on addressing technical issues concerning system incompatibility, access and security. Through MAGIC, programmes have been created to enhance knowledge sharing, training and access to e-infrastructure.

Digital indicators - Uruguay[1]						
Enhancing access	**Uruguay**		**LAC[2]**		**OECD[3]**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
Fixed broadband subscriptions (per 100 inhabitants)[4]	7.3	28.3	4.1	13.9	22.7	32.9
	2009	**2018**	**2009**	**2018**	**2009**	**2018**
Active mobile-broadband subscriptions (per 100 inhabitants)[4]	3.3	99.0	1.8	73.5	29.8	103.6
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Proportion of population covered by at least 3G network[5]	90.0	91.0	86.1	94.6	98.2	98.8
	2008	**2017**	**2008**	**2017**	**2008**	**2007**
Fixed broadband speed (in Mbit/s)[4]	0.51	0.50	0.58	5.1	2.2	27.7
Strengthening their effective use	**Uruguay**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
E-Government Development Index (EGDI)[6]	0.56	0.79	0.52	0.65	0.72	0.82
Share of Internet users (% of population)[4]	39.3	74.8	25.3	67.7	65.0	84.3
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
UNCTAD B2C E-Commerce Index[7]	62.6	51.4	46.4	51.5	73.9	85.0
	2017		**2017**		**2017**	
Share of individuals engaging in online shopping[8]	23.5		14.8		N/A	
Enabling digital innovation	**Uruguay**		**LAC**		**OECD**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**
High-technology exports (% of manufactured exports)[9]	4.8	7.2	9.3	8.6	15.6	15.1
Share of ICT service imports, as % of total trade in services[7]	2.0	9.6	3.1	3.9	4.6	6.7
	2014	**2016**	**2014**	**2016**	**2014**	**2016**
ICT patent applications filed under the Patent Cooperation Treaty (per million people)[10]	0.42	0.58	0.24	0.34	29.9	38.2
	2006	**2016**	**2006**	**2016**	**2006**	**2016**
R&D expenditures, as % of GDP[11]	0.37	0.41	0.35	0.42	1.7	1.9
	2019		**2019**		**2019**	
OECD OURdata Index[12]	0.62		0.43		0.61	
Ensuring quality jobs for all	**Uruguay**		**LAC**		**OECD**	
	2006-15		**2006-15**		**2006-15**	
Contributions to changes in total employment, by digital intensity of sectors, 2006-16[13]	N/A		6.9		4.8	
	2018		**2018**		**2018**	
Share of informal employment to total employment[14]	24.0		54.9		N/A	
	2007	**2017**	**2007**	**2017**	**2007**	**2017**
Tertiary gross enrolment rate (%)[9]	50.7	63.1	37.5	60.5	66.6	74.3
	2016		**2016**		**2016**	
Tertiary graduates by field (%) - Education[11]	N/A		16.0		9.8	
Tertiary graduates by field (%) - Health[11]	N/A		13.8		14.5	
Tertiary graduates by field (%) - Engineering[11]	N/A		12.5		14.6	
Promoting an inclusive digital society	**Uruguay**		**LAC**		**OECD**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**
E-waste generated, kilograms per inhabitant[15]	10.5	10.8	6.9	7.2	17.7	17.7
	2015	**2018**	**2015**	**2018**	**2015**	**2018**
Number of students per computer[16]	2.7	2.3	2.4	1.6	1.8	1.1
	2018		**2018**		**2018**	
Percentage of women scoring at Level 2 or 3 in problem solving in technology-rich environments[17]	N/A		7.7		27.7	
Strengthening trust	**Uruguay**		**LAC**		**OECD**	
	2020		**2020**		**2020**	
CAF GovTech Index[18]	5.1		4.4		N/A	
	2016	**2018**	**2016**	**2018**	**2016**	**2018**
Global Cybersecurity Index (ITU)[19]	0.62	0.68	0.36	0.43	0.56	0.79
	2018	**2019**	**2018**	**2019**	**2018**	**2019**
E-commerce safety (%)[20]	N/A	58.7	72.0	63.1	61.7	58.3
Trust in online privacy (%)[20]	N/A	45.1	52.8	54.9	41.7	45.6
Fostering market openness	**Uruguay**		**LAC**		**OECD**	
	2015	**2019**	**2015**	**2019**	**2015**	**2019**
OECD Digital Services Trade Restrictiveness Index[13]	N/A	N/A	0.24	0.24	0.13	0.15
	2018		**2018**		**2018**	
OECD FDI RRI[13]	N/A		0.07		0.06	

Sources, footnotes and technical details can be found at the end of the country notes.

Technical notes

1. The table as best as possible follows the seven key areas identified in the OECD Going Digital project: 1) enhancing access to digital technologies; 2) strengthening their effective use; 3) enabling digital innovation; 4) ensuring quality jobs for all; 5) promoting an inclusive digital society; 6) strengthening trust; and 7) fostering market openness (OECD, 2019a). Indicators are chosen depending on data availability for LAC countries. Potential bias exists from the way components have been aggregated on index indicators.
2. LAC average is a simple average. Composition of countries depends on availability of country data. Each average includes as many LAC countries as possible.
3. OECD average is a simple average that includes all OECD member countries as of May 2020.
4. Data from ITU (2020), *World Telecommunication/ICT Indicators Database 2020* (database). Fixed broadband speed in Mbit/s refers to the advertised maximum theoretical download speed guaranteed to users associated with a fixed broadband Internet monthly subscription.
5. Data from UN Statistics Division, UN Global SDG Database (database). Data for 2015 and 2018 or latest available year.
6. Data from UN E-government Knowledgebase (2019), *Data Center* (database). The E-Government Development Index is a composite indicator that consists of three indexes (Online Service Index, Telecommunication Infrastructure Index and Human Capital Index), which are equally weighted. It ranges from 0 to 1, with 1 being the most developed.
7. Data from UNCTAD (2020), *UNCTADSTAT* (database). The UNCTAD B2C E-commerce Index measures an economy's preparedness to support online shopping. It ranges from 0 to 100, with 100 being the highest support.
8. Own calculations based on data from Latinobarómetro (2019), *Libros de Códigos por País/Año* (database). Data for 2017. Data from public opinion surveys using randomly selected, nationally representative samples.
9. Data from World Bank (2020a), *World Bank DataBank* (database).
10. Data from World Bank (2020b), *TCdata360*. Data for 2012 and 2016 or latest available year.
11. Data from UNESCO (2019), *UNESCO Institute for Statistics* (database). R&D Expenditures, as % of GDP data from 2006 and 2016 or latest available year.
12. Data from OECD (2020a), *OECD.Stat* (database); and OECD (2020b). The OECD OURdata Index assesses governments' efforts to implement open data in three critical areas: openness, usefulness and re-usability of government data. It ranges from 0 to 1, with 1 being the highest score.
13. Data from OECD (2020a), *OECD.Stat* (database). The OECD Digital Services Trade Restrictiveness Index identifies, catalogues and quantifies barriers that affect trade in digitally enabled services across 46 countries. It ranges from 0 to 1, with 1 being the most restrictive. The Foreign Direct Investment Regulatory Restrictiveness Index (FDI RRI) measures four types of statutory restrictions on foreign direct investment: 1) foreign equity restrictions; 2) screening and prior approval requirements; 3) rules for key personnel; and 4) other restrictions on the operation of foreign enterprises. The FDI RRI is a composite index, which ranges from 0 to 1, with 1 being the most restrictive.
14. Data from ILOSTAT, data from 2018 or latest available year.
15. Data from the Global E-waste Statistics Partnership.
16. OECD calculations based on OECD (2020c), *Programme for International Student Assessment* (database). Data for 2015 and 2018.
17. Data from the OECD (2019d), *Survey of Adult Skills (2018)*. Percentages for problem solving in technology-rich environments are computed so that the sum of percentages for the following mutually exhaustive categories equals 100%: opted out of the computer-based assessment; no computer experience; failed ICT core test; below Level 1, at Level 1, at Level 2 and at Level 3.
18. Data from CAF (2020), *The GovTech Index 2020: Unlocking the Potential of GovTech Ecosystems in Latin America, Spain and Portugal*. The GovTech Index 2020 measures the maturity of the GovTech ecosystem. It is based on 28 indicators across 7 dimensions, which on aggregate form 3 equally weighted pillars: start-up industry, government policies and procurement systems.
19. The Global Cybersecurity Index measures countries' commitment to cybersecurity at a global level. It has five pillars: 1) legal measures; 2) technical measures; 3) organisational measures; 4) capacity building; and 5) co-operation. It ranges from 0 to 1, with 1 being the highest level of cybersecurity.
20. Data from The Economist Intelligence Unit (2019), *EIU Inclusive Internet Index* (database). Indicators present perceived e-commerce safety and trust in online privacy among randomly sampled individuals in selected countries. It ranges from 0% to 100%, with 100% indicating absolute confidence in e-commerce safety and trust in online privacy.

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Latin American Economic Outlook 2020

DIGITAL TRANSFORMATION FOR BUILDING BACK BETTER

The *Latin American Economic Outlook (LEO) 2020* focuses on the role of digital transformation in helping to navigate through challenging times. The Covid-19 pandemic is having a profound impact on socio-economic conditions, accentuating the already complex scenario faced by a region with significant structural weaknesses. This unprecedented crisis comes at a time of high aspirations and reinforces the need to transform the very foundations of the development model in the region. The report explores how digital transformation can help to cope with the current socio-economic situation, boost productivity, strengthen institutions and achieve higher levels of inclusion and well-being. The LEO 2020 also highlights that international partnerships are fundamental to reaping the benefits of the digital transformation.

The LEO is a joint annual publication produced by the OECD Development Centre, the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC), the Development Bank of Latin America (CAF) and the European Union (EU). It is the first pillar of the EU Regional Facility for Development in Transition for Latin America and the Caribbean.

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